

EMPOWERING TEAMWORK EXPERIENCE AND SKILLS IN INDUSTRIAL
DESIGN STUDIO EDUCATION THROUGH COLLABORATIVE TOOLS FOR
TASK MANAGEMENT AND SHARED LEADERSHIP

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INDUSTRIAL DESIGN STUDIO EDUCATION THROUGH
COLLABORATIVE TOOLS FOR TASK MANAGEMENT AND SHARED
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ABSTRACT

EMPOWERING TEAMWORK EXPERIENCE AND SKILLS IN INDUSTRIAL DESIGN STUDIO EDUCATION THROUGH COLLABORATIVE TOOLS FOR TASK MANAGEMENT AND SHARED LEADERSHIP

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For the industrial design profession, to get success, teamwork is a necessity that students have to learn to take the responsibility for managing teamwork and working in a team environment. New graduates now work in many different sectors and produce solutions together with many different disciplines. This changing situation further increases the necessity of obtaining teamwork skills in design education. Current university students, Gen Z has been exposed to technology much more than the other generations, which influences all their activities including learning, obtaining information and education. These tools also bring flexible learning environments without time and place restrictions, which facilitates and develops new perspectives for teamwork.

In teamwork processes including many steps and processes, students are expected to learn to take different roles, work with different people and create a common working discipline. Students with these skills can adapt more easily to teamwork, which is inevitable in professional life, and can be more successful. In addition, design education also involves more complex issues that require teamwork, which

includes systems thinking and social and environmental awareness. Rather than just teamwork-oriented assignments, it should become the main structure of design projects, where feedback is given at regular intervals as part of studio courses and students' progress can be monitored in terms of teamwork skills.

This doctoral study aims to provide a framework and guidance for design students and educators on how to carry out more effective teamwork within the scope of the studio course and how design students learn main teamwork skills especially task management, time management and leadership skills. In this research, the opportunities and challenges for integrating online tools into the design process to promote teamwork experience in design education are reviewed to explore and develop the learning and teaching strategies in order to enhance teamwork for more effective design education in line with the characteristics and needs of new generations and developments of technologies.

Keywords: Teamwork, Industrial Design Education, Task Management, Shared Leadership, Online Tools

ÖZ

GÖREV YÖNETİMİ VE PAYLAŞIMLI LİDERLİK İÇİN İŞBİRLİĞİ ARAÇLARIYLA ENDÜSTRİYEL TASARIM STÜDYO EĞİTİMİNDE EKİP ÇALIŞMASI DENEYİMİ VE BECERİLERİNİ GÜÇLENDİRMEK

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Endüstriyel tasarım mesleğinde, başarıya ulaşmak için öğrencilerin ekip çalışmasını yönetme sorumluluğunu almaları ve ekip halinde çalışabilmeleri edinmeleri gereken becerilerdendir. Yeni mezunlar artık birçok farklı sektörde çalışmakta ve birçok farklı disiplinle birlikte tasarım çözümleri üretmektedirler. Bu değişen durum, tasarım eğitiminde ekip çalışması becerilerinin gerekliliğini daha da artırmaktadır. Şu anki üniversite öğrencileri, Z kuşağı, öğrenme, bilgi edinme ve eğitim de dahil olmak üzere tüm faaliyetlerini etkileyen teknolojiye diğer nesillerden çok daha fazla maruz kalmıştır. Bu teknolojiye dayanan araçlar ekip çalışması için yeni bir bakış açısı geliştirirken, aynı zamanda yer ve zaman kısıtlamaları olmaksızın esnek öğrenme ortamları sağlar.

Pek çok adım ve süreci içeren takım çalışmasında öğrencilerin farklı roller üstlenmeyi, farklı insanlarla çalışmayı ve ortak bir çalışma disiplini oluşturmayı öğrenmeleri beklenir. Bu becerilere sahip öğrenciler, iş hayatında kaçınılmaz olan ekip çalışmasına daha kolay uyum sağlayabilir ve daha başarılı olabilirler. Ayrıca tasarım eğitimi, sistem düşüncesi, sosyal ve çevresel farkındalık gibi ekip çalışması gerektiren daha karmaşık konuları da içermeye başlamıştır. Sadece ekip çalışması

odaklı ödevler yerine, stüdyo derslerinin bir parçası olarak düzenli aralıklarla geri bildirim verilen ve öğrencilerin ekip çalışması becerileri açısından gelişimlerinin takip edildiği, tasarım projelerinin temel yapısı haline dönüşmelidir.

Bu doktora çalışması kapsamında tasarım öğrencilerine kazandırılması gereken ekip çalışması becerilerinin stüdyo derslerine nasıl entegre edilebileceği üzerine bir araştırma yapılmıştır. Bu kapsamda çevrimiçi araçların getirdiği fırsatlar ve zorluklar gözden geçirilmiş ve yeni neslin özellikleri ve ihtiyaçları göz önünde bulundurulmuştur. Çevrimiçi araçlar ekip çalışması süreçlerinin özellikle görev ve zaman yönetimi ve paylaşımlı liderlik süreçlerini nasıl destekleyebileceği üzerine öğrenme stratejileri geliştirilmiştir.

Anahtar Kelimeler: Ekip Çalışması, Endüstriyel Tasarım Eğitimi, Görev Yönetimi, Paylaşımlı Liderlik, Çevrimiçi Araçlar

To my sweet family

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CHAPTER 1

INTRODUCTION

1.1 Problem Background

The internet and technologically oriented products, especially smartphones, have become a crucial part of a daily routine in particular to the new generation, Gen Z that has been exposed to technology much more than the other generations, influencing all the activities of their life such as shopping, communication, learning and education, etc. (Leslie et al., 2021). This common use of technology affects the ways that students learn, search, get information, communicate and interact in higher education. Online tools provide students with many advantages and opportunities such as quick access to information, fast and widespread communication, and instant sharing. Students have a chance to obtain any kind of information and data from the internet and share them with others whenever they want and whenever they need. Online platforms also bring flexible learning environments without the time and place restrictions that facilitate and develop a new perspective for teamwork. The new generation is very accustomed and adapts easily to simultaneous and collaborative tasks with the help of online tools (Lapolla, 2014). These changes in students have started to show their reflections on education.

For success in higher education and professional life, teamwork is a necessity, and students have to learn to take responsibility for managing teamwork and working in a team (Tucker and Abbasi, 2016). Especially for the industrial design profession, teamwork is a key element of a design process and practice. New graduates now work in many different sectors and produce solutions together with many different disciplines (Hidayah, 2020). This changing situation further increases the necessity of obtaining teamwork skills. Design education is a field that be get up-to-date with

these changing conditions (Meyer and Norman, 2020). Acquiring teamwork skills has become one of the priority topics of design education.

As Meyer and Norman (2020) emphasize, design education also involves more complex issues, namely “global challenges”, which require systems thinking and social and environmental awareness. The studio courses, incorporating diverse projects aim to address those challenges, are crucial for design education throughout a four-year education at the undergraduate level (Green, 2005). In terms of acquiring design skills, these courses play an important role in students’ learning experiences in design education. Teamwork is an indispensable part of these studio courses. Generally, each year, students have a chance to experience teamwork in their studio courses and they can have some problems while managing their teamwork. Course hours are not the only hours that the students allocate time for their education. Out of the course hours, they make a great effort in order to complete their design process successfully with their team. Therefore, managing this learning and teamwork process, and directing students for a better learning experience play a critical role in having a thorough education. Although teamwork is a part of the courses, especially in design studio courses, students are not informed about how this process could be effectively adopted. In order to acquire teamwork skills, the teamwork process should be taught to students in certain stages, just like the design project stages and critiques. On the contrary, the lack of effective support for teamwork can cause undesirable results in the teamwork process and it is seen that students have assumptions about teamwork.

In teamwork processes, which include many steps and processes, students are expected to learn to take different roles, work with different people and create a common working discipline (Levin, 2005). Ellis and Bell (2005) define teamwork as “where two or more employees interact interdependently toward a common and valued goal or objective, and who have each been assigned specific roles or functions to perform” (p. 641), and the authors also emphasize working for the same purpose and the importance of division of labor for teamwork. The concept of *task management*, which includes division of labor in teamwork processes and task

planning, comes to the fore for a good teamwork process. Tucker and Abbasi (2012) support this argument and state that the roles and responsibilities of each team member should be clearly defined and assigned to the members by common consent within the scope of task management. Another important point for good teamwork is *leadership*. Although it seems like a simple process, taking responsibility for this process, which needs to be managed, by a member of the team, will support the operation of the process. For this reason, the concept of leadership is another indispensable element of teamwork. However, sharing this task and experiencing it by all students in an educational project contributes to both the students and the teamwork process. Therefore, as Levin (2005) emphasizes, rotating this leadership role provides a democratic environment and ensures that students are in an equal position by preventing competition. Therefore, the concepts of *shared leadership* and *task management* have been the main focus of this research.

Students with these skills can adapt more easily to teamwork, which is inevitable in professional life, and can be more successful. Instead of a process of team assignments left alone, it should become a part of the design projects that are constantly monitored with feedback given at regular intervals and students can be followed for their progress in terms of teamwork skills. The biggest need for this process is that the teamwork process and its stages should become visible to both team members and educators. *Online tools*, as a part of collaborative tools which helps people to work together collectively, such as team management tools that allow simultaneous use of multiple users, give team members access to all information about the team at any time. The question of how these tools used in professional life can be equivalent in education should be investigated. Although there is no guidance in the literature about online tools that can be used for teamwork, studies show that students are not very enthusiastic about learning a new tool from the beginning in short-term studio projects. Tools that are frequently used by students, especially social media tools such as Facebook, Pinterest and Google Docs, are mostly integrated into design projects for different design purposes like brainstorming, sharing content, getting design crits, and facilitating collaborative discussions.

Within the scope of this doctoral study, design research will be conducted on how the teamwork skills that design students should acquire can be integrated into the studio courses. In this research, the opportunities and challenges for integrating online tools into the design process to promote teamwork experience in design education will be reviewed to explore the learning strategies in order to enhance teamwork for more effective design education in line with the characteristics and needs of new generations and developments of technologies.

1.2 Aim and Research Questions

This doctoral study aims to provide a framework and guidance for design students and educators on how to make more effective teamwork within the scope of the studio course and how design students learn main teamwork skills especially task management, time management and leadership skills. The findings from this study and the proposed guideline are intended to be used by design educators who want to make the teamwork process more effective in design education and design students who want to improve their teamwork skills. This aim will be achieved through:

- (i) exploring and understanding the overall experience of using online tools during a design project conducted in a design studio course;
- (ii) understanding the teamwork experiences within the context of design projects for improving design and teamwork skills;
- (iii) exploring the students' thoughts, needs and expectations about the effective learning experience for better teamwork and teamwork experience in design education, and;
- (iv) generating learning strategies or methods for influencing effective teamwork and design education in line with the characteristics and needs of new generation industrial design students and developments of technologies.

In this direction, this thesis aims to answer the following two major research questions:

1- How can the design students' experiences and practices of teamwork be enhanced in design studio education?

- What are the current approaches and strategies for integrating teamwork experience skills into design education?
- What are the roles of *task and time management* and *shared leadership* skills for teamwork experience in design studio education?
- How can the *online tools* enable *task and time management* and *shared leadership* skills for teamwork?
- What are the current strategies and practices for integrating *task and time management* and *shared leadership* skills for teamwork?

2- How can the learning and teaching strategies and skills for effective teamwork be integrated into design studio education?

- What are the key strategies and practices for enabling an effective teamwork experience for design students?
- How can *task and time management* and *shared leadership* skills be incorporated into design education in particular for design studio projects?
- How can teamwork experiences be improved by using online tools in industrial design education in terms of design studio projects?

1.3 Structure of the Thesis

This thesis consists of seven chapters. The first chapter introduces the problem background, and emphasizes the significance of this study. Then it continues with the aim of the research and the research questions, and finally explains the chapters of the thesis.

Chapter 2 includes a comprehensive literature review under three main titles including Design Education, Teamwork and Online Tools. The chapter starts with the technological developments affecting higher education, the characteristics of the new generation who are now university students, and their expectations from education. Then the important key elements of design education, and changes and new perspectives in design are discussed, followed by teamwork and the significance of teamwork in design education, how teamwork has been incorporated in design education, and how online tools can contribute to this process are presented with sample studies.

In Chapter 3, two explorative studies and the problem areas arising from their results are discussed and presented. Then in the last part of the chapter, the research framework is explained in detail which includes three main parts.

Chapter 4 covers the first part of the research in detail. This part of the research aims to understand which online tools students use in different stages of the design project and teamwork within the scope of the design studio course. Within this scope, two surveys and later interview sessions were conducted. The findings and results of this research and the emerging main themes are discussed at the end of the chapter.

In Chapter 5, the main study constituting the second part of the research is presented. In the initial stages of the main study, the tools expected to be used by the students throughout the research are introduced and the process is explained. Within the scope of a teamwork project given within the scope of the studio course, the students were observed closely throughout the process and their feedback was collected during

weekly meetings. The interviews held at the end of the project and the findings that emerged at the end of this whole process are explained in detail in relation to the themes that emerged from the analysis of the data. Finally, the prominent themes are discussed by identifying the main problem areas.

Chapter 6 presents the last part of the research. Two main studies were conducted in order to explore and understand how students see the teamwork process and the changes they made in this field under the changing educational conditions with the pandemic. In the first study, students' thoughts and opinions were collected through a survey, while in the second study, students were observed throughout the teamwork project and their in-depth opinions were taken in weekly meetings. The findings of these main studies are categorized and explained through themes. And finally, the results of the second and third parts of the research are compared and discussed.

In the final chapter (Chapter 7), all the studies and prominent findings are summarized by going over and responding to the research questions. The main contribution of this research, its limitations, and how to proceed with future research are discussed.

CHAPTER 2

LITERATURE REVIEW

2.1 The Changes of Higher Education: New Education and Learning Theories in relation to Technology

Technological developments and changes are becoming an essential part of people's lives. The number of people using the Internet and smart devices has been increasing gradually. So that the daily activities and the way people perform are changing. Technological developments are offering people an alternative way to carry them out. As Korski (2017) states that all the popular devices such as iPhone and applications such as Instagram and WhatsApp were not included in people's lives until ten years, and this transformation and change will continue increasingly in the coming years.

One of the affected sectors by the advancement of technology is higher education. Neustadtl et al. (2002) define the Internet as "the world's largest library, albeit a library of inert, already-analyzed information" (p.186). For people, getting information and finding answers to their questions are becoming easier and faster via online platforms. This shows that the higher education system should provide students with what they cannot obtain from computers and online platforms (Korski, 2017). Unlike formal learning "where learners are engaging with materials developed by a teacher to be used during a program of instruction in an educational environment" (Gikas & Grant, 2013, p.18); the learning experience is becoming a spreading social process via smart devices with which students can access information without time and space constraints.

The characteristics and needs of the new generation growing with this transformation are inevitably changing. The advancement of technology and the new generation

force higher education to develop new learning environments and methods throughout the education history. Harrasim (2012) divides the historical timeline into four intervals in terms of the effects of the technological developments for learning which are Speech (40,000 BCE), Writing (10,000 BCE), Printing and Mass Communication (CE 1600), and Internet (CE 2000). In the 20th century, the invention of the Internet and computer networking technologies institutes a shift in communication, collaboration, community, learning and knowledge. These encourage researchers to be in search of new learning methods integrating current education systems (Blended Learning) and new learning environments taking the place of traditional systems (E-Learning).

Technological developments and their implications for the new generation will be examined in the following sections. How these factors affect higher education will be discussed, and Web 2.0 Technologies will be explored in a comprehensive manner in terms of how these technologies can contribute to the current educational system.

2.1.1 Gen Z

Over the years, the characteristics of generations have been differing. Semaj (2016) divides the generations into five by 2016, which are Traditionalists (1922-1943), Baby Boomers (1944-1964), Generation X (1965-1980), Generation Y - Millennials (1981-1994) and Generation Z (1995-?). Cilliers (2017) defines these generations as follows:

“the Traditionalists born between 1928 and 1944, who value authority and a top-down management approach; *the Baby Boomer* generation born between 1945 and 1965, who tend to be workaholics; *the Generation X*, born between 1965 and 1979, a generation who is comfortable with authority and view the work-life balance as important; *the Generation Y*, born between 1980 and

1995 and who generally grew up in prosperity and have technology savvy; and finally *the Generation Z*, born after 1995” (pp.189-190).

While, most of the Generation X did not encounter with computers during their school period; Generation Y known as Millennials are considered the first generation to grow up with the Internet and tend to reject traditional norms (Leslie et al., 2021). On the other hand, Generation Z, most of this generation are students in higher education now, is the first generation of digital natives (Leslie et al., 2021). They were born into a world where the internet and technology are indispensable parts of life. Nieradka (2016) compares these generations in terms of their preferences for technologies, communication and financial decisions (Table 2.1) and this comparison shows that the year of birth determines the preferences, lifestyle, and needs of that generation.

Table 2.1 Overview of the Generations (reproduced from Nieradka, 2016)

| | Generation X | Generation Y | Generation Z |
|--|--|---|---|
| Major Global Events | - End of Cold War - Vietnam War - Fall of the Berlin Wall | - Technology - Social media - Google | - Global crisis - Mobile devices - Data cloud |
| Device most frequently used | - TV set - Desktop computer | - Smartphones - Laptop | - Social media - Online media |
| Most frequent communication methods | - SMS - Phone - Email | - SMS - Social media - Online media | - Social media - Online media |
| Work outlook | - Career - Job | - Work-life balance | - Working at home - Multitasking |
| Major characteristics | - Flexibility - Individualism - Skepticism towards authority | - Technological convenience - Global communications - Optimism - Freedom | - Distrust of political systems - Permanent connection with the Web - Freedom |

Generation Z are integrating technology into their activities and find the opportunity to meet technology from the youngest age and never imagine a world without

computers and cell phones (Leslie et al., 2021 and Nieradka, 2016). Kingston (2014) from the Macleans, a Canadian news magazine founded in 1905, prepares research about Gen Z and gives a place for this research under the title of “They’re smarter than Boomers, and way more ambitious than the Millennials” and the author stimulate that “this is the first time in history, kids know more than adults about something really important to society – may be the most important thing.” Gen Z is growing different from Gen Y; this brings out apparent distinction effects on their perspective on lives. Gen Z also has been exposed to technology much more than the other generations, converting essential and indispensable parts of their daily routine, which affects all the activities of their life such as shopping, communication, learning and education. Higher education should take care of this new generation in order to be prepared and kept in step with them. In addition, the learning characteristics of Generation Z are defined as:

Gen Z students have grown up in an age of technological advancement. As a result, they spend their whole lives surrounded by a range of digital instruments, which have become vital in their everyday lives (Poláková and Klímová.2019). Gen Z students rely on Google, social media, and YouTube as their major resources for learning and performing research (Ashour, 2020). They also get knowledge and solutions to their queries from any source on the Internet, such as Wikipedia, YouTube videos, etc. (Ashour, 2020). So far, this generation of students have been able to access digital technologies more than other generations (Sakdiyakorn et al., 2021) (as cited in Alruthaya, et al., 2021, p.3).

Lapolla (2014) states that because of learning differently, the new generation has difficulties adapting the teaching techniques enforced for decades. They are used to performing tasks simultaneously and they are more familiar with collaborative tasks and using online platforms to get information. Gikas and Grant (2013) emphasize the research conducted by The Educause Center for Applied Research in 2012, and state that “students are driving the adoption of mobile computing devices, such as cellphones, smartphones, and tablet computers, in higher education, and 67% of

surveyed students believe mobile devices are important to their academic success and use their devices for academic activities” (p.18). Considering this situation, the integration of smart devices into higher education can stimulate students’ interest and can promote them to participate in the lectures more. By taking this situation into consideration, Fleischmann (2014) claims that online technologies can contribute to the new generation more in terms of interactivity and engaging environment and social interaction, and a self-directed learning system.

There are many examples of using technological developments in higher education in order to stay up to date. Souleles (2012) asserts that this new generation can be resistant to traditional teaching methods, and they prefer more interactive environments which can provide an effective situation for communication between students and educators. Higher education should make an effort to include technological developments into their system in order to provide the students with a more appealing environment.

2.1.2 Technological Developments

Considering the technological developments, higher education starts to integrate them into the learning system to discover new and effective learning experiences for students. The Horizon Report divides these technological developments into six categories which are Consumer technologies, Digital strategies, Enabling technologies, Internet technologies, Learning technologies, Social media technologies, and Visualization technologies (Johnson et al., 2015) (Figure 2.1).

| Consumer Technologies | Digital Strategies | Internet Technologies | Learning Technologies | Social Media & Visualization Technologies | Enabling Technologies |
|--|--|---|--|---|--|
| 3D Video Drones Electronic Publishing Mobile Apps Quantified Self Tablet Computing Telepresence Wearable Technology | Bring Your Own Device (BYOD) Flipped Classroom Games and Gamification Location Intelligence Makerspaces Preservation/ Conservation Technologies | Cloud Computing The Internet of Things Real-Time Translation Semantic Applications Single Sign-On | Badges/Microcredit Learning Analytics Massive Open Online Courses Mobile Learning Online Learning Open Content Open Licensing Virtual and Remote Laboratories | Collaborative Environments Collective Intelligence Crowdfunding Crowdsourcing Digital Identity Social Networks 3D Printing/Rapid Prototyping Augmented Reality Information Visualization Visual Data Analysis Volumetric and Holographic Displays | Affective Computing Cellular Networks Flexible Displays Geolocation Location-Based Services Machine Learning Mesh Networks Mobile Broadband Natural User Interfaces Near Field Communication Next-Generation Batteries Open Hardware Speech-to-Speech Translation Statistical Machine Translation Virtual Assistants Wireless Power |

Figure 2.1 Categorization of the Technology (reproduced from Johnson et al., 2015)

According to the 2015 Higher Education Expert Panel some technologies from this categorization are highlighted which are Bring Your Own Device, Flipped Classroom, Makerspaces, Wearable Technology, Adaptive Learning Technology and The Internet of Things (Johnson et al., 2015). These technologies and strategies are categorized again in terms of five-year technology planning for higher education (Figure 2.2). All the items of this categorization are labeled into three timesheets which are “near-term technologies that are expected to achieve widespread adoption in one year or less; mid-term technologies that will take two to three years; and far-term technologies, which are forecasted to enter the mainstream of education within four to five years” (Johnson et al., 2015, p.34).

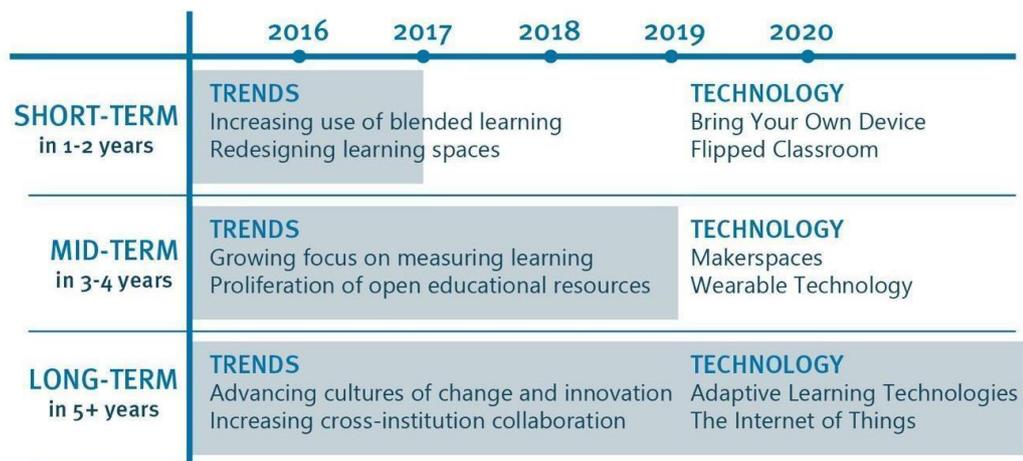


Figure 2.2 Prospective technological developments for higher education (reproduced from Johnson et al., 2015)

According to the Horizon Report (Johnson et al., 2015), the short-term goals are blended learning which refers to “combinations of online and face-to-face teaching” (Mason & Rennie, 2006, p.12) and the revision of the learning environments. In accordance with these purposes, two models are created. One of them is *Bring Your Own Device* which refers to “the practice of people bringing their own laptops, tablets, smartphones, or other mobile devices with them to the learning or work environment” (p.36) and the other is the *Flipped Classroom* model that includes “the instructor using class time to dispense information, that work is done by each student after class, and could take the form of watching video lectures, listening to podcasts, perusing enhanced e-book content, or collaborating with peers in online communities” (p.38). Although all these developments did not adapt to education as quickly as expected, they have started to increase gradually. Education, which gained a completely different perspective with the experience of the Covid-19 pandemic process, gained momentum, especially in the field of distance education and hybrid education. Technological developments such as 3D printers, wearable technologies, robotics, and 3D modeling web-based applications, and wearable technologies such as Google Glass, and smartwatches can be currently observed in people’s daily lives and start to get involved in educational research. For the long-term target, it is

expected that these changes will include *adaptive learning technologies* and the *internet of things* in higher education. Adaptive learning technologies refer to online platforms which are developed according to students' learning needs. These platforms are student-centered developments and more related to education. The Internet of Things (IoT) which refers to "the networked interconnection of everyday objects, which are often equipped with ubiquitous intelligence" describes the future life in which every physical object in human daily life will be connected to the Internet and also each other (Xia et al., 2012, p.1101).

Apart from these technologies, there are many developments that change students' learning experiences and the way of performing their work. Especially social media tools -in daily language- become an essential part of daily life, particularly for communication, sharing, informing, etc. Indirectly, they have become involved in education. When searched in literature, it is seen that social media tools are categorized in the title of Web 2.0 technologies.

2.1.3 Web 2.0 Technologies

The majority of the new generation lives in an environment that is covered by technological tools and developments. They use technology also as part of their educational life. In doing so, it is necessary to support this new generation with different technological developments. Web 2.0 is one of the technological developments integrating learning experiences more and more. Grosseck (2009) describes Web 2.0 technologies as "the social use of the Web which allow people to collaborate, to get actively involved in creating content, to generate knowledge and to share information online" (p.478). Similarly, Livingston (2010) identifies it as "the second generation of web development, which allows people to collaborate, interact, and share information online and it's a dynamic, user-centered environment that encourages two-way communication" (p.1). Web 2.0 technologies such as blogs,

wikis, and social networking sites provide users to share information online to connect with other people easily and bring together people having similar interests or views. These technologies can be described by user participation, knowledge sharing, social networking and collaboration, and user-created content (An et al., 2009). Sharing, interaction, collaboration and user-generated content can be considered the key elements of Web 2.0 technologies.

There are many services and applications that can be served as Web 2.0 such as wikis, blogging, photo sharing, video sharing, communication, social networking, etc. According to Anderson et al. (2007), there are six different types of Web 2.0 technologies. These are blogs, wikis, tagging and social bookmarking, multimedia sharing, audio blogging and podcasting, and RSS and syndication. RSS is defined as “a family of formats which allow users to find out about updates to the content of RSS-enabled websites, blogs or podcasts without actually having to go and visit the site” (Anderson et al., 2007, p.10). On the other hand, Grosseck (2009) divides it into nine which are blogging, microblogging, wikis, photo/slide sharing, video sharing, syndication of content through RSS, social bookmarking, social networking, and others. There are many different categorizations of Web 2.0 tools (Figure 2.3). They generally are divided into different categories according to the situation they are in.

| Web 2.0 Technologies | Educational Applications |
|------------------------------------|--|
| Blogging | real-world writing experiences quickly giving feedback peer networks to develop own knowledge |
| Microblogging | collaborative writing reader response collaboration virtual classroom |
| Wikis | collaborating on ideas and organizing documents and resources presentation tool (as e-portfolios); writing: student created books and journaling classroom discussion and debate area; a place |
| Photos/Slides Sharing | share, comment, and add notes to photos or images create a presentation using the photos use tags to find photos of areas and events around the world post presentations to an authentic audience and get feedback from around the worlds |
| Video Sharing | create an own subject specific videos use video sharing sites to find videos on current issues |
| Syndication of content through RSS | professional development, time saving; updated information in teaching area sharing work with others reducing email overload keep course specific webpages current and relevant etc. |
| Social Bookmarking | accessing from any computer connected to the internet conduct research and share that research with peers setup a group tag in order to share educational resources share resources with each other |
| Social Networking | team and community support personal learning environments |
| Other tools | instant messaging increase the sense of community and accessibility with survey and polls, online diagrams and web-based word processor, online spreadsheet, mind mapping virtual worlds - virtual conferences and seminars, team meetings and collaboration spaces, simulations |

Figure 2.3 Categorization of Web 2.0 Technologies (reproduced from Grosseck, 2009)

The term Social Media encountered much more while talking about Web 2.0 refers to the use of web-based and mobile technologies for interactive communications (Baruah, 2012). In addition, it can be defined as “a group of Internet based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of user generated content” (Kaplan & Haenlein, 2010, p. 61). According to Kaplan and Haenlein (2010), there are six different types of social media which are (i) collaborative projects such as Wikipedia, (ii) blogs and microblogs such as Twitter, (iii) content communities such as YouTube, (iv) social networking sites such as Facebook, (v) virtual game worlds such as World of Warcraft and (iv) virtual social worlds such as Second Life. As is

seen, web 2.0 and social media have many similarities in terms of definition and categorizations including tools (Figure 2.4). In this work, “online tool” refers to all the tools that require an internet connection including websites, applications, and web 2.0 technologies will be used as a generic term.



Figure 2.4 Categorization of Social Media Tools (reproduced from Kaplan & Haenlein, 2010)

Fleischmann (2014) collects social media tools into four titles which are social networks such as Facebook and LinkedIn promoting users to generate a profile and connect to each other; media sharing platforms such as YouTube and Flickr allowing the users to upload and share media like photos and videos; blogs such as WordPress, microblogs such as Twitter allowing the users to publish contents, and lastly, socially curated sites such as Reddit allowing users to promote news and stories. Although the categorizations and names are different from each other, the overall content is similar. In addition, if it is compared with the categorization of the Web 2.0

technologies, it can be realized that their content is nearly the same as each other. Therefore, the terms can be used as interchangeable in some cases. In this research, “online tools” are preferred to use instead of Web 2.0 technologies and social media tools.

2.2 Design Education

“The need for design to articulate what it is, and how it can contribute, is more critical than ever. Without a more rigorous definition of the discipline, it will be that much harder to involve design in the bigger picture which includes research, collaboration, and learning about the world” (Niederheman 2001, p.87).

Design education involves various design disciplines such as architecture, urban design, graphic design, industrial design, fashion design and interior design. It aims to teach the theory of design through design projects facilitated in design studio courses. Studio-based teaching is the central pedagogy of design education (Fleischmann, 2014). The learning experience is conducted in studio environments where students learn to think as designers and experience a design process to create a design solution (Green & Bonollo, 2003). In studio environments, the dialogue between students and instructors provides the students with an informal discussion area to teach design components (Fleischmann, 2014).

Design education adopts a problem-based methodology including a problem-solving process within the context of a studio environment and a design project. Problem-based learning (PBL) is student-centered pedagogy focusing on learning experience through the experience of solving (Powers, 2016). According to Savery and Duffy (1995), there are four main elements for effective PBL and design learning which are studio environment, projects, instructors as facilitators, and students who participate actively in their own learning process as self-regulated learners.

Zimmerman (1986) defines a self-regulated learner as a learner who participates in her/his own learning process metacognitively, motivationally and behaviorally. These definitions show that design students should be encouraged to be self-regulated learners throughout the design project process. Industrial design education will be the focus of this research, therefore its key elements such as design studio education and design process will be examined in the following sections.

2.2.1 Design Studio and Design Process

John Heskett (2005) describes design as “one of the basic characteristics of what it is to be human, and an essential determinant of the quality of human life. It affects everyone in every detail of every aspect of what they do throughout each day” (p.2). Design is the main issue in people’s lives and their activities, it aims to fulfill the needs of users and increase the quality of life which is closely related to industrial design. Similarly, Heskett (1980) makes a definition for industrial design and states that “...Industrial design is a process of creation, invention and definition separated from the means of production, involving an eventual synthesis of contributory and often conflicting factors into a concept of three-dimensional form, and its material reality, capable of multiple reproduction by mechanical means” (p.10). There are different definitions of Industrial Design (ID) in the literature. On the Board of Directors of the Industrial Designers Society of America (IDSA), Scott Shim (n.d.) defines ID as: “Industrial design is a discipline historically known for creating products and systems that optimize function, value and appearance for the mutual benefit of stakeholders involved” (para.3). On the other hand, The World Design Organization (WDO) defines industrial design as

“Industrial Design is a strategic problem-solving process that drives innovation, builds business success, and leads to a better quality of life through innovative products, systems, services, and experiences. Industrial

Design bridges the gap between what is and what's possible. It is a trans-disciplinary profession that harnesses creativity to resolve problems and co-create solutions with the intent of making a product, system, service, experience or a business, better. At its heart, Industrial Design provides a more optimistic way of looking at the future by reframing problems as opportunities. It links innovation, technology, research, business, and customers to provide new value and competitive advantage across economic, social, and environmental spheres” (Definition of Industrial Design, n.d.).

In addition, Industrial Designers' Society of Turkey (ETMK) defines industrial design as “the profession which conceptually develops products manufactured by the industry for the end user according to criteria such as functionality, the taste of the target group and user needs, and which projects them as new products suitable for production. Industrial design constitutes the relationship between humans and products manufactured by industrial methods.” (Industrial Design, n.d.).

While WDO's definition is more inclusive and it embraces the sustainability criteria and involves products, systems, services and experiences, ETMK's definition seems to have taken the definition from a traditional approach. While the focus of industrial design was much narrower until recently, it now has an ever-widening scope. All the changes and needs in the industry have affected and expanded this scope. While the product and its users were the main focus of industrial design, systems, services, and experiences have now joined this field, and while these areas are being addressed, economic, social, and environmental factors have come to the fore as well as the user. It seems that every technological, social, cultural, environmental, economic, and even political change will affect the field of industrial design and every problem that arises in these fields will be the subject of the design. As these areas expand, the sectors in which designers are interested will expand and teamwork in which different disciplines work together will become much more important in order to solve these complex problems related to the different disciplines as mentioned in WDO's definition.

Although the definition of Industrial Design has been changing over the years, industrial design education has the key elements such as studio-based teaching (Sara, 2006). Lance Noel Green (2005) states that “the design studio is at the heart of most industrial design curricula and is a place where students learn to visualize and represent aspects of a problem graphically and to think as a designer” (p.11). In a design studio environment, the learning experience is often built around “dialogical learning and teaching” (Danvers, 2003, p. 51). Dialogues between students and instructors are named as the design critique that is the main strategy for design education. During these dialogues, students and instructors discuss the projects together and the instructors try to guide students during the design process.

In a studio environment, students learn to manage a design process as a designer, which includes creativity, drawing, model making, problem solving, and communication skills. Studio-based education and learning which includes both practical and theoretical knowledge is different from the lectured-based education. While students experience the design process, instructors supervise and guide them, where design learning is actualized through ongoing dialogues between students and instructors.

Industrial design education has been evolving as the definition of industrial design changes over time. Don Norman and Scott Klemmer (2015) make a comparison and claim that while the industrial design was more related with form, function, material and aesthetics in the past; today designers are more interested in culture, emotion and societal issues. Gu et al. (2007) support this opinion and reflect that the information and communication technologies have also brought a new perspective to design and design education, this forces educators and researchers to develop a new pedagogical approach in order to stay up to date. For example, Gu et al. (2010) explain this transformation through 3D virtual worlds, which are multi-user online environments, and state that “3D virtual worlds have the potential to make a major contribution to design education as a new teaching and learning environment, supporting synchronized communication and 3D modeling; as well as encouraging students to explore creative design by responding to the new design contexts and

opportunities as exhibited in these virtual environments (p.1259). The new opportunities formed with technological developments and changes should be evaluated in terms of design education and should be included in the scope of design education.

Design is a problem-solving activity and realized in a systematic process (Archer, 1965). This systematic process is worked by many researchers when looking into the literature. There are various explanations and classifications within the design process. John Chris Jones (1980) divides the design process into three stages which are

- Analysis (Divergence)
- Synthesis (Transformation)
- Evaluation (Convergence)

For the analysis stage (preparation stage), the design problem is broken into pieces, the requirements are listed, and the related information is collected in order to understand design problem completely. Then, possible design solutions are worked on, and through discussing these ideas, design solutions are revealed in the synthesis stage (development stage). In the evaluation stage, the last stage of the design process, designers make decisions and the final design solution is evaluated.

The other categorization made by Reeder (2001) includes five stages which are Problem Definition, Design Research, Concept Development, Concept Refinement and Finalization (p.21). According to Reeder (2001) the design process starts with a problem definition which can be related to a specific product or a gap in a market. First, initial problem statements are decided, and goals, user profiles, usage areas, objectives and economic situations are determined. After these determined boundaries, market research and user research are conducted in order to take information about market, user, and related technologies. Designers use various research methods during this stage to get as much as beneficial information which is used for initial ideas or inspirations. In the concept development stage, initial ideas

are developed in terms of findings obtained in the research stage. Potential design ideas are worked on and assessed with design objectives to find the most viable solutions for developing further. And then the selected idea is refined with its details. The final details such as the size, materials, and manufacturing process of the final design are decided in terms of design objectives and tested by potential users. In the last stage of the design process, the finalization stage, prototypes are produced with their final details and decisions. After final reviews, the design process is completed.

In 2005, Design Council conducted research with professional designers and studied their design processes. Although designers manage their own design processes differently from each other; some similarities in these design processes were realized, and Design Council (2012) demonstrates the design process with “double diamond diagram” which is divided into four stages: Discover, Define, Develop and Deliver (p.6). It focuses on divergent and convergent stages of the design process (Design Council, 2012).

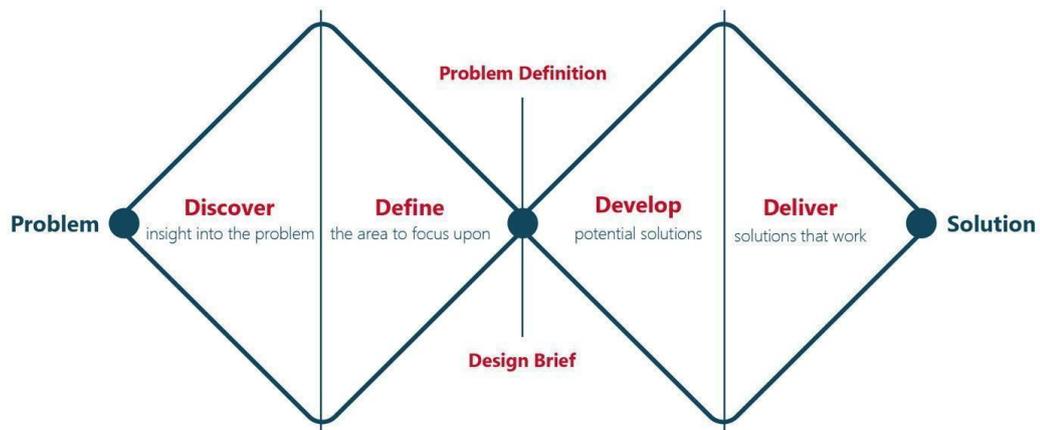


Figure 2.5 Double Diamond Diagram (reproduced from Design Council, 2012)

The first part of the diagram, namely “Discover” includes market research, user research, and managing information obtained from the researches. Designers aim to

extend the problem in order to get as much as information to dominate the area. When the research data reach the saturation point, it is time to narrow down the area, and define the problem and design objectives. Then, designers start to develop design ideas and test them in the Develop stage, the third part of the design process. In the final stage of the process, the Deliver stage, final tests, and evaluations are conducted, and the design is finalized.

Similarly, Martin and Hanington (2012) divide the design process into five:

- **Phase 1 is Planning, Scoping, and Definition**, where project parameters are explored and defined.
- **Phase 2, Exploration, Synthesis, and Design Implications**, is characterized by immersive research and design ethnography, leading to implications for design.
- **Phase 3 is Concept Generation and Early Prototype Iteration**, involving participatory and generative design activities.
- **Phase 4 is Evaluation, Refinement, and Production**, based on iterative testing and feedback.
- **Phase 5 is Launch and Monitor**, the quality assurance testing of design to ensure readiness for market and public use, and ongoing review and analysis to course-correct when necessary (p. 7).

Although there are many different categorizations of the design process; all of them are talking about the same design process under different names with different categorizations. In studio-based courses, the design process is conducted almost in the same sequence. Project briefs including problem definition and design objectives are usually prepared by the studio team involving instructors; in this context, students define their own design problem areas or design directions. They start the design process by conducting research in order to collect essential and inspirational information. Then they generate initial ideas based on their research and try to develop design solutions. With the design critiques including sketches, mock-ups or

low fidelity models, they develop further their ideas and then refine these. In the final stage, they present their design solutions to the jury of instructors and professionals.

2.2.2 New Approaches in, Changing Design Education and its implications for Industrial Design Education / Design Studio

Graduates from the field of design can find the opportunity to work in many different sectors. These range diverse from social design to UX design, as well as the more traditional sectors like product and interior design. This diversity also increases and diversifies expectations from graduates. As Hidayah (2020), who is the dean of the Faculty of Design, LASALLE College of the Arts, emphasizes:

The designers we are educating today may never work in one single sector of the design discipline. They are more likely to work over a very diverse range of projects, where they do not stop at simply designing an object but also design everyday experiences and systems of thought. The shift in a designer's role also necessitates a shift in how we deliver design education. (Hidayah, 2020, para. 3)

As in all sectors, the world is constantly changing and developing. This change shows that the current professions will not remain the same tomorrow and will constantly change. Technological, scientific, and social changes and developments shape human life needs and ways of life, which leads to the transformation of existing professions and the birth of new professions in new fields. For this transformation, the education process cannot be expected to remain the same. But it seems that the world of education cannot respond to these changes as quickly as in professional life. In design education, the main thing is to teach design students how to solve problems and show how they can adapt them to different areas (Hidayah, 2020).

All these changes appear as bigger and more complex problems, and this necessitates that different fields become a part of design education, as Meyer and Norman (2020) state that to cope with today's complex design problems, design education should integrate different disciplines and fields such as technology, business, social sciences and art into education. The necessity of thinking in different fields and working in different fields should become an inevitable part of design graduates. A design that emerges in this large-scale world no longer only affects a user, but at the same time different user groups, manufacturers, organizations and stakeholders are the parts of designers' responsibilities. Therefore, creating a design solution that is not only user-oriented but also meets the expectations of all these parts seems to be a result of the new world (Friedman, 2012). In this, it is an inevitable part for designers to dominate different fields and to be able to work with people from different fields. In light of all this, Friedman (2019) asks a very fundamental and important question "What should design education be to meet today's needs and what should it become to educate tomorrow's designers?" (slide, 95).

Before establishing the design department, Kristian Simsarian conducts extensive research and meets with the leaders of companies in today's leading industries to try to understand what they expect from design graduates. In this process, he talks with Bill Moggridge, IDEO cofounder and he says that "Technology changes too fast, you need to educate students in the stuff that changes slowly - those things that are fundamentally human. Verbs, not nouns." (2019, p. 39). Similarly, Meyer and Norman (2020) state that:

The curriculum should be designed to prepare graduates to succeed in a rapidly changing field. Curricula must prepare students for lifelong learning and must include professional practice (e.g., communication skills, teamwork, ethics) as components of the undergraduate experience.... Students must learn to integrate theory and practice, to recognize the importance of abstraction, and to appreciate the value of good engineering design. (p.33)

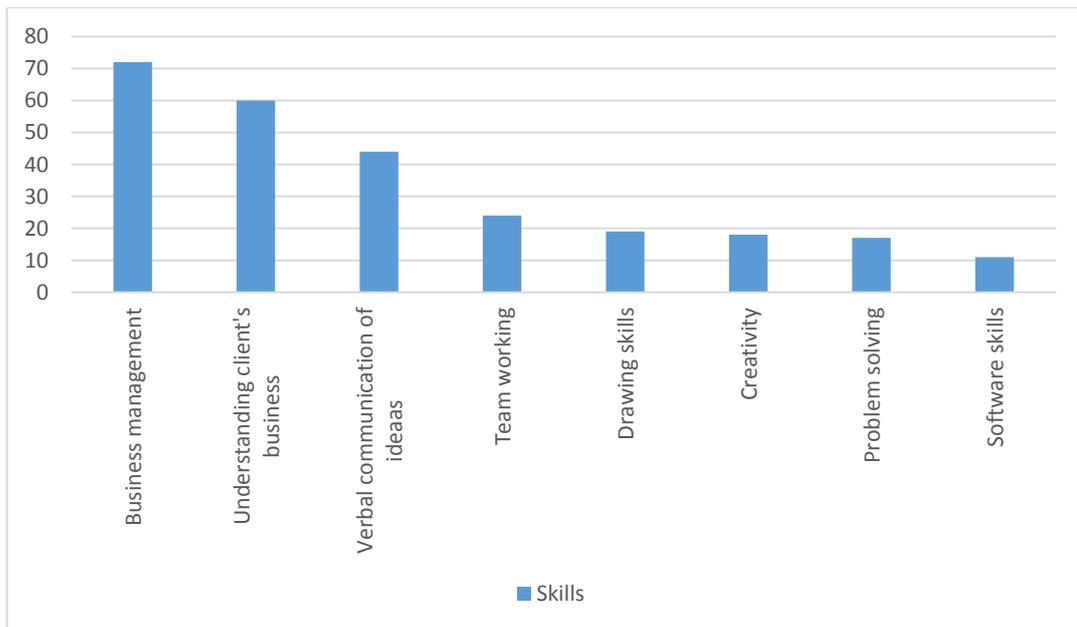


Figure 2.6 U.K. skills designers lack at most. Recreated from Design Council, UK (2005).

In the earlier years, the main subject of the designer was the form, function and material of the design, plus many different areas have been added to these subjects nowadays such as culture, social issues, different technologies and etc. Therefore, design education should change in light of all of these. As Don Norman (2014) states:

For design to succeed, grow, achieve its potential, and train future leaders, we envision a new curriculum. In our vision, these new programs combine learning the art and craft of beautiful, pleasurable well-crafted design with substantive courses in the social and biological sciences, in technology, mathematics and statistics, and in the understanding of experimental methods and rigorous reasoning (para. 12).

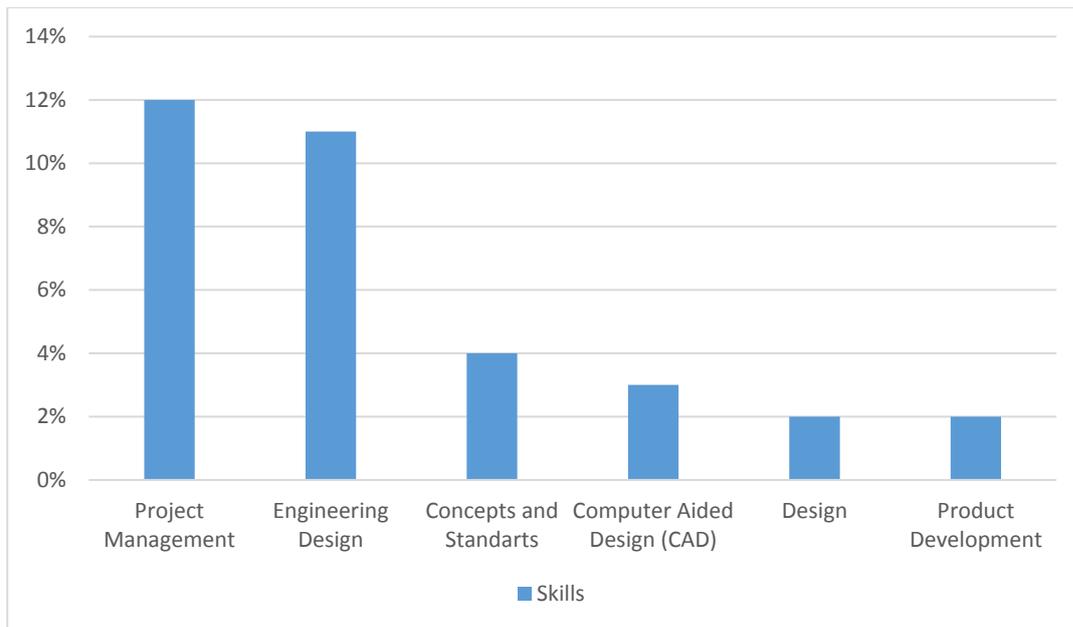


Figure 2.7 Recreated from PayScale (2017) U.S. skills trends affecting salaries for industrial designers as per.

It is unlikely that all these skills will be present in a single designer. Therefore, teamwork skills are needed especially for alternative solutions to complex problems that are more common today (Meyer & Norman, 2020). Teamwork and project management skills are now even more prominent among the ones that designers need to experience and learn. As stated in Figure 2.7, being able to manage and sustain a project comes to the fore more than design skills. And it seems that these are one of the most missing skills in designers as mentioned by Design Council (2005) (Figure 2.6). In order to close this gap, it is seen that more importance should be given to team projects, project management and leadership role in design education.

All these changes indicate that designers should be experienced in teamwork, leadership, and working under a leader when necessary. Meyer and Norman (2020) add that in curriculum design students should experience followership in the first and second years, and experience leadership roles in the third year. In parallel with all these, students will gain experience in task management and team composition.

2.3 Design Education and Teamwork

Most of the organizations which accredit the design discipline emphasize teamwork skills as the essential qualification for design graduates (Tucker and Abbasi, 2016). Graduates from the design disciplines need to have good teamwork skills in order to be successful in their professional life, and the design disciplines' work environment requires collaborative working. Although the design students have an opportunity to experience teamwork during their educational life, there is no extra effort to teach students how effective teamwork can be managed. Passerini et al. (2007) state that learning institutions serve as an ideal environment for team learning experiences, and they provide the students with an opportunity to experience practice for their professional careers. However, generally, in design studio courses, while all stages of the design project are planned in detail, the students are expected to manage the teamwork process completely themselves and there appears to be little about it. The teams that we expect them to manage their own processes may have problems in some cases, and because they do not know how to manage these processes well, they may also fail in the project or have different problems within the team. These problems and complaints affect the team's success in the design project. Even if they have teamwork experiences previously, they do not get enough support or guidance in the process. Therefore, they cannot learn enough from such an experience and cannot increase their awareness of teamwork.

These teamwork experiences could be managed in a more structured way to show design students how they can conduct a more effective teamwork process. Okba and Soliman (2005) inform that faculty members should work on and decide how they will manage students in teams, contribute to and improve their experiences, provide feedback and evaluate the outcomes of the teamwork. These issues are very critical and important for both students and educators. Both sides, students and educators encounter different problems during this teamwork process. For the educators, the process of the teams has mostly little visibility, and consequently, it is very difficult to evaluate the team members individually. Students think that it is not fair due to

the unequal division of workload and getting the same grade, these experiences affect the students' attitudes towards teamwork. In addition, it is becoming very difficult for educators to intervene in a team's problem. Since, they do not know the working process within the team and how much team members contribute to this process, they can prefer to abstain in order to be fair. In terms of students, when they face a problem in their team, they can get into a deadlock, because they do not know how to overcome this problem, which makes the process more challenging. They may also have to spend more energy and time than expected because they do not know how to make an effective distribution of work, and how to better conduct the process, and they may not get any clear direction. In this case, the students may feel overwhelmed and that may affect their attitudes negatively towards the project. Positive and successful experiences of teamwork in design education contexts contribute significantly and positively to students' perception and attitudes towards following teamwork and design projects (Tucker and Abbasi, 2016).

2.3.1 Teamwork in Education (skills, applications, approaches that can be transferrable to design education)

Teamwork is an inevitable working method nowadays and its necessity is increasing in all sectors. The national association of colleges and employers (NACE) conducted an extensive survey in 2015 with 260 employers including Chevron, IBM and Seagate. The survey questioned the most important skills looked for in candidates. The results show that the most desired skill was effective teamwork skills (as cited in Casper, 2017). It is very important for students to develop such a necessary skill before they start their professional life. Therefore, it is very essential to integrate the teamwork process into the education process, especially in higher education. By supporting this, it is stated that “considering the modern, global business marketplace, it is important that students learn about, and develop, cultural awareness due to the cultural diversity that exists in the modern workplace, as well

as in the modern classroom (Avramenko, 2012; Fournier and Ineson, 2014; Nga and Mun, 2013)”, (as cited in Volkov & Volkov, 2015, p.271). In addition to teamwork skills, the ability of individuals from different cultures and personalities to come together and learn to work together is another indispensable part of teamwork education.

Before discussing the skills needed for teamwork, it is critical to explain and teach what teamwork is. There are many different definitions of teamwork and group work, and although these two definitions are used interchangeably, they are different from each other. Ellis and Bell (2005) define teamwork as “where two or more employees interact interdependently toward a common and valued goal or objective, and who have each been assigned specific roles or functions to perform” (p. 641). In this definition, the authors emphasize that team members *work for the same purpose*, and all the members *take different roles and responsibilities through a division of labor*. From a different point of view, Levin (2005) emphasizes that the group that comes together should adopt and apply the method of joint work in order to become a team. Emphasizing the word *team spirit*, he states that a group of people that comes together for a purpose should develop team spirit. The author also states that in an environment where these ties cannot be established, that work is not a team but a group. Although people who come together in group work have a common goal, they adopt the individual working method instead of the collaborative working method.

Students who are expected to come together for the same purpose and adopt a common working method and carry out this process are expected to acquire certain skills in order to make an effective teamwork process. These skills can be defined as the basic skills required for good teamwork. Teamwork Skills Questionnaire (TSQ), which evaluates the general skill level of an individual in order to participate effectively in teamwork includes six main skills which are: (a) adaptability; (b) coordination; (c) decision-making; (d) leadership; (e) interpersonal development; and (f) communication (O’Neil & Mashbun, 1997, p. 413).

- *Adaptability* refers to being able to recognize problems at work and respond appropriately.
- *Coordination* is an individual's ability to organize team activities in order to complete a task on time.
- *Decision-making* is the ability to use the available information to make team decisions.
- *Leadership* refers to the ability to lead a team.
- *Interpersonal development* is related to the ability to interact cooperatively with other team members.
- *Communication* is the global exchange of clear, precise information (as cited in Prada et al., 2022, p.6).

Researchers (Prada et al., 2022) who conducted research to reveal the relationship of these teamwork skills with certain socio-academic factors such as gender, academic year and academic success make interesting conclusions. Before moving on to the results, it should be noted that the research was conducted with 615 Spanish social science students, cultural differences could be an important issue that may change the results. The results of the research showed that female students outperformed males in all six teamwork skills mentioned above, except for leadership. In addition, as the academic year progresses and students gain experience, and their teamwork skills increase. Finally, it is emphasized that academic achievement has a positive effect on these skills (Prada et al., 2022). But there are other factors that come into play at this point. Extracurricular activities such as sports, arts, educational clubs, and extracurricular courses seem to improve students' teamwork skills (Cox & Bobrowski, 2004). Not only academic success but also extracurricular activities contribute to the acquisition of such skills. All these results show that students who are exposed to teamwork from the first year, develop by increasing their skills every year. They can also take these skills to a higher level with extracurricular activities.

From a different point of view, Levin (2005) divides teamwork skills into two main topics and explains them in detail which are *intellectual* teamwork skills and *emotional* teamwork skills. It is advocated that intellectual teamwork skills can be taught by an educator to students in a course. Intellectual skills are more about the way of thinking, which are (Levin, 2005, p.14):

- The ability to ‘appreciate’ a situation: to use observation, investigation and theorizing to identify the salient features, the significant variables and their interconnections, the politically sensitive aspects, and organizational constraints and rewards;
- The ability to think in an ‘issue-oriented’ way (centering on the need and scope for action) and formulate objectives and proposals for action;
- The ability to plan and manage a project by which to implement proposals;
- The ability to gather and manage knowledge and expertise relevant to one’s specialty, and;
- The ability to deploy other forms of learning alongside ‘studying’, e.g. imitation, trial-and-error, systematic experiential learning (the plan–do–review cycle).

On the other hand, *emotional teamwork skills* are very difficult to teach in a course context. Levin (2005) indicates that these skills could be learned by experiential learning which includes a three-stage cycle (1) plan; (2) do; (3) review. This cycle continues by repeating over and over in the teamwork process. Levin (2005) categorizes and explains emotional teamwork skills in detail. But the main highlights emphasize the ability to communicate within the team. He states that the ability to listen to each other's ideas is important for teamwork, as team members must convey their ideas constructively without breaking the framework of respect. He also explains the ability of team members to help each other, increasing team motivation, when necessary, in emotional teamwork skills. In addition, the responsibility of

participating in all processes within the team, process organization, time planning and taking initiative in taking more responsibility when necessary are also discussed under this category. Saying that all these skills cannot be taught, Levin (2005) argues that this can develop in a cycle with experience. At this stage, although instructors cannot interfere with these skills much, they can guide students in this area to improve themselves. It can be explained how these skills should be and at least the awareness of the students can be increased.

The increase in the need for teamwork in professional life and the fact that it is one of the features sought from candidates has increased the inclusion of teamwork in the curriculum in higher education. However, it seems that there is a great gap in the literature on how to teach and experience this process to students in design education. Teamwork skills become much more important, especially for a field such as the design discipline, which works in many sectors and has to work together with people from many sectors. For this reason, it is important to evaluate the higher education process well and to try to give students such skills.

2.3.2 Role of Teamwork in Design Education and New Approaches and Related Studies

Especially in the projects carried out within the scope of studio courses, students often work as a team. The increasing number of students in recent years, changing life conditions, pandemic and distance education seem to increase the tendency of instructors to give assignments involving mainly teamwork. However, students who do teamwork within the scope of the courses do not receive any instruction or feedback on this subject. They can only learn something from their own experiences in this process that they carry out on their own. It seems that they could not receive detailed information on how an effective teamwork process should be, how they should manage this process, or what the roles and responsibilities should be in the

process. This can lead to an increase in students' presumptions and negative views on teamwork. Therefore, in higher education, if it is wanted to teach teamwork and necessary skills to students, it should not only integrate teamwork into courses but also make this process a part of the syllabus. Although there are not many studies at the intersection of design education and teamwork literature, some studies provide very comprehensive information.

Associate Professor Dr. Richard Tucker, and Dr. Neda Abbasi from the School of Architecture & Built Environment, Deakin University, conducted a project named Teaching & Assessing Team & Group Learning in Architecture & related Design Disciplines which is funded by the Australian Government Office for Learning and Teaching between 2011-2013. As a result of the project, two manuals were written, which explain in detail how effective teamwork should be and what can be done for both students and educators separately, with examples and applications. There are six main teamwork skills highlighted in both documents which are (1) Coordination of tasks and responsibilities (using, for instance, project work-plans and team contracts); (2) Communication via speaking, writing, drawing, modeling; (3) Idea generation, evaluation and selection; (4) Decision making; (5) Leadership; and (6) Conflict management.

Good teamwork experiences provide design students with many opportunities. Teamwork can enhance problem-solving skills and creativity. The students who are active in the process have a much better learning experience. Good teamwork is an ideal environment for this. In a well-organized teamwork process, students learn a lot from each other's experiences and working styles. Oakley et al. (2004) explain an effective student team as a group of individuals who work together for the same purpose and are aware of what each other does, even if they are not physically next to each other. In design education, the process proceeds in a very similar way. Even though the students work physically in the same environment during class hours, they can choose to work separately in different environments outside of their class hours. At this point, this process should be well organized for effective work. Within this context, *a good division of labor and task management* are very critical and

significant. Tucker and Abbasi (2012) support this argument and state that the roles and responsibilities of each team member should be clearly defined and assigned to the members by common consent mentioned as the first main teamwork skill.

Another important issue is related to *communication*. The communication of individuals within the team is one of the most influential factors throughout the process. Team members with good communication skills are open to discussion, do not hesitate to express their opinions, and can better manage the process and deal with the problem in a shorter time. The process can be enriched and accelerated through different communication channels including synchronous and asynchronous communication technology. Online tools and applications now decrease the need for team members to get together physically always. By facilitating a good division of labor and providing task tracking, online tools enable them to work effectively from a distance. In addition, with the help of communication channels, members can be informed about each other's processes, and when they encounter a problem, they can quickly solve this situation by conducting online meetings. For this reason, it is important to be able to use different communication channels together in order to advance the process more effectively.

Good design skills are also expected in order to be able to work effectively on a design project. The team members' use of the skills they gained in design education in the process of *finding, developing and evaluating ideas* in this process supports the teamwork process. One of the most critical stages needed as a team in this process is the joint *decision-making* process. Tucker and Abbasi (2013) discussed this process in great detail with its stages and different methods in the *Manual on Teamwork in Design* for students. One of the most remarkable stages that emerged is that all team members participate in the decision-making process, express their ideas comfortably, listen to each other's ideas very carefully and ask questions, and finally reach a consensus to take a joint decision. If they encounter a problem in this process, students are advised to choose the voting method or to get help from an instructor.

One of the critical points for effective teamwork is *leadership*. Leadership is defined by Guzzo et al. (1995) as “the ability to direct and coordinate the activities for other team members, assess team performance, assign tasks, motivate team members, plan and organize and establish a positive atmosphere” (p.345). Moreover, Tucker and Abbasi (2016) list the tasks of the leaders in design education as; “(i) assist students to assign roles within their teams at regular intervals and at different stages of the design process, (ii) encourage students to reflect on their roles at the end of each project stage, (iii), require students to discuss appropriate approaches to leadership in their teams” (p.20). In design education, the design students may not be particularly directed that these responsibilities should be undertaken by a leader and one of the team members should manage this process with this responsibility. If a person is not identified as a leader, none of the team members may take that responsibility, as they may expect that other team members will do that. However, when the responsibility for leadership is identified, this process is evaluated with consciousness, and the process will be more structured.

Rather than selecting one leader in a team, *distributed leadership* is more powerful and influential for effective teams (McGourty and De Mause, 2001). Distributed leadership provides an opportunity for all the students to experience this role. The design students will both learn to take responsibility for this process and to reevaluate teamwork from a very different perspective. Also, it would not be fair to expect that only one student will take this responsibility throughout the process of an educational project. In order to make this process balanced and fair within the team, it is critical to share this responsibility. Similarly, Levin (2005) emphasizes rotating chair in leadership and states that:

Frequently student groups opt to have a ‘rotating’ chair. It feels democratic – everyone has a turn at being chairperson – and it doesn’t concentrate power in the hands of one person. It also feels appropriate to the absence of ‘status differentiation’ among you: as students, you’re all equal. And deciding to have a rotating chair, if only for the time being, avoids having a competition for the post (p.37).

Another skill that stands out for effective teamwork is *conflict management*. It is very normal for students to encounter problems for different reasons at different stages, especially as the project process lengthens and intensifies. One of the important points in this process is to try to solve this problem within the team first. At this stage, it is important that all team members share their ideas and solutions about this problem, listen to each other and find a common solution. Therefore, at this stage, communication skills and joint decision-making processes are reintroduced. If the problem reaches a stage that cannot be solved within the team and this stage also affects the team's process and outputs, students should not hesitate to get help. In this process, it is critical that educators are open to this request for help and are in the role of *mediator* while managing the process (Tucker and Abbasi, 2013). Intervening at an early stage before the problems get too big and become chronic can be an important gain. Team members should not personalize problems and should approach them from the team's point of view.

Being a part of a team, working together for the same purpose, leading a team, and managing all the tasks related to teamwork and process give students a wide range of experiences and benefits. Okba and Soliman (2005) list these experiences as:

- Practicing the skill of working in teams and making their own decisions.
- Learning how to divide a project into tasks and managing their time-schedule for their project.
- Choosing their own mechanism to develop their work and achieve their aims.
- Solving their problems.
- Practicing self-criticism and making reports about their individual efforts (p.6).

These experiences are the learning outcomes that they can experience in teamwork more effectively. Therefore, in order to increase and encourage these gains, this process needs to be planned and organized in a detailed way like design project processes in design education. Okba and Soliman (2005) suggest that educators

should help student teams organize their plans about how the process will proceed, review their plans, and discuss and evaluate their process. This process, which provides great benefits for students, should be organized and followed in detail by the instructors. Tucker and Abbasi (2016) offer that the instructors should encourage students to assign roles within their team, to make plans, and establish rules and agreed on ways of working. Besides, Johnson and Johnson (1998) recommend that the learning experience becomes more successful when the instructors monitor the process of the students much more closely. This provides an opportunity for instructors to intervene when students have a problem or do not understand a task clearly. Teamwork, which is an integral part of design education, should be designed and followed closely by the educators. In this way, students can benefit from this experience more effectively and increase their gains in this process.

2.3.3 Guidelines for Design Educators and Students

There are certain points that students and instructors should pay attention to for effective teamwork in design education. These stages should be integrated into educational projects in order to develop the skills necessary for effective teamwork, and students should be given direction and feedback on this issue. The first of these issues is about how teams should be formed. There are three different ways to form teams which are (i) self-selection, (ii) random allocation, and (iii) deliberate allocation (Hains-Wesso, 2013). In the self-selection method, students are expected to choose and create their own teams, while in random allocation, instructors assign students to teams at random. In the deliberate allocation method, this process is done more systematically, not randomly. Students' interests, knowledge levels, and abilities guide educators while forming teams. Although students' presumptions towards each other lead them to work directly with their closest friends, encountering cultural and individual differences in line with their teamwork skills will improve them in this regard. Levin (2005) insists that this choice and responsibility should not be left to the students and should be carried out by the educators and offers

students the following advice: “If your teachers don’t take responsibility for the selection process, why don’t you all – i.e., the whole year-group – get together and choose a random method and apply it?” (p.24). In Table 2.2 where Crebert et al. (2011) list the advantages and disadvantages of team forming methods, it can be seen that each method has both advantages and disadvantages. For this reason, it may be a correct method for instructors to decide which method to use, taking into account the conditions in their classes (such as the number of students, academic success, getting to know each other, and density of foreign students). However, in order to ensure fairness among students in an environment with crowded and foreign students, it may be a good choice to organize this process by instructors.

Table 2.2 Methods for team formation (reproduced from Crebert et al., 2011)

| Method | Advantages | Disadvantages |
|---|---|--|
| Random allocation <i>Educators use a random selection method of forming teams</i> | <ul style="list-style-type: none"> - Relatively easy to administer - Allows students to work with others they usually wouldn’t - Can be viewed by students as a fair system of allocation - Efficient in large classes when students do not necessarily know their peer group | <ul style="list-style-type: none"> - Can break up traditional friendship teams (could also be an advantage) - Students may view as an easy option taken by the teachers - Students may feel they are powerless to make their own decisions |
| Staff-selected <i>Teams are formed based on information about the students’ interests, mark, preferences and skills</i> | <ul style="list-style-type: none"> - Can ensure diversity so that students gain from a social and cultural mix - Replicates workplace situations where there is generally no or little choice | <ul style="list-style-type: none"> - Can take some time to determine students’ interests, skills and preferences - Can be considered unfair by students |
| Self-selected <i>Teams are formed by students themselves</i> | <ul style="list-style-type: none"> - Easy option of allocation - Students may be more motivated with control over process - Students can form teams according to familiarity | <ul style="list-style-type: none"> - Can reinforce student cliques - Can prove a difficult option for those students who do not know others in their peer groups - Can be difficult to get a diversity of student cohorts, e.g. internal and external, gender, local and international students |

After the teams are formed, it is important for the team members to come together and talk about their expectations from this process and what kind of working process they want to carry out and take a joint decision. Expressing this process in a more formal way, Tucker and Abbasi (2013) recommend that teams make a *team contract* before they start working to identify their strategies and rules (Figure 2.8). In this process, team members are expected to communicate, express their opinions, and even negotiate to reach a consensus. At this stage, especially when teams are not formed by students, such an introductory meeting will be a good start for teams to get to know each other and get ideas about the process. While preparing the team contract, it is critical that all team members participate in the whole process, share their ideas, listen carefully to the others, and make sure that they fully understand the final decision. Tucker and Abbasi (2013) propose three main stages when creating a team contract which are *team process*, *ground rules/team expectations* and *consequences*. For the team process stage, teams are expected to make decisions on communication, leadership, division of labor, time planning, team meetings, and the tools they will use. For the second stage, it is expected that the ground rules approved by all team members will be listed, while in the third stage, it is suggested that they discuss the consequences when one of the team members does not follow the rules. Setting and agreeing on these rules at the very beginning of the process, not as the process progresses, reduces possible problems, clarifies the expectations of team members from each other, and supports them to be better prepared for the process.

Team Contract of Team X, Sample no.1

SECTION A. Team Code of Conduct

- ✓ Respect and listen to all members opinions.
- ✓ Everybody has the right to speak. All ideas need to be heard and understood.
- ✓ Constructive criticism is acceptable. Personal attacks must be avoided.
- ✓ Team X will work as a TEAM. This demands respect and encouragement from all members to one another.
- ✓ No member of Team X should feel uncomfortable. There is a mutual respect amongst the team, and there should be no hesitation in members speaking out of any issues that arise.

SECTION B. Team Participation

- ✓ Group Assessment for weekly reports – all members of Team X are expected to participate in the completion of the weekly reports.
- ✓ Group reports are to adhere to a predetermined group format (fonts, logo, sizes etc.).
- ✓ All tasks need to be completed by the set due date/time, ensuring that the team can continue to progress on the project.
- ✓ Members must participate in group discussions, offering their opinions on different issues.

SECTION C. Meetings

- ✓ Meetings are to be held on: Tuesday - 9:00am – 6:00pm & Thursday - all day when required.
- ✓ All members are required to attend these meeting so that information, tasks and viewpoints can be shared and discussed.
- ✓ Tasks to be completed will be allocated throughout the meeting.
- ✓ Minutes will be taken at all meetings/discussion groups, listing tasks completed, topics discussed and apologies.

Team Contract of Team X, Sample no.1 (continued)

SECTION D. Absenteeism

- ✓ When unable to attend class or meetings, members need to notify another group member of their absenteeism. Suitable reasons will be accepted by all group members.
- ✓ Constant lack of attendance will become an issue in terms of group participation and may be taken further.

SECTION E. Log Book

- ✓ Team X will set up a Log Book. This will contain all financial transactions, minutes from meetings and tasks that have been completed. It will be kept up to date by Freddy Smith.

SECTION F. Punishment

- ✓ In the event of a team member not meeting the requirements, consequences will be faced. Members will be required to complete more work than the norm during week of punishment.
- ✓ Punishment is the last resort. Team X will try to their utmost to avoid punishing fellow group members.

SECTION G. Decision Making

- ✓ Team X runs a consensus system. Consensus rules in the decision making, with democratic decisions made only when consensus cannot be reached.
- ✓ Amendments can be made to the contract only if all members agree on the change.

Figure 2.8 Sample Team contract (reproduced from Tucker and Abbasi (2013, p.15-16))

The second step for the teams is making a *team project plan* after the team contract. In this process, it is necessary to determine the purpose of the team, talk about what to do, and determine the roles and responsibilities of the team members in this process. At this stage, it is expected that how often and where the meeting will be held, and how all these stages will be recorded, discussed and decided (Tucker and Abbasi, 2013). Active participation of all team members is important in all these processes. While making all this plan, the team should decide what to do, how to do it, who will do it, when to do it and how this process will be followed should be

discussed and recorded. Tucker and Abbasi (2013) offer students simple tables for this (Figure 2.9).

| WHO | WHEN | FOLLOW-UP |
|---|---|--|
| Agree and decide upon who should be in charge of completing specific task/s | Determine the due date according to what you have set in Team Project Time Frame/Workplan (Refer to table "Establishing Team Goals & Purposes") | Monitor the progress, detect the problems / issues/ conflict and discuss the solution (Refer to Conflict Resolution Section for details) |
| | | |
| | | |
| | | |

Figure 2.9 Assigning roles and responsibilities (Tucker & Abbasi, 2013, p.22)

Although Tucker and Abbasi (2013) do not make any recommendations on how to decide on a team leader, they list the following points that leaders should pay attention to (Tucker & Abbasi, 2013, p.25):

- The leader is responsible for seeing that the work is organized so that it will get done.
- The leader must encourage everyone's contributions with an eye to accomplishing works.
- The leader must encourage group interactions and maintain a positive atmosphere. The leader might therefore ask: are individuals' contributions listened to and appreciated by others? Are people arguing

with other people, rather than disagreeing with their ideas?; Are some people withdrawn or annoyed?

- The leader must anticipate what information, materials, or other resources the group needs as it works.
- The leader must take part in the discussion and participate otherwise as a group member.

Another important element that will ensure the healthy progress of the process in teamwork is *communication*. Attitude in communication is critical for both roles: narrator and listener. For narrators, the subject is a design project, drawings, models and mock-ups are an indispensable part of the process and facilitate the communication of team members. Tucker and Abbasi (2013) state that “when designing in teams, if you describe an idea in words to more than one person, each person will have in their mind a very different picture of that idea” (p.36). Therefore, visualization of the communication process indeed is supportive for team members to understand and imagine the same thing. Visualization of the ideas with the sketches or 3D models that support verbal expression will positively affect the decision-making process. For another role, being a good listener, understanding the other person and being able to ask the points that they do not understand makes the progress of the process easier. Tucker and Abbasi (2013) emphasize that the best way to understand the message given is to be a good listener.

Finally, another topic Tucker and Abbasi (2013) give advice to students is about *conflict management*, and they state that “conflict in teams is inevitable” (p.38). In teamwork, where a group of people from different characters come together for the same purpose, different egos, different perspectives, different individual lives and problems inevitably affect the teamwork process. Putting personal problems aside, people's disagreement with each other, and decision-making processes can cause conflicts to arise. Tucker and Abbasi (2013) state that “team conflict may occur due to poor team planning or lack of a team project plan that specify and allocate the team tasks, including who should do what and when, or simply because the team do

not have a clear goal and don't know what they should produce" (p.41). In order to minimize problems, *a good team plan, division of labor, follow-up, communication and the role of the leader* are very critical. Recognizing and intervening in a conflict at an early stage will prevent the problems from escalating. Therefore, interfering with the problem instead of ignoring it makes the process go more smoothly. Tucker and Abbasi (2013) propose a five-step method for resolving a conflict including: (i) revisit team expectations, (ii) understand conflict and map out solutions, (iii) depersonalize conflict, (iv) structure discussion and, (v) reflect and review. In a conflict within the team, this situation must first be evaluated within the team. For this purpose, first of all, team rules and plans should be reviewed, and it should be tried to find out where the disagreement originated. At this stage, all team members are expected to participate in this process and express their opinions and offer ideas for possible solutions. In this whole process, considering the problem as a common problem of the team without being personalized prevents the process from getting into a dead end. It should be discussed whether the final result convinced all the members and whether the result was achieved. If teams cannot resolve their disagreements despite all this process, they should not hesitate to seek help from their educators. Solving the problems before they get bigger will positively affect the team's process and the result.

Rachael Hains-Wesso (2013) from Deakin University gives tips for teamwork for higher education students similar to the research of Tucker and Abbasi (2013). Hains-Wesso (2013) states that it is important to encourage students to get to know each other before start working and educators can conduct ice-breaker activities to build a positive spirit at the beginning. After a good start, another important task for educators is to inform students about certain issues related to teamwork from the very beginning for effective teamwork. This information is about how to resolve conflicts, the selection and responsibilities of the leader in the team, intra-team communication and team meetings, division of labor, time planning, work follow-up, and suggestions in organizational processes.

Hains-Wesso (2013) offers suggestions to the question of how to ensure that all team members contribute equally to the team projects which are:

- academics can ask students to clearly define roles and responsibilities prior to commencing a teamwork activity (i.e., form a written contract between team members). It is important that each team member confirms their agreement to the contribution (e.g., by asking all team members to sign the document)
- academics should encourage students to document their contribution throughout the working journey of their projects
- the signed agreement or contract (completed prior to commencing the project) and documentation of tasks (throughout the project) completed by each team member should be submitted at the time that students conduct an oral presentation of their group work, or submit a written report of their project
- academics may also set a reflective piece for individuals to complete on their teamwork project. (p.6).

Although all these suggestions seem like an extra responsibility for both students and educators, if teamwork is carried out in an educational project, it is necessary both for effective teamwork and for teaching the teamwork process and skills.

The factors affecting effective student teamwork are categorized and correlated in Figure 2.10 (Tucker, et al., 2014) and the recommended teaching responses and strategies corresponding to each title have been determined. The factors are divided into three main items which are input, process and output. The input factors are grouped under the three titles which are *Task Design Variables*, *Individual Level Factors* and *Team Level Factors*. Task structure and description, team size, task assessment criteria are examined under the title of the Task Design Variables. While individual levels factors include knowledge & skills, learning & personality styles,

and attitudes & motivation, team level factors involve leadership & role, team contract & climate, team composition, and team cohesion.

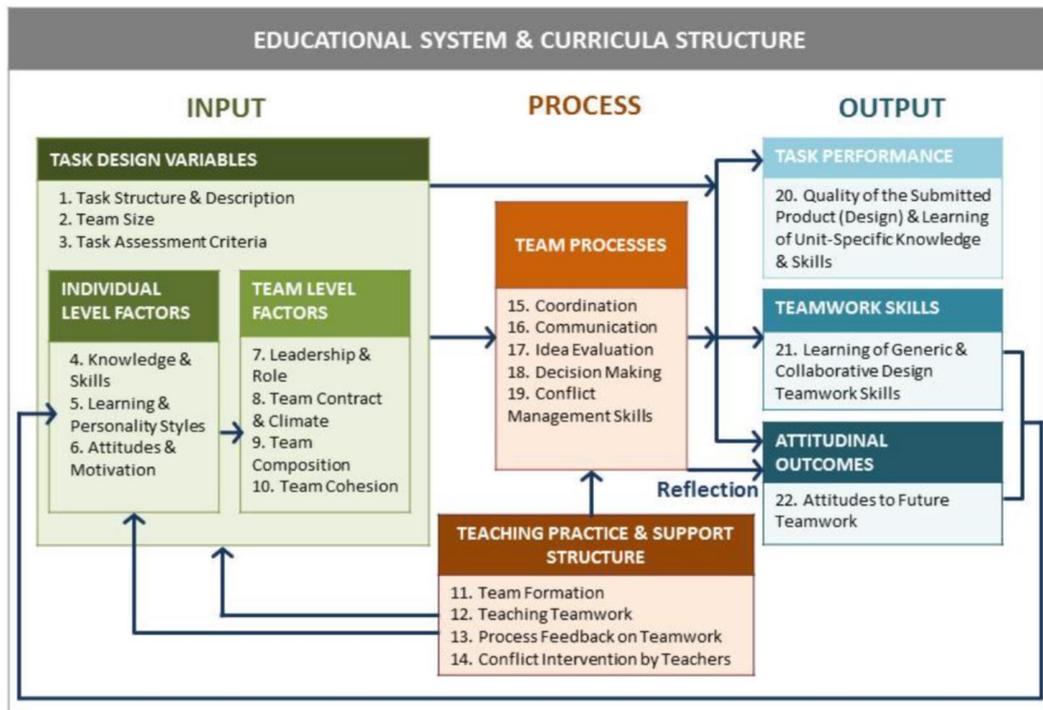


Figure 2.10 Framework of Effectiveness in Student Design Teams (Tucker, et al., 2014)

Details and suggestions about the task are discussed in detail under the title of Task Design Variables. Task structure & description, which is one of the three sub-headings of the task design variables, examines how long the task will take and its relationship with other tasks. But, most importantly, it is stated that all team members should best understand what is expected from the tasks. The other factor is team size. The number of people in the teams is one of the important factors that will affect the definition of the tasks. Finally, the last factor related to the tasks is task assessment. It shows how much the team members contribute to the team in the evaluation of the tasks and supports the perception of the students that they will be evaluated fairly.

Tucker et al., (2014) suggest teaching strategies for these three topics. Among these suggestions, it is emphasized that the assignment should be defined in a way that students can contribute to this assignment both individually and as a team, which allows for task description. They also suggest that it may be good to have a minimum team size such as three to five team members. They also recommend that task performance and teamwork skills should be separated from each other during the assessment phase and reflective statements and self-and-peer assessment can be obtained from students for a fairer assessment.

Individual level factors are included in the input section focusing on the individual characteristics of students examined under three titles which are knowledge & skills, learning & personality styles, and attitudes & motivation. Different levels of knowledge and skills of students affect the results of the tasks and, as a result, the team performance. Similarly, different learning styles determine how tasks are defined, done, and completed. Different personalities are also an important factor affecting communication within the team. In addition, past teamwork experiences appear to be a significant factor influencing team members' attitudes towards the team and engagement in the process. As a teaching strategy, it is suggested by Tucker et al., (2014) that students should be encouraged to have different personalities, different knowledge and abilities, and even different learning styles in design teams. In a design studio course, apart from encouraging that individual differences are accepted within the team, these are not factors that can be interfered with or changed by the educators. The only point to be considered in this regard is that unpleasant teamwork experiences can cause students to start the next teamwork with prejudice. For this reason, preparing an environment in order to ensure that students have a smooth and effective whole teamwork process as possible can be an area where educators can contribute.

In addition to individual factors, team factors are seen as another factor affecting the team process. These factors were analyzed under four main sub-headings which are leadership & role, team contract & climate, team composition, and team cohesion. Determining the roles within the team and being the leader are seen as other positive

factors affecting the performance of the team. Defining the roles of the team members before starting work helps the process to progress more structured. Another factor that supports this is the team contract. The team contract, which includes the role of the leader in the team, what kind of working path they will follow, what they will do in case of a disagreement, and how the team climate should be, provides a more convenient environment for people of different characters to work together. Another factor Tucker et al., (2014) advocates and recommends is to ensure diversity when forming teams. This may include age, gender, cultural and personal differences. Although these differences may seem like a challenging factor for students at first, they will provide an advantage for effective teamwork. And finally, team cohesion can be defined as the process of keeping the team together throughout the process, which ensures the balance of individual contribution and team contribution throughout the process and affects the process positively.

The factors affecting team performance in the process are examined under two main headings; these are Team Processes and Teaching Practice and Support Structure. Under the title of team process, these are the topics that are seen frequently in teamwork: coordination, communication, idea evaluation, decision making, and conflict management skills. These areas, which are discussed detailed in the above sections, also match the teamwork skills expected from a student to acquire in a team effort. All these factors are closely interconnected with each other. Tucker et al., (2014) suggest different strategies for educators at this stage. For coordination, they recommend that students should be encouraged in this regard and that team plans could be regularly collected and evaluated. For communication, they propose to encourage them to prefer one-to-one communication on complex issues. Written communication and virtual communication may be missing in such topics. It is also suggested that students can be informed about joint decision-making methods in the decision-making process, and that they can be supported and experienced democratic decision-making processes. For conflict management, on the other hand, encouraging the teams to inform and raise their awareness on this issue with a

workshop that includes role-play could be an alternative way to teach conflict management skills.

The title of Teaching Practice and Support Structure has been examined under four sub-titles which are team formation, teaching teamwork, process feedback on teamwork, and conflict management by the teacher. While the way of forming the teams is stated, it could be better to inform students about the pros and cons of the methods to be chosen, it is emphasized that it would be good for the educators to support the diversity and difference while forming the teams. Tucker et al., (2014) do not directly recommend a method to be used when forming the team, but they suggest that it should be evaluated with its consequences. It is stated that students should be taught both generic teamwork skills and collaborative design skills for teamwork. In addition, it is recommended that continuous monitoring of the teams throughout the teamwork process and providing feedback on both the project output and the teamwork process at regular intervals could be ideal methods for educators. For this, it is stated that a face-to-face discussion can be held with the students at regular intervals and feedback will be given to improve their team performances. Finally, in the conflict management section, it is emphasized that the educators should remain neutral when the problem cannot be resolved within the team and comes to them.

Finally, the process outputs are covered under three sub-titles which are (i) Quality of the Submitted Product (Design) and Learning of Unit-Specific Knowledge and Skills, (ii) Learning of Generic and Collaborative Design Teamwork Skills, and (iii) Attitudes to Future Teamwork. In the evaluation of the project results, it is recommended that asking for both individual and team performance in the interim submissions in order to separate the individual contribution could provide a fair evaluation. There are teamwork skills and collaborative design skills that were expected from students to learn during the teamwork process. It is recommended that students could evaluate and give feedback on this issue. Finally, for future teamwork, students can submit a reflective journal and examine how they define a positive

teamwork environment, and a discussion of which skills students need to learn and which need to be developed helps to plan the next teamwork project.

Tucker et al., (2014) cover the whole process in great detail and present different strategies to educators about each factor that affects the teamwork process (the original table is included in the appendix chapter, see Appendix R). In the input section, as a teaching strategy, educators can't go too far to encourage students about differences, but there are many steps that will be taught to students and guide them during the process. How these steps can be integrated into which stage of a design project can be discussed and be included in the project. In particular, the factors affecting the process are seen as important points for students to gain the desired teamwork skills. And getting a process evaluation from the students at the end of the project will help both to see the deficiencies and to plan the next project.

Teamwork enables students to come up with more creative solutions by bringing different ideas together. In addition, teamwork activities enable students to develop organizational and communication skills and improve their ability to come together with people of different personalities and to work together in this diversity. By taking different roles in the team, they gain experience in empathy, leadership and management. A well-constructed team project provides great benefits to students.

2.3.4 Teamwork and Online Tools in Design Education

The involvement of online tools in students' learning process provides significant opportunities for teamwork process. Online tools especially social software tools enable students to contact their peers, instructors, experts and users, which contributes to enhancing interaction and collaboration between these stakeholders. Students can connect to the world and access all kinds of information more quicker (Kitsantas & Dabbagh, 2011). These opportunities allow students to reevaluate their performance and encourage them to follow new strategies for more effective

experiences. On the other hand, online tools allow instructors to monitor and guide their students via online platforms and support their teamwork projects in their courses.

The EDUCAUSE Center for Applied Research (ECAR) study reports that although students in higher education prefer to use online tools for learning any kind of information, they do not do this consciously for their academic success (Smith et al., 2009). In addition, the report declares that a limited number of instructors encourage students to benefit from the online technologies. When the opportunities of the Web 2.0 technologies are considered, it can be stated that there is a need to inform instructors on how to integrate these technologies into their teaching program and curriculum, and promote students to use them.

Gu, et al. (2010) emphasize that “technologies have always played an important part in revolutionizing design and design education” (p.1259). Design education is a field that should get up-to-date with the changing world. The development of technology with the Internet has affected people’s daily routines and how to experience these. Design practice and design education have been transforming under these circumstances. The internet has become an inevitable part of daily life and changed the educational process too. It has provided new research and communication tool for both students and instructors. Industrial design education has started to be affected by this transformation too. The online tools that require the Internet connection, provide huge data for design researches. On the other hand, design reviews and critiques conducted in the traditional design studios have started to be experienced in online environments without time and place constraints.

The communication experiences via the Internet can be divided into two in terms of the synchronization of the time that two sides spend which are synchronous (real-time) and asynchronous (non-real-time) communication (Park, 2011). Whereas synchronous communication offers live communication like online chatting and video conferencing, asynchronous communication provides users to reply to the messages at any time such as emails. Different types of communication and

interaction contribute to the educational process and enhance the collaborative design process (Park, 2011). Morkel (2011) states that traditional design studios can be identified as physical environments where learning experiences can be sustained by communication and interaction between students and instructors. The importance of communication and interaction can be supported with online platforms for more effective learning experiences in design education.

Virtual Reality (VR), Augmented Reality (AR), Artificial Intelligence (AI), Internet of Things (IoT), 3D Printing, Drones and Wearables are some of the prominent emerging technologies that affect the future of jobs (Eckler 2016). Some of these technologies have also become part of higher education and design education. Virtual Reality (VR) and Augmented reality (AR) are popular technological developments that have been applied in the field of design education. Virtual Reality produces an artificial environment, developed by people, that affects the senses of the human to give the impression of a more realistic virtual environment (Xi, 2010). Wearable equipment enables users who are dismissed from the real world completely, to interact with the artificial environments and to react to other users' motions which promote the reality of the environment. On the other hand, Augmented Reality provides users to be conscious of both real and virtual worlds by generating virtual subjects in a real environment; this mixed scene can be constituted by looking through a device screen or by using an intermediary tool (Ayer, et al. 2016; Özenen & Şener, 2015). Virtual Reality technologies provide a 3D environment for designers to illustrate their design ideas and to represent them with more details such as appearance, materials, and interactions with users and in context (Xi, 2010). Similarly, Augmented Reality helps designers to visualize their design ideas in the context of physical space, differently connected with the real environment (Ayer, et al., 2016).

The other popular technology that has started to change design education is 3D Printing. Model making is a fundamental stage of the design process while generating and presenting the idea. Models help design students to express their ideas more easily and they assist instructors to give effective feedback to students in order

to improve ideas within the design process (Greenhalgh, 2014). 3D printing technologies offer designers and design students to create 3D physical models of their ideas from 3D computer models quicker and easier than hand-made models. In addition, Rivera-Chang (2015) claims that 3D printing motivates students through the design process, since models enable students to realize the scale of the design ideas more quickly. Students can also evaluate their ideas faster and more detailed with online 3D printing services.

New tools and devices are the center of attention of the new generation. They are growing with these technological changes, and they are trying to integrate these innovations into every aspect of their lives. Education is one of these aspects. This inevitable transformation should be organized and arranged in order to take advantage more and to create more effective learning experiences. In the next sections, online tools will be reviewed into three which are design stages oriented online tools, design management-oriented online tools, and social media tools for the design process.

2.3.4.1 Design Stages Oriented Online Tools

As mentioned above, although there are different names and categorizations, they are focusing on a similar process with similar design stages. In studio-based design courses, the design process starts with a problem definition including design objectives and design limitations. Students' design process begins with conducting research to get familiar with the topic. Then idea generation and development stages are enriched with the design critiques sessions until design detailing and finalization. In the last stage of the process, the final version of the design solutions is evaluated by diverse stakeholders including instructors, experts and users. This intense process is surrounded by different design methods and tools. When online tools are examined, it is realized that there are various tools focusing on different design stages

and different methods. A google search was conducted for the methods frequently used in the design process (such as brainstorming, user testing, focus group and persona creator) and the online tools used for these methods were brought together in Table 2.3 (an extended version of the table is in Appendix A). It seems that most of the tools in this table are not very aware by students and instructors. This table demonstrates various online tools in relation to different design stages and related methods. The tools are compiled and reviewed according to their accessibility, free version, and/or open-source, popularity. The methods are connected with the related design stages according to the categorization made by Martin and Hannington (2012). A summary of the top tools in a Google search for each design method has been brought together in Table 2.3. Even these prominent ones appear to be not very unheard of online tools.

Table 2.3 Online Tools for Design Process (See Appendix A for extended version)

| <i>Design Methods</i> | <i>Name</i> | <i>Aim/Method</i> | <i>Link</i> |
|---|---------------------|--|---|
| Brainstorming (Mind Mapping) (Stage 1,2,3) | Mindmeister | An web-based online mind mapping tool that lets you capture, develop and share ideas visually. | https://www.mindmeister.com/ |
| | Lucidchart | An online flowchart maker that lets users share, communicate and collaborate | https://www.lucidchart.com/ |
| | Pinterest | A visual social media tool provides to collect ideas and articles around a particular topic. The boards can be shared with others. | https://tr.pinterest.com/ |
| Focus Group (Stage 1,5) | FocusGroupIt | An online, easy, fast and low cost (free) way to gather qualitative feedback online. Participants can respond to questions and each other. | https://www.focusgroupit.com/ |
| | Theclickroom | A 3D interactive environment that not only engages but provides a level of enjoyment for participants. Participants from different areas of the country can get together in one place. | http://www.theclickroom.com/ |

Table 2.3 (continued) Online Tools for Design Process (See Appendix A for extended version)

| <i>Design Methods</i> | <i>Name</i> | <i>Aim/Method</i> | <i>Link</i> |
|--------------------------------------|----------------------|--|---|
| <i>Persona Creator (Stage 3)</i> | Xtension | User Persona Creator | https://xtensio.com/user-persona/ |
| | MakeMyPersona | a free step-by-step wizard to take through the process of creating buyer personas | http://www.makemypersona.com/ |
| <i>Storyboarding (Stage 2,3)</i> | Boords | Collaborative online storyboarding which saves time and stay organized. | https://boords.com/ |
| <i>User Testing (Stage 3,4,5)</i> | Voice | Getting inspiration from future customers: collecting opinions and growing engagement easy | http://voicepolls.com/ |
| <i>Expert Feedback (Stage 3,4,5)</i> | Clarity | Getting advice and feedback from experts | https://clarity.fm/ |
| | Pivotplanet | Connect people and getting advice | https://www.pivotplanet.com/ |
| <i>Diary and Survey (Stage 2)</i> | 24tru | Qualitative research platform: provides an app for remote diary studies that let participants upload videos, photos, or text | https://www.24tru.com/ |

Dan Perkel (2014) from the IDEO states that “using digital tools for design research is exciting for us because they open up new ways for us to engage with people, even when the experiences we’re studying seem fairly analog or physical” (para.3). Perkel (2014) divides the design research into five stages and states that the first stage of the design research aims to explore the area of focus in design and get inspiration; the tools provide online survey platforms to get information about existing products, solutions, technologies, and user experiences. Similarly, designers try to include users and experts in the design process to get insights and feedback, and the online tools present an effective environment for this information exchange. In order to get deeper insights from users about their daily lives and experiences, different research methods are used such as diary studies, focus groups, surveys, usability tests, ethnography, etc. The online tools offer qualitative research platforms which allow designers and design students to conduct many of these research methods mentioned

above. The fourth activity is more about usability testing and getting feedback from live prototyping. Online platforms have many advantages for enhancing design research in terms of “broadening scale and diversity”, “increasing flexibility” and “developing depth” (Perkel, 2014). Compared to traditional methods, online tools make it available to get in touch with more people from different backgrounds and geographic contexts. In addition, the flexibility in working hours through online platforms allows both designers to carry out their research with users whenever they are available. By asynchronous tools, surveys and interviews can be conducted from distance. Considering geographic differences, working hours can be incompatible; therefore, online tools remove these barriers and open up the possibility to get insights or feedback anytime. It is very critical to get in touch with participants throughout the design process, and online tools sustain an appropriate environment for this connection. Moreover, online platforms help designers to conduct many different research methods, look at the context from different perspectives, and obtain information from different levels of complexity.

Communication tools provide students to get in touch with their peers, instructors, users or experts and to establish relationships or share experiences. They also enable students to conduct interviews, ask questions and participate in online discussions. Similarly, online tools for resource and experience sharing tools help students document their process and be more aware of their progress. Instructors can encourage students to think about their learning process and determine how to improve their learning for better learning experiences. In addition, social networking tools such as Facebook and LinkedIn create a learning community and provide opportunities to connect with experts from the fields, and to benefit from their experiences (Kitsantas and Dabbagh, 2011).

Although online tools focused on design processes are not very familiar, when a google search is made for tools used in education, there are many tools that are very familiar. According to a study conducted in 2021, the first 30 of the online tools used in education can be seen in Table 2.4. A very similar version of this table (based on 2018 data) was included in the surveys made in the first phase of the research (see

Appendix D). Although the tools included in both tables are very similar, there are new additions to the list with the increase in distance education and the need of remote work with the pandemic. Zoom and Microsoft Team, which are seen in the top 5, seem to be indispensable tools for distance education and remote meetings of teams. In addition, google drive - google docs, which allows remote work, and slack, which is used for teamwork management, show this change as being in the top 10. Although these tools are not directly related to the design process, it is seen that they are frequently used by design students too. In order to measure this awareness, a series of surveys was conducted in the first stage of the research, aiming to learn which online tools the design students used in which design stage and how.

Table 2.4 Top Tools For Learning 2021 (retrieved April 6, 2022 from <https://www.toptools4learning.com>)

| | | |
|-----------|---------------------|------------------------------------|
| 1 | YouTube | video hosting and sharing platform |
| 2 | Zoom | video meeting platform |
| 3 | Google Search | search engine |
| 4 | Microsoft Teams | enterprise collaboration platform |
| 5 | PowerPoint | presentation software |
| 6 | Google Docs & Drive | office suite/file sharing platform |
| 7 | LinkedIn | professional social network |
| 8 | Twitter | social network |
| 9 | Wikipedia | online encyclopedia |
| 10 | WhatsApp | messaging app |
| 11 | Slack | team collaboration platform |
| 12 | Word | document tool |
| 13 | Canva | graphics tool |
| 14 | Facebook | social network |
| 15 | Excel | spreadsheet tool |
| 16 | Google Meet | video meeting platform |

Table 2.4 (continued) Top Tools For Learning 2021 (retrieved April 6, 2022 from <https://www.toptools4learning.com>)

| | | |
|-----------|------------------|-------------------------------------|
| 17 | Google Classroom | learning platform |
| 18 | Kahoot | live engagement tool |
| 19 | Articulate | e-learning tools |
| 20 | Mentimeter | live engagement tool |
| 21 | WordPress | blogging/website platform |
| 22 | Gmail | email client |
| 23 | Google Forms | online forms/survey tool |
| 24 | Trello | project/team tool |
| 25 | Instagram | photo sharing social network |
| 26 | Padlet | organize content on bulletin boards |
| 27 | Feedly | RSS reader |
| 28 | Dropbox | file sharing platform |
| 29 | Camtasia | screen casting tool |
| 30 | Miro | online whiteboard |

Although there are plenty of positive benefits in using online tools in the design process, there are also some disadvantages and limitations. As Souleles (2012) states that face-to-face interaction in a studio environment is more preferred in design education. Face-to-face design critiques or getting feedback from experts or users could be more effective for some of the students in terms of expressing their works and asking questions more comfortably. Exercises such as brainstorming and mind mapping conducted in a studio environment with students may end up with more effective results in a shorter time than an individual exercise done by students due to collaboration and interaction in the studio environment. In addition, especially the tools used for research such as surveys and focus groups have some limitations compared to face-to-face practices. In a face-to-face interaction, a researcher or designer can generate more effective interaction and have more chances to intervene in the process in order to get a more in-depth understanding. Also, technical problems such as “a slow internet connection could affect situations such as the

timely performance of a skill, and thus negatively impact student learning. The limitations of the technology can also potentially cause frustration and confident participants can become shy, inhibited and angry” (Green et al., 2013, p.5). Moreover, in the early days, the learning process of these online tools takes a lot of time and generates a workload on students.

2.3.4.2 Design management-oriented online tools

Collaborative learning is defined by Prince (2004) as an instructional method that students work together in a group in order to achieve the same goal. When the studio course and environment are considered, it can be stated that collaboration and interaction are the key elements of the design process. Vygotsky (1978) claims that peer interaction and collaboration are important aspects to contribute to individual development, and encourage students in the problem-solving process as in the design process. Therefore, providing a suitable environment and encouraging students to maintain this process is important. The development of the Internet as a social tool encourages and facilitates online collaboration, sharing and interaction. Online platforms and online learning environments help students access various multilevel interaction, resource sharing and thinking activities.

Park (2011) asserts that online communication can enhance participants’ ability to work in different geographic places, so that the information about the design research can be reviewed at any time by other participants, and the process can be sustained through online platforms. Similarly, online collaboration contributes to participants to work at any time in an interactive mode that they can share knowledge and resources with other participants to gather the research findings (Hong, et al., 2011). Along these lines, Dreamson (2017) adds that online platforms and their acquirements “help designers find breakthrough products during early stages and subsequently speed up the pace of product development” (p.190).

Apart from the online communication tools facilitating interaction and collaboration between team members such as Facebook, WhatsApp and Skype, there are many online collaborative learning environments. Blackboard is one of them which allows users to access course materials, announcements, assignments, tests, and to collaborate online through discussion boards, blogs, wikis, etc. Moreover, it provides real-time online lectures, meetings and online team collaboration. Although it is not a design-based platform, some features overlap with some characteristics of the design process and thus it is used by designers. Another popular team collaboration tool is Slack which is a communication tool providing users to coordinate team works effectively. Conducting discussion forums, sharing documents, sending notifications, sending direct messages, and organizing checklists related to the works can be realized via Slack. It focuses on the requirements of collaboration and teamwork. Similarly, it is not designed for a specific discipline, it can also be used in other areas where teamwork is necessary or needed.

2.3.4.3 Social media tools for design process

There has been an increase in the use of Web 2.0 Technologies – Online Tools – in higher education facilitating new and effective learning experiences for students. These online tools provide supportive and alternative platforms for each design stage. The Internet and online tools promote students to obtain information more quickly, share them in an easier way, and collaborate with coworkers without time and place restrictions. The development of the Internet has changed the way of performing the research process, and all the steps can be conducted online and online resources can turn into key elements for research and inspiration (Cheng, 2016). As mentioned above, there are many online tools specialized for design methods supporting the design process in terms of different perspectives. Although there are many specialized research tools, no research on these design process-oriented online tools could be found; however, there is research about the use of social media tools

in design education covering different stages of the design process. This part comprises the implications of online tools especially social media tools in design education. Social networking sites have become increasingly popular with the rise of Web 2.0 technologies among the new generation, in other words among university students.

i. Facebook

Facebook, one of the most popular social media tools, is used as a supportive platform for higher education. There is little research working on the educational potential of Facebook for higher education. Bosch (2009) conducts research to investigate the possible applications of Facebook for teaching and learning experiences in higher education. The research was conducted with the students of a South African university, and it examined how Facebook would affect the relationship between instructors and students. The author states that the new generation prefers more interactive environments than traditional learning techniques in order to create more effective learning experiences, and the social media and also the virtual environment provided by Facebook enhance students to ask questions in a more comfortable way than face-to-face interaction. In addition, it is found very useful to check course material at the same time while spending time on Facebook (Bosch, 2009). Interactive and accessible environments are also very critical for design education where face-to-face interaction is the key element of studio-based education. Souleles (2012) and Morkel (2011) focus on researches to determine the advantages and disadvantages of using Facebook in design education. Souleles (2012) examined the perceptions of undergraduate Graphic Design students on the use of Facebook for studio-based teaching and learning experiences. Instead of considering Facebook as replacing studio practices, it is examined as a supplementary tool for design education. Semi-structured interviews are conducted in order to get students' perceptions of the instructional potential of Facebook. Although some students consider that Facebook has a positive influence on their

education, some of them state that it has no influence or negative impact on their learning experiences. The author clarifies how students benefit from Facebook and states that “diverse ways of using Facebook to help them with their studies, such as uploading their work in Facebook and receiving formative feedback from peers and teachers, searching and joining Facebook groups relevant to their studies and forming study groups to support each other” (Souleles, 2012, p.249). Although some students prefer face-to-face interaction with their classmates and instructors, some of them state that using Facebook removes the barriers between students and instructors, and provides them with more comfortable environments for learning experiences. The physical studio environment and self-reflection of the students are essential aspects of design education. Therefore, the author states that although Facebook has some opportunities, face-to-face interaction in the studio environment is more preferred in terms of better social interaction and self-reflection compared to Facebook (Souleles, 2012).

On the other hand, Morkel (2011) conducts research on how Facebook enhances face-to-face learning at the architecture studio. The research is carried out in the final year of an undergraduate program in architecture at a South African University of Technology, and the face-to-face learning experiences are supported by a closed Facebook group for six months. Besides this, alternative online tools such as Skype and blogs are used by students during this process. The focus group method is used to collect students’ perceptions about the use of Facebook for learning experiences. Facebook is considered a social learning environment that supports studio education. Ivalo and Gachago (2010) conducting focus groups for this study state that “Facebook groups enhance(ed) teaching and learning by improving communication between the lecturer and students, assist(ed) in accessing academic and moral support from their lecturers and peers and improve(d) the quality of their projects through feedback from students and lecturers” (as cited in Morkel, 2011, p.3). In addition, Morkel (2011) claims that Facebook as an online learning environment provides an environment for interaction and communication. “The horizontal (peer

to peer) and vertical (student to lecturer) relationships” can be improved by online tools (p.5).

Although there are some contradictions among the findings, social media tools such as Facebook can be an alternative way to enhance communication and interaction between students and instructors. While online platforms remove some barriers such as time and place, the power of traditional design studio education can be supported with their advantages.

ii. Pinterest

Pinterest is a visual social media tool providing to collect ideas and articles around a particular topic and share them with others. Lapolla (2014) conducted research focusing on using Pinterest as a social media in an undergraduate second-year fashion design course at a United States University located in San Diego, California. Students, tutors, and customers come together in order to develop an explorative learning environment through using Pinterest.

The project comprises different stages that Pinterest is used for different purposes. In the first stage, customers are asked to prepare individual inspiration boards by using Pinterest to reflect their characteristics and likes. Students examine these customers’ boards and develop their personas, and start to develop initial ideas. These ideas are posted online, and customers give feedback and suggestions via Pinterest providing collaborative environments. After the project is completed, open-ended questions are sent to students, and the responses are collected via emails to get their perceptions about using Pinterest in their design process. Lapolla (2014) classifies the advantages of using Pinterest as “(1) designing for an actual customer in a real-world scenario and (2) benefits of group work as preparation for work in the fashion industry. Two secondary themes apparent in the analysis were (3) appreciation of using Pinterest.com and (4) positive critique experience” (p.182). Pinterest provides an appropriate online environment for design students to identify

user needs and interact with actual users, share their design ideas, and get feedback from them. In addition, the online platform enables the project conducted easily in terms of connecting customers.

In this project, Pinterest is considered as a social media which provides interactions between students and customers to support collaboration. Although it can be used for mind mapping in the early stage of the design process, this can be beneficial for different stages of the design process like sharing design ideas and getting feedback from users.

iii. Google Docs

Google Docs is an online collaboration tool which offers real-time sharing, communication and interaction. Jung, Lim and Kim (2017) conduct a design workshop to explore the possibilities and limitations of using Google Docs for the design process by comparing these online collaboration experiences with face-to-face collaboration. Google Docs enables users to create, store and share documents with others. Jung et al. (2017) assume that different activities such as brainstorming, sharing content, and discussions can be conducted easily on this shared platform. Google Docs also provides an interactive environment for users through that they can add comments and give feedback to each other. In order to discover the opportunities and limitations of Google Docs, a comparative study is conducted with the face-to-face collaboration which is the essential method for design education (Jung, et al., 2017).

In order to get beneficial feedback, the research team asks four teams to perform their face-to-face collaboration first and then Google Docs collaboration, while the other four teams are doing the opposite. Their design process focuses on designing an alarm clock or designing a Bluetooth speaker. After finishing the workshop, open-ended interviews are conducted with the participants in order to understand their experiences and perceptions about the use of Google docs for their design process;

in addition, each design process is recorded, and examined later to examine participant attitudes during these processes. The participants compare these two types of communication and explain the differences in terms of communication and interaction; also, overall design process and outcomes are evaluated. According to the findings, Jung et al. (2017) present a table which includes the characteristics and properties of both Google Docs collaboration and Face-to-face collaboration.

Table 2.5 Characteristics and properties of Google Docs and face-to-face collaboration (*reproduced from Jung et al., 2017*)

| Type | Characteristics | Property |
|---------------------|---|------------------------|
| Google Docs | - Generating ideas by simultaneous participation - Collaboratively visualizing working ideas or design outcomes - Occurring independent participation frequently - Equally participating - Low level of attention to others' participation | Simultaneity |
| | - Retrieving and sharing sources without delay - Interacting with retrieved sources - Parallel activities of source finding, sharing, | Shareability |
| | - Using visualized dialogue as design resource - Co-editing design concept or direction in text - Visualizing ongoing process - Reflecting based on visualized process | Visualizability |
| | - Reflecting based on visualized process - Recording process details - Being reminded by recorded process - Reorganizing and reusing the recorded contents | Recordability |
| Face-to-face | - High level of attention to others' participation - Easily catching intentions of activity without explanations | Visibility |
| | - Using relatively long sentences in communication - Explaining intentions of activity with verbal communication - Using narratives when sharing experiences - Using humors and pun in communication - Making decisions based on discussion | Audibility |
| | - Expressing working ideas by hand-drawn sketches - Communicating based on drawings - Delivering product-feature-oriented design outcome | Drawingability |

The table shows that both types of collaboration have various opportunities. Jung et al. (2017) conclude that:

“An online document collaboration tool can be appropriate for divergent thinking stages, ‘Discover (finding problem space) and Develop (generating solution ideas)’, due to its properties evoking active and equal participation. Face-to-face interaction is effective for convergent thinking stages, ‘Define (defining a design direction) and Deliver (making decisions among generated solution idea)’, because of its properties facilitating deep discussion among participants” (p.1105).

iv. Skype and Flickr

Fleischmann (2014) claims that the use of Web 2.0 technologies especially social media tools in higher education contributes to developing interaction, active learning and social engagement among the new generation who need these. In order to evaluate the effectiveness of Web 2.0 technologies, Fleischmann (2014) conducts a five-week project which is “Living in the Tropics – Life in the City” (p.42). The project is performed between first-year design students at the School of Creative Arts at James Cook University, and first-year photography students at CATC Design School. Flickr is used for photo sharing and Skype is preferred for face-to-face communication and to share their feedback with each other for this collaborative process. During the project process, the students share their photos via Flickr with each other and at certain times, they meet with the other students via Skype and express their observations and thoughts (Fleischmann, 2014).

Both quantitative methods (questionnaires) and qualitative methods (open-ended questions) are preferred to obtain extensive information from the students. Fleischmann (2014) reports that

“Flickr and Skype were used to facilitate communication and exchange between students in geographically different locations. Web 2.0 technology

was used to bridge the distance and facilitate exchange, communication, and collaboration in the virtual environment. It is clear that certain learning outcomes in this first year media design subject could not have been achieved without the use of Flickr and Skype as tools for exchange and communication across the distant locations within the given timeframe” (p.47).

Web 2.0 technologies remove distance problems and provide students to experience a collaboration from a different culture. While synchronous activities such as expressing their observations and thoughts to each other are performed through Skype, asynchronous activities such as sharing photos and sustaining discussions are realized via Flickr. “The combination of engaging students in asynchronous activities (Flickr) and synchronous activities (Skype) as well as the combination of face-to-face and virtual dialogue during the five-week project is seen as significant factor for the success of this project and students achieving intended learning outcomes” (Fleischmann, 2014, p.49).

Web 2.0 technologies support design education through different approaches and features. While some online tools maintain the design process outside of the studio hours, some of them provide students to conduct collaborative projects from different cultures. Communication and interaction can be enhanced by the online tools, and the barriers between students and instructors can be removed. Although face-to-face interaction is very critical for learning experiences in design education, these tools encourage the students’ ability to share their processes with each other and take feedback without being constrained to design studio hours.

v. Twitter

Professor Margaret Rubega from the University of Connecticut prefers to use Twitter for data collection and sharing in her Ecology and Evolutionary Biology class (Revkin, 2011). Although this study is not from the area of design education, it is very inspirational in terms of the activities of data collection and sharing which are similar to research stage-related activities performed during the design process.

Twitter is also used as a learning and communication tool among students. It is assigned to the students to post their interesting bird behavior photos on Twitter under the hashtag #birdclass and to check others' sharing and make comments (Revkin, 2011). The comments that somebody makes, can be beneficial for students in terms of getting feedback.

The project shows that Twitter can be used as a submission platform or archive for assignments or tasks. It is an interactive environment where students and other people can get involved in the process and share their thoughts about the topic. In addition, while conducting research, students can share their findings simultaneously and it creates a rich information source for the next steps.

vi. Blogs

Blog is another social media tool used in higher education. Harrison (2011) states that Todd Idew, a doctoral student from Michigan State University conducted research focusing on the use of blogs in higher education and how to integrate blogs into courses. It is shown that blogging facilitates collaboration, contributed students to sharing and refining their ideas in an interactive environment, and encourages them to develop critical thinking. All these features make blogs appealing for higher education. Although this research does not focus on the design process, the results show that blogging helped students to control and direct their own learning process, increase participation in courses, and promote the development of informal learning communities which are also critical for design education.

Churchill (2009) suggests that blogs can be used by students to “publish their own writings, discuss group assignments, peer review each other's works, collaborate on projects, and manage their digital portfolio” (p.179). He conducts research with postgraduate students for one semester in order to explore the use of blogs. The results indicate that a blog-based environment increases students' participation and motivation to be a part of a learning process and to share their thoughts and needs.

In addition, blogs help students to access course materials, express their reflections on a topic, and create an interactive platform that commenting each other.

Baldeaa, Maiera and Simionescua (2015) from the Faculty of Architecture and Urbanism of Timisoara, Romania manage a research project concentrating on the way in which blogs can be used as a tool for teaching in higher education within the concept of an architecture design studio focusing on studio-based design education. The research consists of three simultaneous blogs usage by different years (1st, 2nd and 5th) in order to compare different backgrounds. At the end of the projects, the findings illustrate that blog provides fast communication between students and also make it easier to access instructors. A dynamic discussion platform including getting and giving feedback to each other is obtained by blog usage which increases the interaction between students. Baldeaa et al. (2015) also state that blogs help each student monitor the information related to the design and learning process. The cross-comparison of the different years shows that students in their final years have more tendency to use blogs actively and the content of the blogs is more well-organized compared to the previous years. The differences between different years (1st and 5th) in terms of educational background and the relationships between students developed in time have an impact on the effectiveness of the blog usage for design education.

Blogs give chance for users to personalize user experiences more than others. It can be used for communication, sharing documents, discussing a topic, monitoring the process, etc. Robert and Nelson (2008) give another example of blog usage and express that the students can use blogging platforms such as WordPress for developing and sharing their portfolios which is an important aspect of the design students. In addition, Kitsantas and Dabbagh (2010) emphasize that students using social media tools such as blogs and wikis have an opportunity to create their own personal learning environment (PLE) that enables them to establish a correlation with the self-regulated learning process. The activities such as “self-generating content and managing this content for personal productivity or organizational e-learning tasks such as creating online bookmarks, media resources, and personal

journals and calendars” promote students to self-regulate their design process (Kitsantas & Dabbagh, 2010, p.6).

The examples mentioned in the above section focus on online tools and their effects on design education. Although social media tools are not specialized applications for the design process; as seen from the examples, they are integrated into different stages of the design process or the whole process. For example, Pinterest (Lapolla, 2014) is used during the whole process; it brings together design students with the customers within the context of conducting user research in order to create a persona and conducting user testing to get feedback. In addition, it is also managed as a sharing and archiving platform both for students and instructors. On the other hand, Twitter (Revkin, 2011) is only used for collecting research data and sharing that with each other. One of the most significant opportunities that social media tools offer is accessing many people. Due to this, communication, collaboration and interaction between students and users are becoming easier and faster. Considering the examples in design education, it can be realized that the other important advantage is sharing and archiving. Social media tools offer users to send their findings and works to others and to get comments; and also, indirectly it constitutes an archive. Online tools have both opportunities and limitations for design education. However, these advantages are not enough to diminish completely the dominance of traditional design studios; therefore, online tools can be used as supplementary mediums and can be integrated into traditional design education to make them a more effective part of the learning experience.

2.3.4.4 Discussion on the use of tools for teamwork

The online tools are examined into three categories which are *design-stages oriented tools*, *design management tools* and *social media tools*. *Design-stages oriented tools* are specialized tools for specific methods used during the design process. Although some methods such as brainstorming and mind mapping can be used in different

disciplines, these methods and tools are commonly used in design education. However, these tools can be accessed by searching privately; they are not popular like social media tools. The instructors first need to encourage students to use these kinds of tools so that they can experience them. On the other hand, students should have a personal interest in self-improvement and technological developments to benefit from design-stages oriented tools.

Design management tools that are more teamwork-oriented such as Slack are not design-specific tools. These tools are used in any discipline where teamwork is needed. Online collaborative environments are very popular and effective in higher education. These platforms help participants develop collaboration among different teams, disciplines, and universities without the time and geographic restrictions. Also, an online learning environment such as Blackboard is one of the most popular platforms used by many universities in order to support students to access learning materials, interact with instructors, and share their thoughts and needs. The accessibility of these tools depends on the students' own special efforts or the guidance of the instructors too.

On the other hand, social media tools are very popular among the new generation and their accessibility and usage frequency are very high. When the examples are examined, it can be stated that when the tools are integrated into the design process, students adapt and utilize these tools very quickly. When other tools are included in the design process, it takes a while to learn how to use and get used to them. In addition, the high frequency of usage of the social media tools by students helps them benefit from these tools unconsciously for their learning experiences. When this process is arranged by instructors, students can take advantage of these tools more.

2.3.4.4.1 Opportunities for using online tools in higher education

Considering the developments in technology, researchers try to experience new tools in higher education and discuss their opportunities and advantages for the learning experience. Gikas and Grant (2013) conduct a research project to explore the learning experience of integrating mobile devices and social media tools in higher education. The students in that research discuss its advantages and disadvantages through focus group interviews, and the opportunities are organized into four titles which are “accessing information quickly, communication and content collaboration, variety of ways to learn and situated learning” (Gikas & Grant, 2013, p.21). Mobile devices are easily accessible for students, and they allow them to access information more quickly. The students state that use mobile devices to access content is quicker and more efficient in terms of time; in addition, accessing content, posting, or uploading related content provides an interactive environment (Gikas & Grant, 2013). Students also realize that they communicate with their classmates and instructors more due to their mobile devices. This quick communication allows students to learn with and from their classmates. Online tools encourage students to share their thoughts with their classmates immediately within the scope of course content. The other opportunity Gikas and Grant (2013) mentioned is the variety of ways for learning that mobile devices and online tools provide various environments for communication and collaboration. On the other hand, the internet offers students to get information from different platforms and different people. For example, interacting with a researcher over Twitter presents a connection and interaction for students that a course context cannot do by itself. The last opportunity mentioned by Gikas and Grant (2013) is *situated learning* that “mobile computing devices also allowed for interaction with the course content and other classmates in a highly situated and contextualized way” (p.22). Situated learning and informal learning occur throughout daily activities unconsciously. The other research conducted by Baruah (2012) aims to analyze the effect of using social media in higher education in terms of communication. She emphasizes that one of the most important

advantages is sharing information with people. As emphasized by her, social media in higher education can be one of the most advantageous forms of communication for effective use of time.

An et al. (2009) conduct research in order to explore the benefits and barriers of using Web 2.0 technologies in higher education. The research includes 14 university instructors and the data was collected by web-based survey. According to the analysis of the data, the advantages of Web 2.0 technologies are categorized into four titles which are: (i) interaction, communication and collaboration; (ii) knowledge creation; (iii) ease of use and flexibility; and (iv) writing and technology skills. In terms of interaction, communication and collaboration, the students state that online tools promote new ways of communication, collaboration and sharing with their classmates and also with instructors and remove the barriers between them. For knowledge creation, An et al. (2009) state that web 2.0 technologies support active and student-centered learning experience, and give the students the opportunity to manage their own learning process, which contributes to interaction and encouragement. In addition, Web 2.0 tools are reported as easy-to-use and they provide more flexible learning environments without the time and place restrictions. Many students also note that the use of these tools promotes them to develop their writing technological skills.

The involvement of Web 2.0 tools in higher education introduces new learning ways. Conole and Alevizou (2010) discuss these new ways of learning supported by Web 2.0 technologies and clarify them as:

- Inquiry-based and exploratory learning
- New forms of communication and collaboration
- New forms of creativity, co-creation and production
- Richer contextualization of learning (p.16).

These new ways of learning experience provide innovative, creative and flexible environments for students to facilitate. Accessibility to technological developments

are becoming easier and more available gradually. This has encouraged the use of these tools for more effective learning and teaching experiences in higher education for which, eventually, Web 2.0 tools present many opportunities. Students and instructors can develop and personalize their own learning environment in accordance with their wishes and needs to facilitate their own learning experience. For example, user-generated content such as wikis and blogs allows students and instructors to create a collaborative and interactive environment and activities within the course content. Many online tools such as social media tools provide to create video-audio, take photos including notes, location, time, and share them with each other. These tools promote interaction and students tend to write comments and share their thoughts with each other.

2.3.4.4.2 Challenges of using online tools for higher education

When the literature was reviewed, it was observed that there are some challenges to Web 2.0 technologies. Gikas and Grant (2013) make comprehensive research about using mobile devices and social media tools, and categorize the challenges of using these tools into three main topics including: (i) anti-technology instructors in other classes; (ii) device challenges; and (iii) devices as a distraction. Gikas and Grant (2013) state that “students were frustrated with instructors who were unwilling to effectively incorporate technology in their courses and felt that those instructors were not attempting to assist their students in interacting with and participating in the course content” (p.23). This approach demotivates students to attend the course. On the other hand, applications may not work properly on mobile devices and similar applications may cause conflict. Students state that small device keyboards make the writing process long and difficult (Gikas & Grant, 2013). The last challenge Gikas and Grant (2013) mentioned is about the devices can cause distraction meaning that social networking applications can disturb students’ concentration. However, students think that “it was very easy to respond to a text message that was received

and just as quickly return to the task at hand when using the devices for coursework, demonstrating that they were able to manage their time on appropriate tasks” (Gikas & Grant, 2013, p.23). Similarly, Baruah (2012) claims that although social media offers opportunities for communication and sharing, there are some disadvantages such as intrusion into privacy, breakdown in family ties, and reduction in worker productivity.

On the other hand, An et al. (2009) indicate the challenges encountered in using Web 2.0 tools in teaching include (i) uneasiness with openness, (ii) technical problems, and (iii) time. Students may prefer face-to-face interaction and communication rather than the public nature of online collaborative environments; they feel uncomfortable sharing their thoughts with everybody, so they are unwilling to attend collaborative platforms. Due to enough technical support is not provided by the university, while working on online platforms, students can encounter some technical problems, and this reduces students’ interest in new developments. In addition, An et al. (2009) state that learning new technologies takes time and students can prefer to spend this time learning subject instead of new technology. The research by An et al. (2009) is not a very recent one, considering the time gap, the limitations (technological and learning) can be quite different back then compared to the current situation and technological developments. It is hard to say that we have fewer challenges, but most likely different ones.

2.4 Summary and Discussion

Changing and developing technology and also unexpected universal events such as pandemic cause different needs and priorities in people's lives. The development of smart devices and the internet has accelerated and improved the cycle of the whole process, especially in education and working life. Quick access to information has changed the way students view education. In order to better understand the new

generation, their needs, thoughts and expectations from higher education, this generation is discussed in detail (see Section 2.1 Gen Z). Opportunities for students to develop themselves in the field they are interested in, to have the knowledge and to exchange ideas with experienced people have increased. This situation differentiates students' expectations from education. In connection with this, what kinds of technological developments exist and their implications in education were examined (see Section 2.2. Technological Developments and Section 2.3. Web 2.0 Technologies). In order to link this change with design education, design education including design process and design studio (see Section 3 Design Education) and changes in design education (see section 3.2 New Approaches in, Changing Design Education and its implications for Industrial Design Education / Design Studio) are reviewed in detail. This shows that as technology developed, the scope of design began to expand. Gradually, the expectations of the users have begun to increase and differentiate. This change has given rise to more complex design problems. In other words, the field of design began to differentiate, the expectations of the students changed, and the design problems began to become more complex with the widening of the users' perspective. The solution to these complex problems made it necessary for people from different disciplines to come together, and the means of working together became widespread and a necessity. In a discipline that carries out its activities in many sectors such as the design discipline, this situation has started to come to the fore even more prominently. This brought the teamwork process to the fore in design education.

In this changing world where teamwork skills have been widely expected and applied, it is inevitable that the education system will also change. While change is observed very rapidly in professional life, it is seen that the education world cannot follow it accordingly. For this reason, teamwork in design education was investigated in the most comprehensive way (see section 4. Design Education & Teamwork), and the examples on how online tools can be used in this process are examined (see section 4.4. Teamwork and Online Tools in Design Education).

As noted by leading company executives, the ability to work in a teamwork setting appears to be essential among other skills expected from new candidates. In return, acquiring teamwork skills in higher education and experiencing this process will provide great gains to students. Not only educational but also extra-curricular activities such as student clubs and extracurricular courses provide students with great gains in terms of teamwork. The biggest deficiency seen in teamwork projects carried out within the scope of education projects is that although the design process of a design education project is usually planned in detail by the educators, this process is not mainly planned considering the requirements of teamwork experience. While this makes it difficult for students to acquire the necessary teamwork skills, it is also seen that students may have presumptions against teamwork projects.

Traditional education methods also need to be updated within this framework. With the advancement of technology, smart products, and the internet, many different applications and tools have become an indispensable part of people's lives. Ignoring these methods affects the expectations of students regarding higher education. Considering that young people, especially the Z generation, adopt technological changes very rapidly and make them a part of their lives, their impact on education should not be ignored. The applications and technological developments such as Bring Your Own Device, Flipped Classroom, Makerspaces, Wearable Technology, Adaptive Learning Technology, and The Internet of Things (Johnson et al., 2015). used should be made a part of the education process and the learning process should be matched with the expectations of the Z generation. There is an increasing area of research on how such developments and practices can be integrated into education. When this issue is considered in terms of teamwork, incorporating online tools into educational projects will enable students to experience a different side of teamwork and support team management.

As Generation Z, a generation born into technology, it seems very difficult for them to imagine a life without computers and phones. They incorporate technology into every aspect of their lives, from shopping to entertainment. Along with web 2.0 technologies, many services and applications, especially in the fields of sharing,

interaction and collaboration, joined their lives. Technological developments, which are even a part of daily life routines, take a large part of their time. This shift is changing how they learn and handle everything from how they do everything down to their daily routines. The frequent use of these applications and their being a part of daily life necessitated differentiation in education. Considering that most of the higher education students are from this generation, their approach to life, methods of acquiring knowledge, and their needs also determine the roadmap of education. As Lapolla (2014) states the new generation is more prone and willing to perform many things simultaneously, to use existing technologies, especially online tools and to work collaboratively. This kind of aspect should be integrated into higher education to encourage this generation.

Studio education, which forms the basis of design education, is one of the higher education units that are directly affected by this transformation. However, especially in this period when distance education is at the forefront of the pandemic, online applications and services have become an indispensable part of education. This transformation has changed the reaction to change and innovation among different stakeholders in education. Students' interest in online platforms has increased and they have started to benefit more.

The fact that teamwork should be an indispensable part of design education has come to the fore with the recent changes. However, since the priority is not to teach teamwork skills to students in teamwork projects within the scope of the studio courses, and this process is not planned and managed by the educators, the process management is entirely up to the students' initiative. This both causes problems within the team and prevents students from acquiring the skills they need to learn. First of all, it should be decided what the students are expected to experience and what skills they are expected to develop in the teamwork they carry out within the scope of an educational project. It seems that the formation of teams affects this whole process before it comes to teamwork skills. There are three different ways to form teams which are (i) self-selection, (ii) random allocation, and (iii) deliberate allocation (Hains-Wesso, 2013). Especially in higher education, after the first year,

students want to do teamwork with their close friends with whom they get along well, preventing them from fully experiencing the teamwork process. Also, when students are left to form their own groups, the students left out pose a big problem. Particularly within the scope of compulsory courses, where the number of students is gradually increasing, the process of forming teams in teamwork should be provided by the educators as Levin (2015) insisted, to an equally fair start to the process for all students (see Section 4.3. Guidelines for Design Educators and Students).

After the start of a fair and equal team organized by the educators, it is a critical first step to ask the students to get to know each other better before starting work and to make a *team contract* as suggested by Tucker, et al., (2013) so that they can talk about their expectations from the teamwork project, what kind of work they want to do, as well as their personal preferences. Talking to team members about matters such as communication within the team, task management, meetings, time planning and leadership and trying to make a joint decision will reduce the problems that may arise in the future. With this type of start, team members will get a more detailed idea of each other, and work planning will be completed more comfortably. As the process intensifies, the problems in the teams increase. Therefore, being planned and aware from the beginning makes the process easier.

There are six basic skills that come to the fore when teamwork is considered within the scope of design education (Tucker & Abbasi, 2013) which are (1) Coordination of tasks and responsibilities; (2) Communication; (3) Idea generation, evaluation & selection; (4) Decision making; (5) Leadership; and (6) Conflict management. Expecting all these skills to be taught in a single team project can be an overwhelming goal. However, for the coordination of tasks and responsibilities, encouraging the division of labor within the team, making time planning and setting goals, and following this process will enable students to make a start for this skill. And in this whole process, students can be informed about how they can make an effective division of labor, what they should pay attention to in time planning, and how they can follow up the work by submitting updated project plans regularly

throughout the project or with the cant charts as suggested by Tucker and Abbasi (2013). As for communication, it can be recommended to be flexible in using different channels and these can be suggested. As mentioned in section 4.1. (Teamwork in education (skills, applications, approaches that can be transferrable to design education) Levin (2005) divides the teamwork skills into two, intellectual and emotional teamwork skills. Although intellectual teamwork skills can be taught, emotional skills are not. These emotional skills (Levin, 2005) including the ability to communicate, listen, to take initiative, similarly mentioned as individual-level factors by Tucker and Abbasi (2013) could not be taught. These differences should be encouraged by the educators. Paying attention to each other's needs and styles in communication, trying to understand the other side, being a good listener, and providing an environment where all team members can convey all their ideas without hesitation should be an environment that should be provided within the team.

The idea generation and evaluation phase may be the most relevant to design skills. At this stage, the process of working together and making decisions comes into play. In this process, it is critical to provide a working environment where all team members can freely convey their ideas and listen to each other very well. It can be stated that in situations where deadlocks are reached at this stage, the result-oriented behavior such as the majority vote method will distract the teams from possible problems. Another skill that a design student must experience in the teamwork process is leadership. In order for an equal and fair teamwork process to continue, it seems more reasonable that the team leader should not be carried out by a single team member, but by dividing it among all members. For this reason, it will facilitate the process of recommending this to students and will ensure that all students experience this process as the suggested method by Levin (2005), rotating chair. Finally, in a collaborative environment, conflicts are inevitable. In order to resolve these conflicts before they escalate, it should be recommended that the teams try this among themselves first, but if they cannot, they should definitely get support from the educators. Resolving problems at the beginning by following the taught process including that all team members share their ideas and solutions about this problem,

listen to each other and find a common solution (Tucker and Abbasi, 2013) would positively affect the process as well as the outcome of the teamwork experience. Another point encountered at this point is that the whole teamwork process should be visible and transparent first to all team members and then to educators. Tucker and Abbasi (2013) suggest conducting interim steps to discuss individual and team progress or make face-to-face meetings regularly to discuss the teamwork process and give feedback or using self-and-peer-assessment (SAPA). These methods can be decided together with the number of students, the duration of the project, and the number of educators. While online options can be used in cases where there is a time problem, otherwise face-to-face discussion may be more effective for students. It is a critical point for both fair grading and solving potential problems without being personalized.

Students can be encouraged to use online tools, which will primarily facilitate this process for the teams and make their process more effective. In professional life and especially in the experience of remote working, which is increasing day by day, employees continue their teamwork by advancing both communication and task tracking and processes through online platforms. Online platforms offer different alternatives to teams, especially in terms of sharing (e.g., Google Drive), communication (e.g. WhatsApp), remote working (e.g. Zoom), and process monitoring (e.g. Slack). Normally, considering that design students are always side by side, they may think that they do not need such tools. However, using such applications for a planned and effective teamwork experience makes their processes easier. In addition, not having to be at the same place and time in all processes of the project facilitates flexible working for team members. Online platforms provide this flexibility within the team, making the interdependent process of team members more comfortable.

The transformation in design education has become undeniable. In addition to design skills, it is inevitable that teamwork skills are an indispensable part of this process. Making team projects a part of studio projects and having students execute with a structured plan seems necessary for teaching teamwork skills. In a well-planned

teamwork project, students will acquire these skills better, and a positive working environment will positively affect their design skills and results. Also, this will break the prejudices of the students about teamwork. In a design process that is left to itself, the results from the students do not meet the expectations, and similarly, they will not gain the necessary skills and gains when the teamwork process is completely left to the students' management too. Under the supervision of educators, they can have a more successful teamwork process with their suggestions and interventions. For this, design students will be able to learn teamwork skills more effectively in an educational process where educators plan and follow the process and give feedback.

In this direction, this doctoral study tries to find an answer to the question of how the effective teamwork process can be integrated into the design projects conducted within the scope of studio courses in design education, focusing on how to benefit from online tools and how students can acquire teamwork skills especially task management, time management and leadership skills. Each stage of the research conducted for this purpose, including how it was applied, analyzed, and the findings of the research will be presented in the next chapters. In the final part, the learning strategies or methods for influencing effective teamwork and design education in line with the studies and prominent findings will be explained.

CHAPTER 3

EXPLORATIVE STUDIES AND RESEARCH FRAMEWORK

3.1 Explorative Studies

Technological developments and changes are becoming an essential part of people's lives particular to the new generation. Especially, the internet and smart products have become a key element of a daily routine, which resulted in the use of these opportunities in education more and more. The characteristics and the needs of the new generation growing up with this transformation are inevitably changing. This transformation forces higher education to develop new learning environments and methods throughout history. To understand this change more deeply in industrial design education, two explorative studies were conducted.

3.1.1 Explorative Study 1: Effects of designer and client roles in collaborative design projects

In the first explorative study, design research is conducted in the context of a graduate course, ID 542 Design Management, at the Department of Industrial Design, METU (see Appendix B). The research aims to understand students' behaviors and thoughts about collaborative design projects, distance communication and using online technologies in the scope of The Global Studio project, Fall 2016 - 2017 semester, which gives students an opportunity to work in cross-cultural and geographically distributed groups (Bohemia, Harman & Lauche, 2009). The project aimed to provide an appropriate environment for students to develop distance communication and teamwork skills by encouraging them to use online technologies that bring new perspectives to design education and design studio courses. In order

to develop an in-depth understanding of this impact, the blogs of the teams were reviewed regularly to monitor the process throughout the 10 weeks and in-depth interviews were conducted with six students. The interviews aimed to understand students' experiences and insights about the project, comparing these experiences with the previous ones like studio projects, and getting their suggestions about using online tools and learning experiences (Table 3.1).

Table 3.1 The interview guideline of the first explorative study

| <i>Interview Guideline</i> | Content |
|---|--|
| <i>Previous Experience</i> | <ul style="list-style-type: none"> • Experiences of client-designer interaction / remote collaboration design process |
| <i>Design Process</i> | <ul style="list-style-type: none"> • The stages of the design process • Division of labor and responsibilities • Effects of roles on each stages • Problems and challenges |
| <i>Defining Client and Designer Roles</i> | <ul style="list-style-type: none"> • Definitions of the roles • Responsibilities of the roles • Comparing the other team's performance |
| <i>Comparing this process with the studio projects</i> | <ul style="list-style-type: none"> • Taking critiques from a client / a studio staff • First experiences • Comparing responsibilities |
| <i>Analyzing the communication process throughout the project</i> | <ul style="list-style-type: none"> • Communication platforms • Strategies for problems • Level of collaboration • Changing situations |
| <i>Reflections on the design process</i> | <ul style="list-style-type: none"> • Suggestions • Learned tips • Expectations from a client or a designer |
| <i>Comparing the experiences with the previous ones</i> | <ul style="list-style-type: none"> • Differences • Inferences |

All the interviews were verbatim transcribed and analyzed with the qualitative content analysis method. In line with the analysis, important issues were raised which

are process management from the point of view of different roles, responsibility and communication. The teams matched the teams from Loughborough University and Hongik University, and in the context of the course, the teams are responsible to manage two projects at the same time; one of them is carried out as a designer, and the other as a client. They have different responsibilities for a design project conducted in a traditional studio course. Teams interacted with each other during the whole process and gave feedback, made comments and expressed their request to each other. Therefore, they compared these experiences by taking critiques process from educators in a studio course and stated that educators give feedback on design projects in order to enhance the designs in the direction of their perspective while clients indicate their own opinions in the direction of their own requests and interests.

The most prominent finding of this study is about distance communication. Although regular weekly skype meetings were proposed teams by educators, except for one team, other teams preferred to use WhatsApp for communication for the purpose of being quicker and more effective; however, it gave the chance to teams to access each other whenever they needed or wanted and so this flexibility cause pressure on students. This communication process gave some suggestions to participants as a designer. They defended that it is very important to communicate with clients face to face in order to understand and comprehend the clients' requirements very well. WhatsApp is a very casual communication platform and more formal platforms such as Skype and Email should be chosen while interacting with clients in a work environment. In fact, frequent and short meetings or communication is the better choice while conducting a design project. This comparison showed that online communication tools during a collaborative project have an enormous effect on the design process.

3.1.2 Explorative Study 2: The use of online tools in industrial design education

In the second explorative study, research was conducted with my classmate Özümcan Demir, in the context of a graduate course, ID 730 Modeling User Experiences, Spring 2015 - 2016 semester, at the Department of Industrial Design, METU; (see Appendix C). The research aimed to understand the experiences and opinions of industrial design students related to online tool usage in the design process performed in the scope of design studio courses. In order to develop an in-depth understanding of this process, the research consisted of different methods including a survey (conducted with 39 third-year students), experience sampling method (ESM) (conducted with 4 teams, 16 students via WhatsApp for four weeks), and in-depth interviews (conducted with 10 students).

The findings show that internet usage constitutes the main medium of the research phase of the design process. The use of personal devices such as laptops and smartphones and online platforms is the first choice of students while conducting research for their design project. Although students state the advantages of using online tools for research, such as reaching various and large sample groups and time-efficient and, they have concerns about the reliability of information and lack of interaction. In addition, especially during the idea generation phase, the students avoid using the internet. They are afraid of unconsciously being influenced by the product examples and forms they see on the internet while designing and they think that inspiration can easily turn into copying ideas. Therefore, they get demotivated when they come across with their ideas already done before.

They prefer to use online platforms to improve their visualization and presentation skills. They examine presentation and visualization examples to develop their practices. They use Instagram to find good sketches and use Pinterest to find presentation board and mood board examples. Also, they prefer to use online tools to improve their visualization skills by watching tutorials. They indicate that YouTube constitutes the main source for sketching and modeling tutorials. While

online tools are used for improving their design skills, they also benefit from the online tools to get expert and user feedback. The research demonstrates that students use online tools, especially instant communication tools such as WhatsApp or Facebook Messenger, to get feedback from family and friends. However, getting feedback from experts, either tutors or professionals, they prefer face-to-face interaction. Despite their inclination towards face-to-face communication, they state that they use mail, ODTÜClass, and Skype to receive expert feedback. Although they read user reviews at the research stage of the design process, they rarely share their finalized projects with users to receive feedback. They do not feel competent enough to share their design projects publicly.

In addition, communication, sharing and archiving of data constitute important aspects of the design process. During a teamwork process, these are very critical aspects for conducting an effective design process. It is stated that using online tools supports teamwork and remote collaboration. The most popular tools used during the teamwork, WhatsApp and Skype for communication, and Google Drive and Email for sharing and archiving data. Although, it is stated that using online tools support teamwork and remote collaboration, students have concerns about always being accessible which affects their daily life. Considering the findings, it can be made an inference that teamwork is one of the most important aspects of the design process that requires online tools.

3.1.3 Emerging Problem Areas

In order to constitute a more comprehensive understanding, two more in-depth interviews are conducted before deciding the problem area for this research. It is aimed to understand the experiences and opinions of third- and fourth-year ID students related to the use of online tools, the working experiences during a design project and extracurricular studies to improve their skills and support their design

project. The interviews show that using the internet is the first and main choice among students while working on their design projects. Due to the increasing number of students, the time allocated to each student for critiques is decreasing. Therefore, monitoring the design process during and before the critique session is more critical for a more effective process. Interaction and communication between students and instructors are also critical aspects of a design project.

According to three researches, emerging themes and problem areas have come to light. These themes and problem areas are described in Table 3.2; which are *changes in learning, collaborative learning, virtual environments and communication*.

Table 3.2 Emerging Problem Areas from the Explorative Studies

| <i>Emerging Problem Areas</i> | Emerging Statements | Point of Origin |
|--------------------------------------|---|---|
| <i>Changes in Learning</i> | <ul style="list-style-type: none"> - Common and easy accessibility of online tools and smart devices - Students' desires to improve their design skills for better education - Easy accessibility of information and stakeholders - Maintaining to work out of studio hours | Literature Review Explorative Study 2 |
| <i>Collaborative Learning</i> | <ul style="list-style-type: none"> - An indispensable part of the design discipline - Popularity of online collaboration and collaborative environments - Easy accessibility of people - Possibility of working from different places | Explorative Study 1 Explorative Study 2 |
| <i>Virtual Environments</i> | <ul style="list-style-type: none"> - Developing of the technology - Becoming widespread of the internet - Increasing the use of smart phones and personal computers - Having tendency to request for digital copies of presentations | Literature Review Explorative Study 1 Explorative Study 2 |
| <i>Communication</i> | <ul style="list-style-type: none"> - Significance of effective communication for teamwork - Accessibility of experts to obtain information - Getting feedback from distance - Informing team members easily | Explorative Study 1 Explorative Study 2 |

ID education is going through a rapid evolution with using of the internet resources by more students, benefiting from online tools while conducting effective design process and preferring to improve their design skills by various platforms for better education. The materiality of the studio courses and students' inner motivation encourage students to continue their work outside of the studio hours. Explorative studies support that they have many tasks to be finished out of the studio hours. During this duration, they prefer to use online platforms which provide to access information and stakeholders easily.

The other emerging problem area is about *teamwork* which is an indispensable part of the design discipline. Considering the explorative studies 1 & 2, the findings show that communication, collaboration, sharing and archiving are critical aspects of the teamwork process during a design project. Therefore, time and accessibility are critical to conducting this process effectively. The development of technology increases the popularity of online collaboration and collaborative online environments, and students start to facilitate these opportunities during their teamwork. Online platforms provide to access participants easily and they make working from different places possible. Especially, an online collaborative environment is one of the most popular topics for teamwork in design education.

With the development of technology, using smartphones and personal computers become widespread among students in higher education. This transformation has changed the students' attitudes and behaviors towards digital and hardcopy. Design students have the tendency to work with digital copies of researches and works, rather than relying on the hardcopies as presented in the studio environment. They state in explorative studies that sitting on the computer is more effective in terms of time and accessibility. Therefore, virtual environments and digital versions are becoming an indispensable part of design education and design students.

As mentioned above, teamwork and collaboration are the key elements of a design project. Therefore, effective communication between team members increases the success of a design process. Online communication tools provide many opportunities

for students while sharing documents, archiving data, making division of labor, and discussing a topic. On the other hand, online communication platforms make available to access experts or users to obtain information or receive feedback. When these opportunities and aspects are considered, it can be stated that these opportunities are not specific to the design process or design education; they are applicable to any discipline teamwork is conducted.

Collaborative learning, communication and virtual environments are more general topics which are not specific to design education. In addition, collaborative learning and online collaboration are more popular topics in literature and many researches (such as Page and Thorsteinsan, 2017; Ku et al., 2011; Wang, 2009) can be found in both design education and other disciplines. Although communication issue is not specific to the design education; there are many interesting findings like the comparison of online communication tools according to their formality.

3.1.4 Emerging Themes for Teamwork

Considering the emerging problem areas obtained from the explorative studies and literature review, teamwork and the implications of online tools for the design process were reviewed in more detail. This examination revealed the following emerging themes which are self-motivation, the documentation of the process, design feedback, monitoring the process, asking for help, and improving design skills and teamwork skills (see Table 3.3).

Table 3.3 Emerging Themes for Teamwork

| <i>Emerging Themes</i> | Emerging Problem Areas | Point of Origin |
|--|---|---|
| <i>Self-Motivation</i> | <ul style="list-style-type: none"> - Individual responsibilities of the students throughout the design process - The necessity for self-motivation to complete the design process successfully. - Online platforms as motivator - The necessity of documenting each stage as a motivator | Literature Review |
| <i>Documentation of the process</i> | <ul style="list-style-type: none"> - The necessity of the documentation of the design process - Monitoring the process regularly by different stakeholders - Online platforms as an archive - Making synthesizing including the reliability of info and feasibility of design solutions. | Explorative Study 1 Explorative Study 2 |
| <i>Design Feedback</i> | <ul style="list-style-type: none"> - Essential part of the design course - The necessity of the documentation of the process - The accessibility of the process to monitor by the educators - Quick and effective feedback sessions | Literature Review Explorative Study 1 Explorative Study 2 |
| <i>Monitoring the process</i> | <ul style="list-style-type: none"> - The necessity of the monitoring the process before critique sessions - Increasing the number of students - The duration of the effective critique sessions - Online tools as an alternative way to document and check the process - Quicker and effective interaction | Literature Review Explorative Study 2 |
| <i>Asking help</i> | <ul style="list-style-type: none"> - Design studio as an interactive environment - The necessity of the communication and collaboration between students and instructors - Online tools as an alternative way for quick access - Privacy as a concern (the boundaries for work time) | Literature Review |
| <i>Improving design skills</i> | <ul style="list-style-type: none"> - Desires and necessity for improving design skills - Online tools as a first choice to access an information - Visual materials as preferred ones - Quick alternatives such as videos | Literature Review Explorative Study 2 |
| <i>Teamwork skills</i> | <ul style="list-style-type: none"> - The necessity of working in a team - Better division of labor in a team - Better communication skills | Literature Review Explorative Study 1 Explorative Study 2 |

Teamwork and design feedback are popular topics encountered in both literature reviews and explorative studies. As mentioned above, teamwork is an essential part of the design projects, and the students need teamwork skills for an effective design process. *Self-motivation* provides students with the responsibility to complete their individual tasks on time that are critical for an effective teamwork experience. In addition, when students are aware of their best and worst skills and practices, the division of the labor in a team can be conducted better to deal with the process. Also, the awareness of individual skills promotes students to improve their abilities. They prefer to use online tools such as video tutorials, blogs, and social media to enhance their design skills like sketching, modeling, presentation, etc. It can be stated from the explorative studies that checking visual materials is very popular among students for research and self-improving practices. They also prefer to learn from a video than a PDF version due to it is more practical and quicker.

During a design studio course, although the design process is organized by the instructors, students have many responsibilities taken individually. While the research stage of the process is conducted with a team, students work individually for the other stages generally. Therefore, they have experiences both in teamwork and individual work. To complete the design process (6-8 weeks) effectively, *the use of online platforms* such as blogs helps students to get motivated and connected with their peers. The necessity of writing posts on blogs each week provide students to be aware of their process and to gain control of the project.

In addition, online tools can be an alternative way to interact with experts, classmates, or instructors in order to get feedback while encountering a problem in order to support the studio course although the design studio is an interactive environment where communication and collaboration between students and instructors are prominent. That kinds of tools can be encouraging for students for their work outside of the course. Especially during the teamwork sessions, students prefer to use online platforms mostly for *communication, sharing, and archiving* documents. Although online platforms provide quick access to stakeholders, privacy

can be a concern that the boundaries for work time are vague, and anyone can reach you any time.

Throughout the design process, the data obtained from each stage is critical for the progress of the stages for the students. Therefore, design critiques sessions which are the key elements of the studio course, are becoming significant. With the increasing number of students, *monitoring all the students' design processes* closely is getting difficult. This causes the time allocated to each student for critiques to decrease. For this reason, throughout the process, well-planned documentation and easy monitoring of the process by the instructor is getting crucial. Online platforms such as blogs can be an alternative way to document the design process and give the opportunity to educators to check the process regularly. *Online documentation* also can be a solution for quick and effective critique sessions. In addition, that kinds of tools offers to archive the process. This documentation also forces students to make synthesis including the reliability of info and the feasibility of design solutions.

The design education system forces students to conduct extracurricular studies to improve their skills and to support their design projects for a better education. This necessity encourages students to develop their teamwork practices and abilities. For this reason, emerging themes related to the design education such as design feedback, self-motivation, teamwork skills and asking for help are the prominent topics which are associated with design education and are related to the teamwork process and online tools usage. The advancement of technology and the easy access to the internet promote communication, interaction, sharing, archiving, and obtaining information between students and other stakeholders such as instructors, experts, users, etc. This interrelation between the online platforms, teamwork, and design education is worth-exploring.

3.2 Research Framework

This study uses a qualitative research approach, and the research adopts a grounded theory that is defined as “the discovery of theory from data systematically obtained from social research” (Glaser and Strauss, 1967, p.2). The grounded theory provides an exploratory framework for data gathering and analysis throughout the research. It focuses on not only the data but also the process in which the data is collected and analyzed systematically during the research (Glaser & Strauss, 1967). The grounded theory contains the iterative process of developing descriptions and combinations of categories of meaning from data and then establishing relationships between categories by comparing and contrasting the data to structure patterns (Charmaz, 2000; Glaser & Strauss, 1967). In this research, themes have started to emerge from the pilot studies and literature reviews, and the relations between these themes are becoming more apparent with the support of the following studies.

In addition to the grounded theory approach, the research follows a generative research approach that aims to participate users in creative processes in order to make them think, judge, and express their thoughts, experiences, needs, and desires, and to contribute to generating new solutions (Martin & Hanington, 2012). The generative research approach is divided into two, which are *projective* and *constructive* methods (Hanington, 2007). Projective methods are expressive activities that enable participants to express thoughts, feelings, and desires that are difficult to express verbally. These methods include collages, diagramming, drawing, daily logs, image and text-based cards (Hanington, 2007). On the other hand, constructive methods enable participants to generate tangible things while reflecting their thoughts and experiences, such as Velcro modeling, and flexible and creative modeling kits (Hanington, 2007). Throughout the research stages, this study adopts projective generative tools and techniques to understand participants, to get their thoughts, experiences, needs, and desires, and to encourage them to generate ideas for more effective learning experiences.

Considering the main objectives of the research, there will be three stages that have to be accomplished for the realization of this research and different methods including surveys, semi-structured interviews and participant observations were used in these stages. Using different qualitative research methods is considered effective in getting deeper insights from the participants concerning their experiences (e.g., needs, preferences, expectations, etc.) about the use of online tools and teamwork strategies during their educational projects. The framework of this research is illustrated in Figure 3.1. The figure includes the aim of each research stage, the information about participants, and the related semester details.

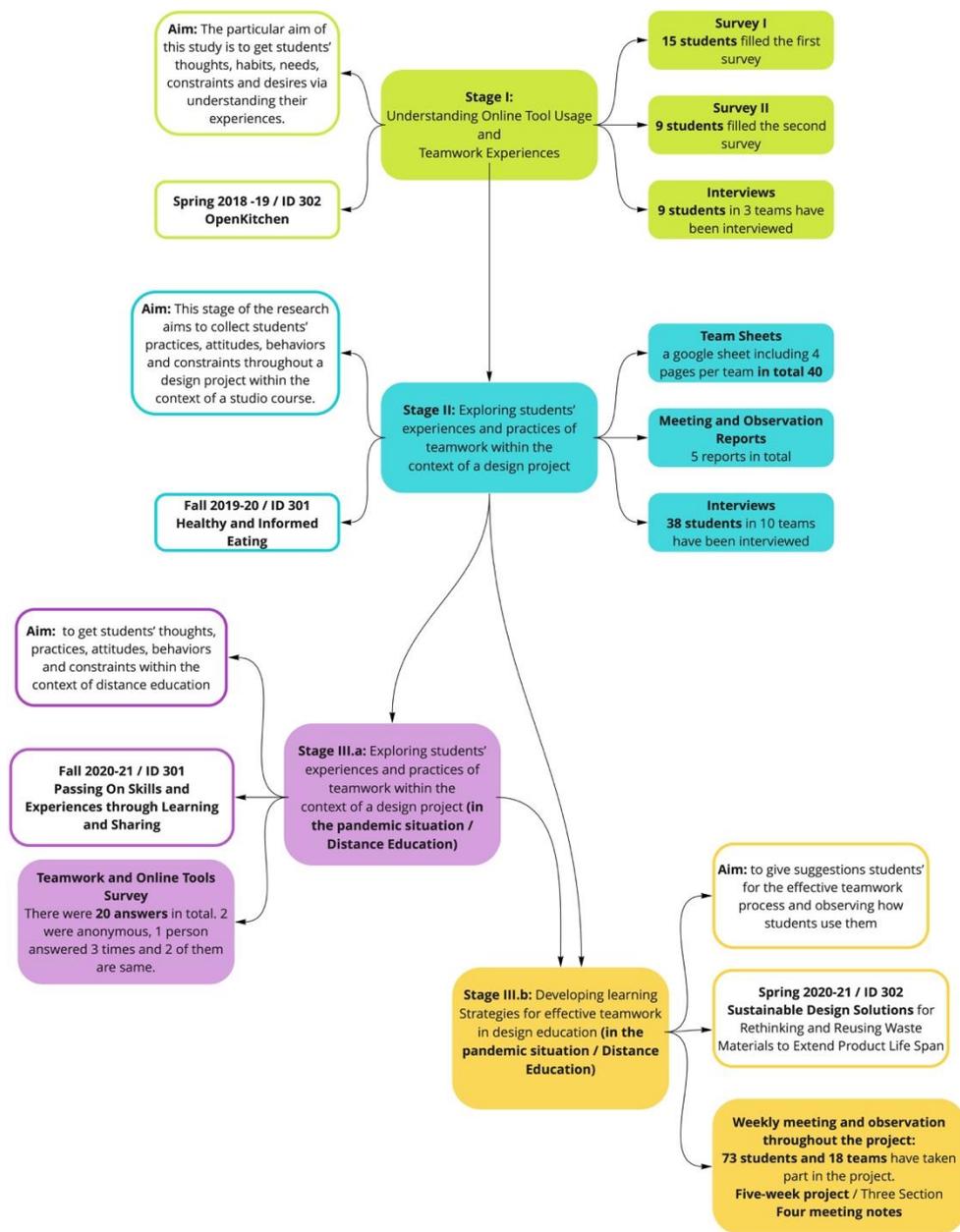


Figure 3.1 The main research framework involving three stages

In the first stage of the study, survey and group interview; in the second stage of the study, detailed participant observation, team meetings and group interview; in the third stage survey, and in the fourth stage participant observation and team meetings

methods were used. The information obtained as a result of all these methods was analyzed in detail with *content analysis* method. Although the emerging themes are not the same, they are interrelated and supported with each other. These themes are explained in detail in the following sections, supported by students' quotations. Since the language of all collected data is Turkish, the quotations have been translated into English .

All research phases were done within the scope of the third-year studio course at the Department of Industrial Design, METU. Four different research stages were integrated into the teamwork project carried out in these studio courses held in four different semesters. The fact that the researcher worked as a research assistant in the third-year studio for six years, know about the content and operation of the course and the problems experienced and her familiarity with the studio team facilitated the planning of the research. In the first stage of the study, the number of students were low compared to other semester, so they were not divided into the sections. The research was carried out with all students. The research carried out in the second stage was made with only one section, half of the third year students. In the following years, although the students were divided into sections, the general facilitation of sections was common, so it provided the opportunity to reach all students.

The fact that the teamwork carried out within the scope of the third-year studio generally covered half of the semester, 6-7 weeks, provided a flexible time frame for carrying out the research. While this duration is less in the second-year industrial design studio, it can be spread over the whole term in the fourth-year. Therefore, a period of 6-7 weeks was ideal for conducting research and observing students' teamwork processes. Another common feature of teamwork in the third-year studio is that the teams are made randomly in line with the joint decision taken by the studio team. Different team-building methods could be compared, but that was not the purpose of the research. Despite this, students had the opportunity to compare their past experiences with the current ones, since they generally form their own teams in previous years. In fact, past experiences and problems allowed students to look at the teamwork process in a different way and focused on improving the process.

The first stage of the research examines the experiences of industrial design students regarding *the use of online tools and teamwork practices* during their design projects conducted in a design studio course setting. The particular aim of this study is to get students' thoughts, habits, needs, constraints, and desires via understanding their experiences. The research is conducted based on the studio project titled "OpenKitchen: Sustainable design solutions for a flexible, adaptable cooking platform enabling healthy eating habits for shared kitchens in collaboration with Vestel" in the third-year industrial design studio course, Spring 2018 - 19 semester (see Appendix I). Considering the particular aim of this stage of the research, I conducted two-stage surveys (see Appendix D & E) and follow-up semi-structured interviews (see Appendix F). I listed the answers including findings and insights from both surveys in an excel document for thematic coding analysis by categorizing them in terms of the online tools. This categorization shows us which online tools were used mainly in those tasks, how the students benefited from this tool, and how they evaluated this experience. Due to the technical issues of the sound recording, only three out of five interviews could be analyzed. All the interviews were verbatim-transcribed and analyzed with the qualitative content analysis method. In line with the analysis, statements were grouped in two different ways. In the first one, the statements were categorized in terms of online tools such as WhatsApp, drive, drive, google, etc.); while in the second one, the statements were associated with the purpose of using the online tools such as communication, sharing, archiving, etc. (see Appendix G & H).

The second stage of the research aims to collect students' practices, attitudes, behaviors, and constraints throughout a design project within the context of a studio course. The research is conducted based on the studio project titled "Healthy and Informed Eating: Engaging Sustainability Scenarios for Encouraging Children's Healthy Eating Behavior in Collaboration with Meraklı Kedi and Nesibe Aydın Primary Schools" in the third-year industrial design studio course, Fall 2019-20 semester (see Appendix K). In order to facilitate this research, it was planned as a part of a design education project to encourage all the students' participation.

Considering the particular aim of this stage of the research, weekly meetings throughout the process and semi-structured interviews at the end of the project have been conducted with the teams for an in-depth understanding of the students' thoughts, experiences, needs, and desires about the teamwork strategies in their learning process (see Appendix J). In this process, for tracking the teamwork experiences of the student teams, an online tool was developed and incorporated into the project through using Google Sheet to make the process more visible for both team members and researcher; and to collect data. All the data was verbatim transcribed and analyzed with the qualitative content analysis method.

The third stage aims to encourage participants to reevaluate their experiences and practices with the online tools for teamwork to introduce effective learning experiences and to generate new design learning strategies and methods for teamwork experience in design education projects. This stage includes two different studies. Because, after the second study, with Covid 19, the pandemic situation made many changes in higher education. Due to that shift, university education was carried out in entirely online conditions. This transformation changed the teamwork processes of the students and their habits and experiences of using online tools. In the third stage, the first study aims to explore students' experiences and practices of teamwork within the context of a design project in the pandemic situation and distance education. The study was conducted based on the seven-week studio project titled "Passing on Skills and Experiences through Learning and Sharing: Sustainability Scenarios for Encouraging Children's Engagement in Online Courses" in the third-year industrial design studio course, Fall 2020-21 semester (see Appendix O). At the end of the semester, a questionnaire was sent to the third-year students, focusing on teamwork and online tools to get students' thoughts, practices, attitudes, behaviors, and constraints within the context of distance education (see Appendix M). Seventy-one students and twenty-three teams have taken part in the project. Two teams involved four members, and the others were three-member teams. There were twenty responses in total. The responses are collected anonymously but the students had the option to provide their names if they prefer to

participate in the following stages. Two of the responses were anonymous, one of the students answered three times, and two of them were the same. The answers have been combined into a file (see Appendix N). According to the students' responses, an evaluation was written about teamwork and online tools in distance education during the pandemic situation.

The second study of the third stage aims to develop learning strategies for effective teamwork in design education in distance education. The study is conducted, based on the five-week studio project titled "Sustainable Design Solutions for Rethinking and Reusing Waste Materials to Extend Product Life Span in Collaboration with Aslİteks" in the third-year industrial design studio course, Spring 2020-21 semester (see Appendix Q). There were seventy-three students, and eighteen teams took part in the project. One team had five members, and the others were four-member teams. Throughout the project, weekly meetings were conducted with all the teams to get students' thoughts, practices, attitudes, behaviors, and constraints within the context of distance education. Four weekly meetings were conducted, and these meetings and observation notes were recorded in the form of reports (see Appendix P).

Throughout the project, as the researcher and educator, I suggested the student teams adopt the shared leadership process and task management tables to support their teamwork experiences. They constantly used the Miro board for their design process; therefore, I also showed the potential features of this online platform for task and time management. Some teams made tables on the Miro boards and personalized their online working space, and used different strategies to follow and plan the related tasks for enabling the teamwork process. The screenshots of the tables created by the teams that followed the suggestions and used Miro for task management were recorded.

CHAPTER 4

STAGE I: UNDERSTANDING ONLINE TOOL USAGE AND TEAMWORK EXPERIENCES

This first stage of the research examines the experiences of industrial design students regarding the use of online tools and teamwork practices during their design projects conducted in a design studio course setting. The particular aim of this study is to get students' thoughts, habits, needs, constraints, and desires via understanding their experiences. Through this study, the emerging problem areas for the use of online tools in teamwork practices are explored. In addition, the experiences and thoughts of the new generation are considered in order to understand students and their needs more clearly.

Considering the aim of this stage of the research, surveys and semi-structured interviews have been conducted for an in-depth understanding of the students' thoughts, experiences, needs, and desires about the use of online tools and teamwork strategies in their learning process.

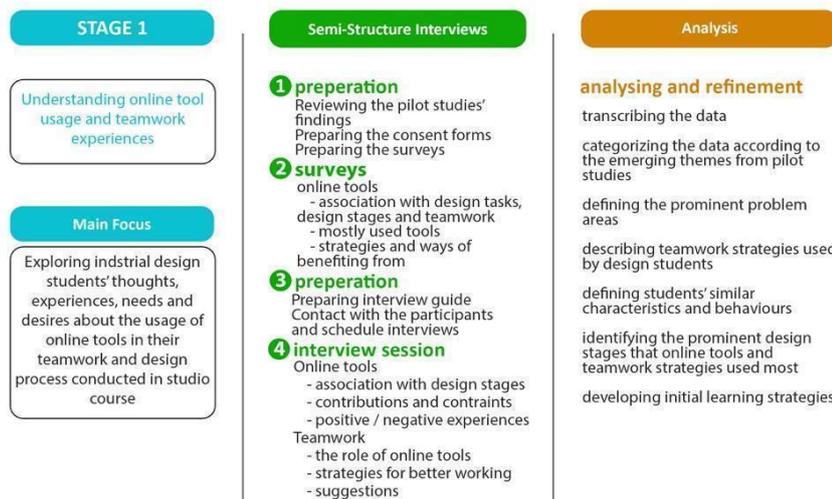


Figure 4.1 Phases of the Research Stage I

Figure 4.1 presents the phases of the stage and expected outcomes from this study. With the aim of understanding industrial design students use online tools during their design process and teamwork, two sets of surveys and semi-structured interviews have been conducted with the third-year students. The surveys help the researcher discover the general perception and use practices of online tools among industrial design students. The interviews, on the other hand, provide more in-depth information regarding those perceptions and practices. The findings of both of these researches support and complement each other.

Table 4.1 Participants of the Research Stage I

| <i>Team</i> | <i>Participant</i> | <i>Survey I</i> | <i>Survey II</i> | <i>Interview</i> |
|---------------|-------------------------|-----------------|------------------|------------------|
| Team 1 | Team 1 _ Participant 01 | | X | |
| | Team 1 _ Participant 02 | X | | |
| | Team 1 _ Participant 03 | | | |
| | Team 1 _ Participant 04 | | X | |
| Team 2 | Team 2 _ Participant 01 | X | | X |
| | Team 2 _ Participant 02 | X | X | X |
| | Team 2 _ Participant 03 | | | X |
| Team 3 | Team 3 _ Participant 01 | | X | |
| | Team 3 _ Participant 02 | X | X | |
| | Team 3 _ Participant 02 | | | |
| Team 4 | Team 4 _ Participant 01 | X | | X |
| | Team 4 _ Participant 02 | X | | X |
| | Team 4 _ Participant 03 | X | | X |
| Team 5 | Team 5 _ Participant 01 | X | X | X |
| | Team 5 _ Participant 02 | | | X |
| | Team 5 _ Participant 03 | X | X | X |
| Team 6 | Team 6 _ Participant 01 | X | X | |
| | Team 6 _ Participant 02 | | | |
| | Team 6 _ Participant 03 | X | | |
| | Team 6 _ Participant 04 | X | | |
| Team 7 | Team 7 _ Participant 01 | | | X |
| | Team 7 _ Participant 02 | | | X |
| | Team 7 _ Participant 03 | | | X |
| Team 8 | Team 8 _ Participant 01 | X | | X |
| | Team 8 _ Participant 02 | X | X | X |
| | Team 8 _ Participant 03 | X | | X |

The purpose of the survey is to discover the general tendency among third-year industrial design students towards using online tools in relation to teamwork, to identify the frequently used tools during which design stages and to understand how well these tools satisfy the needs of the students. 26 students and 8 teams have taken part in the project. 3 of them did not attend any of the research phases. 15 students have filled out the first survey, 9 students filled out the second survey and 15 students in 5 teams have been interviewed while the studio course continued. Table 4.1 shows the participants of the research.

4.1 Surveys

First, a pilot survey was conducted with 4 participants from the fourth-year industrial design students in order to test the effectiveness and appropriateness of the questions, and also the timing of the survey was checked. After revising the survey in line with this feedback, I distributed the survey to all third-year students, 26 students. To understand which stage of the design process require online tool use, the first survey was distributed after the design research stage ended. Table 4.2 shows the tasks third-year students completed by that time. Each stage of the process was divided into different tasks according to the project brief and project calendar provided in the studio course, to examine the experiences of the students. In total 15 students responded to the survey, 14 students filled out the hard copy version, and only 1 student filled out the online version.

Table 4.2 The List of the Tasks Used in the First Survey

Survey I / Task List

| | |
|--|---|
| <i>Literature Search</i> | <ul style="list-style-type: none"> - Developing a general understanding of the project - Acquiring technical information (how it works, material, energy consumption, and conservation) - Getting users' feedback (recall cases, safety issues, diverse user groups (elderly, children, etc.)) - Looking for user reviews including experiences and comments - Visiting stores, repair shops, and making observations at stores and shops - Searching for academic journals and topic related electronic sources - Preparing presentation boards |
| <i>User Observations via EC Guide</i> | <ul style="list-style-type: none"> - Understanding the practices, experiences, and characteristics of the target user group - Taking pictures - Recording videos - Taking notes - Sharing and archiving data - Preparing presentation boards |
| <i>Teamwork</i> | <ul style="list-style-type: none"> - Communication - Sharing information - Archiving data - Task management - Simultaneous working/collaboration on the same document and/or file |

To get more responses from the students, an online survey was prepared for the second survey. Before it was sent to students, a pilot study was conducted with one third-year student and in line with the feedback, the online survey was revised. The tutor of the studio course sent an email to the students to remind them to fill in the survey. Meanwhile, the online version of the first survey was prepared to get answers from the students who did not respond. It was also sent to the students via email by the studio tutor. However, only one student completed the online versions. It was very surprising and worrying to have this low participation; because that year of students had quite a positive and constructive approach, so as design educators we were expecting more effective participation. To increase that, again hard copy version of the second survey was prepared and distributed to third-year students during the studio course hours. However, again the rate of answering students was also very low. Only 8 students completed the survey.

Table 4.3 The List of the Tasks Used in the Second Survey

Survey II / Task List

| | |
|-----------------------------------|--|
| Biomimicry Sketch Analysis | <ul style="list-style-type: none"> - Biomimicry sketch analysis (BSA) Part I (individual submission) <ul style="list-style-type: none"> - Documenting observation and exploring process, - Finding inspiration from the internet - Preparing the board - Biomimicry sketch analysis (BSA) Part II <ul style="list-style-type: none"> - Compiling diverse inspirations - Working. With teammates (decision making, task management, communication, etc.) - Preparing biomimicry sketch analyses |
| Scenario Building | <ul style="list-style-type: none"> - Step 1 Scenario Building (individual work) <ul style="list-style-type: none"> - Teamwork for making a selection - Understanding the themes (the shared home/dorm/office space and the personas in detail) - Developing scenario - Preparing presentation boards - Step 2 Transformation scenario (individual work) - Step 3 Bodystorming (Teamwork) - Step 4 Evaluate/Reflect on/Sketch out |
| Preliminary Jury | <ul style="list-style-type: none"> - Understanding the requirements of the pre-jury - Working with team (communication and division of labor) - Finalizing the ideas for pre-jury (making decisions in team) - Preparing presentation boards - Getting ready for oral presentation - Making 3D presentation models |

The second survey was distributed after the pre-jury. Table 4.3 shows the main tasks from the design stages in the second survey. The second survey started after the process of the first survey ended. So that each stage of the design process was examined separately. Due to this low rate of participation and in order not to overwhelm students, the planned surveys were canceled and the semi-structured interviews which allowed the participants more freedom while sharing their experiences were conducted. The initial plan was to conduct one or two more surveys covering all the incomplete stages up to the final jury, which was replaced by the interviews that examined the whole process in detail.

4.2 Interviews

All student teams were contacted via email and asked for the appropriate time to schedule an interview for the research. However, this means of contacting the students did not work effectively. The students did not reply to their emails. Therefore, during their studio course, I went to the studio and tried to schedule the interviews face-to-face. Special attention was paid to including all the members of the teams. Before the scheduled time, a message was sent to the students to remind them that there will be an interview session the next day. Despite all this effort, some problems were encountered in the scheduled interviews.

Table 4.4 The interview Guide of the Research Stage I

| <i>Interview Stages</i> | Themes | Questions |
|-------------------------|--|--|
| <i>Entry</i> | An introductory question | How would you describe studio course and design projects this semester? |
| <i>Process</i> | Review of the stages of the design process | How would you define the stages of the design process of the project? How would you use online tools during these stages? Which are they? |
| | Teamwork | <ul style="list-style-type: none"> - What do you think about teamwork? - How would you describe your teamwork throughout the design process and the contribution of online tools?) - How did you organize in-group communication/task management/sharing and archiving? - Did you experience working on the same document simultaneously? - What are the difficulties in working in a team? |
| | The role of online tools | What are the contributions of using online tools to your teamwork throughout the design process? Could you explain their advantages and limitations in more detail? |
| <i>Conclusion</i> | Finishing question (suggestions and other added) | What are your recommendations to make the education process more productive and effective? |

The interview guide was developed before the interviews were conducted, and Table 4.4 shows the details and steps of the interview guide that included three parts. The first part was entry, and a few questions were asked to make the students in order to make students feel relaxed and support them to talk. In the second part of the interviews, the questions focusing on teamwork, the use of online tools and the stages of the design process were discussed in detail. At the end of the interviews, a final question was posed to get students' suggestions and recommendations about the use of online tools in teamwork and design education.

Table 4.5 The List of the Tasks Used in the Interviews

| <i>Interview / Task List</i> | |
|---|---|
| <i>Design Research</i> | - Design Research / Literature Search - Design Research / EC Guide |
| <i>Idea Generation</i> | - Ideation/BSA (Design Workshop On Biomimicry Sketch Analysis (BSA))(Idea Generation And Sketching Session) - Ideation/Design Transformation (Scenario Building and Lo-Fi Prototyping) |
| <i>Idea Development</i> | - Design Development/Refining, Compiling, And Lo-Fi Prototyping - Pre-Jury - Design Detailing/User Interface/User Experience (User Interface and Adobe XD Workshop) |
| <i>Design Detailing</i> | - Design Detailing/Concept Prototyping (Introduction of Concept Prototyping For User Testing) - Design Detailing/2d-3d Modeling (Video Presentation) |
| <i>Finalizing</i> | - Presenting Your Design /2d- 3d Modeling |

In this semester, the students have mainly worked in teams in the third-year studio course. In order to get more information from the students about their teamwork experiences and design process, group interviews were conducted. There were 8 teams in the studio course, in total, 5 of them participated in the interviews (Table 4.1). The duration of the interviews was about one hour, and all the interviews were

recorded with the consent of the participants. However, 2 interviews could not be transcribed due to technical problems during recording. Conducting the interviews throughout the project helped the students recall their experiences easily. However, due to the time limitation, including final juries and exams, it had some problems scheduling a meeting time with the other three teams.

Throughout the interviews, all the stages of the project (Table 4.5) were discussed separately to understand the different use of the online tools. Throughout the group interviews, the students were reminded of their experiences with each other, especially related to the first stages of the design process. They also explained their individual experiences with the use of online tools in their works and design process. In addition, while explaining their thoughts, they gave examples from teamwork studio projects from the previous terms. This variety provides rich and comprehensive data. Three of the interviews were transcribed using F5 Transcription Pro software.

4.3 Analysis

All the answers from both surveys were listed in an excel document. Each participant was labeled with a specific color. That participant's responses are marked with the same color in the whole document (Figure 4.2).

| Part I: Literature Search / Answers | | | | | | | | |
|---|---|---|---------------------|----------------|----------------------|--------------------|----------------------|----------------|
| Tasks in relation to main research activities and tasks | Online Tool | HOW: specifically for what topic and/or purpose? | Satisfaction | | | | | |
| | | | Extremely effective | Very effective | Moderately effective | Slightly effective | Not effective at all | |
| Developing general understanding of the project | Google | For looking at the terms that describing in project | | 1 | | | | Participant 1 |
| | Youtube | Looking for the similar and essential ideas | | | 1 | | | |
| | Wikipedia | Searching the terms and their descriptions | | 1 | | | | |
| | Oduclass | Looking for requirements of project | | 1 | | | | |
| | Whatsapp | | | 1 | | | | Participant 2 |
| | Google | | | 1 | | | | |
| | Oduclass | | | | 1 | | | |
| | Google | Searching | | | | 1 | | Participant 3 |
| | Oduclass | Understanding the project | | 1 | | | | |
| | Oduclass | Understanding of design brief | | | 1 | | | Participant 4 |
| | Google | Searching unknown terms | | 1 | | | | |
| | Pinterest | Awaring of concepts, market | | | 1 | | | |
| | Google Drive | Reaching all information in one file | | 1 | | | | |
| | OduClass | Looking for the brief | | 1 | | | | Participant 5 |
| | Pinterest | looking for keywords | | | | 1 | | |
| | Google | Looking for keywords | | 1 | | | | |
| | Youtube | processleri incelemek için | | | 1 | | | Participant 6 |
| | WhatsApp | resimleri online'da birbirimizle paylaşmak için | | | 1 | | | |
| | Wikipedia | araştırma için | | | | | | |
| | Youtube | to get information | | 1 | | | | Participant 7 |
| | Google | to get information | | 1 | | | | |
| | Microsoft Teams | to combine , write our sentences | | 1 | | | | |
| | Grammarly | to check our sentences | | 1 | | | | Participant 8 |
| | Youtube | Details with examples | | | 1 | | | |
| | Wikipedia | more technical details | | 1 | | | | Participant 9 |
| | Oduclass | proje tanımını okumak | | 1 | | | | |
| | Google | anahtar kelimeleri araştırmak | | | | 1 | | Participant 10 |
| | Oduclass | learning what should I do | | | 1 | | | |
| WhatsApp | asking classmates | | | | 1 | | | |
| Oduclass | proje brieflerini anlamak | | 1 | | | | Participant 11 | |
| Google | konu hakkında araştırmaklar için | | 1 | | | | | |
| Google Docs & Drive | bilgilerimizi takımca online ortak bir yerde birleştirmek | | | 1 | | | | |
| Microsoft Teams | bilgilerimizi bir araya getirmek | | | 1 | | | | |

Figure 4.2 Screenshot from the Answers Excel Sheet

All the answers were listed with the color coding and according to the tasks. They were categorized in terms of the online tools (Figure 4.3). Each online tool was also marked with a color. When the document is reviewed, it is easier to see which tool is used most. This categorization shows us which online tools were used mostly in that related tasks, how the students benefited from this tool, and how they evaluated this experience. In addition, color coding for each participant provides us to make a comparison. It becomes easier to check the participants' answers for each online tool and for each task.

| Part I: Literature Search _Analysis | | | Satisfaction | | | | | |
|---|---|--|---------------------|----------------|----------------------|--------------------|----------------------|--|
| Tasks in relation to main research activities and tasks | Online Tool | HOW: specifically for what topic and/or purpose? | Extremely effective | Very effective | Moderately effective | Slightly effective | Not effective at all | |
| | | | | | | | | |
| Developing general understanding of the project | Google | For looking at the terms that describing in project | | 1 | | | | 10 kişi google i konu ile ilgili araştırma yapmak ve proje ile ilgili kelimeleri araştırmak için kullanıyor |
| | | Searching | | | 1 | | | |
| | | Searching unknown terms | 1 | | | | | |
| | | Looking for keywords to get information | 1 | | | | | |
| | | araştırma kelimeleri araştırmak | 1 | | 1 | | | |
| | | projenin araştırma kelimelerinin anlamalarını ve kullanımı anlamak | 1 | | | | | |
| | Oduklclass | konu hakkında araştırmak için | 1 | | | | | Süreç boyunca Oduklclass'tan pek bahsetmeseler de, proje başında projeyi anlamak için brief i okuduklarını ve bunun için de online platformu tercih ettiklerini söylebilir |
| | | Looking for requirements of project | | 1 | | | | |
| | | proje başlangıcında daha iyi anlamak için brief i sürekli okumak ve devamında da önceki adımların öğrenen görmek | | 1 | | | | |
| | | learning what should i do | | 1 | | | | |
| | | proje tanımını anlamak | | 1 | | | | |
| | | Understanding the project | | 1 | | | | |
| | Youtube | Learning what should i do | | 1 | | | | |
| | | proje başlangıcında daha iyi anlamak için video destekleri | | | | 1 | | |
| | | Looking for the similar and essential ideas | | | 1 | | | |
| | | Details with examples to get information | 1 | | | | | |
| | Pinterest | processleri incelemek için | | | 1 | | | |
| | | Awareing of concepts, market | | | 1 | | | |
| | Whatsapp | looking for keywords | | 1 | | | | |
| | | asking classmates | | | 1 | | | |
| Wikipedia | resimleri online'da birbirimizle paylaşmak için | | | 1 | | | | |
| | araştırma için | | | | | | | |
| | more technical details | | | 1 | | | | |
| | genel bilgi arşını için kullanılmak | | | | 1 | | | |
| | | Searching the terms and their descriptions | | 1 | | | | |

Figure 4.3 Screenshot from the Analysis Excel Sheet

All interviews were transcribed, and the data was analyzed through thematic analysis. At this stage, the results and themes of the surveys contributed to the analysis of the interview results. Different lists were created according to the statements that came out of the interview, both according to the tools used and for what purpose they were used, and these results were compared with the survey results and arranged in a way that supports each other. The next section describes the detailed results of the surveys and interviews.

4.4 Results

In all the tasks discussed in Survey 1 and 2, students' online tool choices and how to use those tools will be summarized. Finally, the general and detailed comments of the teams in the interviews will be evaluated

4.4.1 Survey I

In studio projects, the process begins with the research phase. In the research phase, literature research and user research are carried out. For literature research, sub-titles related to the project subject are determined as much as the number of student teams and a subject title is assigned to each team. In user research, students are requested to find potential users on the subject and have one-on-one interviews with them. In this process, the method to be followed by the students can be given by the studio team. In this project, the students used the EC guide method and conducted user interviews during design research stages. The results of these two stages were presented to the whole class in a one-on-one presentation and the results were shared. At the stages of these processes, which online tools the students used and how they benefited from these tools will be explained in detail.

Literature Search

Developing a general understanding of the project

Before starting the literature research, it is seen that the teams made general research on the subject in order to understand and assimilate the project brief. For this, *Google* is mostly preferred. It is stated that the title of the subject and the keywords related to the subject are searched and researched on Google. In addition, the project brief and other documents shared by the studio team are other documents that students apply to understand the project, and they can access these documents from *ODTÜClass*. Apart from this, *YouTube*, *Wikipedia* and *Pinterest* are other sources referenced at this stage. Another tool is *WhatsApp*, the communication tool they use most. They exchange information by asking their friends about the parts they do not understand on WhatsApp.

Acquiring technical information (how it works, material, energy consumption, and conservation)

One of the literature topics, product reviews and technical details including how it works, how it is mounted, and material information is the most frequently consulted place for *Google*. In *Google*, students use it to get general information on the subject and to find different sources for detailed information. At this stage, another tool used as much as *Google* is *YouTube*. They stated that they could get more detailed information about the products by watching the videos in which the technical details of the products are explained, the parts of the products are explained in detail, or the users evaluate their usage in detail. Apart from that, *Wikipedia* and *Pinterest* are other platforms used for general information and visual research.

Getting users' feedback (recall cases, safety issues, diverse user groups (elderly, children, etc.))

User comments are another topic that is examined while doing research. At this research stage, *Google* is the tool that comes out the most. Students used *Google* as a gateway to access user reviews and browsed *Blogs* where relevant comments could be found. *YouTube*, another tool used, has been examined, especially the videos where users review products and share their experiences. Apart from that, students looked at product reviews on major shopping sites (such as *AliExpress*, *Gittigidiyor*, etc.) while researching user feedback. In this period when online shopping increases, people give importance to product reviews and share their opinions when shopping for products. This can turn into a good feedback point for designers.

Looking for user reviews including experiences and comments

Very similar to user experience research, students use *Google* and *YouTube* very often. *Blogs*, videos and pages where users share their product usage experiences are reviewed. Negative experiences on sites such as *Şikayetimvar*, user reviews or

complaints under similar products are investigated. Unlike these, an online survey tool such as Google Forms can be used to reach users and get one-on-one experience.

Visiting stores, repair shops, and making observations at stores and shops

Students who want to go to stores or shops search the shops they can go to via *Google*. They learn how to go to those places with the help of *Google Map*. In addition to the physical visit, the online pages of the stores are searched and examined on Google. Similarly, videos of users who went to those stores and shot videos are watched on *YouTube*. While Instagram and Pinterest are used for a similar purpose, students who prefer physical visits share their knowledge with each other via WhatsApp.

Searching for academic journals and topic related electronic sources

Tools used by students to access scientific articles are *Google*, *Google Scholar* and *METULibrary*. Although they are not very knowledgeable about scientific research methods, it is a good step for them to use resources such as Google Scholar and METULibrary. Another tool they use at this stage is TedTalks. They listen to seminars and conferences on the subject. It is seen that the new generation is increasingly inclined towards visual and audio sources.

Preparing presentation boards

Before transferring this whole research phase to the presentation, the students stated that they examined the sample templates on Pinterest. In the preparation process, WhatsApp, Google Drive and One Drive come to the fore for sharing within the team. In addition, Google Images is preferred for the images needed while preparing the presentation sheet. One student stated that he watched a TedTalks talk to learn how to present more effectively. At this stage, although the students do not use an

online tool to prepare the presentation sheet, it is seen that different tools are preferred for the auxiliary stages of the process.

User Observations via EC Guide

Understanding the practices, experiences, and characteristics of the target user group

Before starting the user research, the students prefer to gain general knowledge about the user group. For this, they mostly use *Google* and *YouTube*. They get general information about users and read reviews about user experiences and watch related videos. Also, a few students prefer to use *Instagram* to understand the users. *WhatsApp* was preferred to reach and communicate with the potential participants to arrange a time slot for the user research.

Taking pictures

During the user research, team members were advised to take photographs of the stages they found important, to record the whole process if possible, and to ask questions and write down the answers. It was asked if there was an online tool that helped the students during the photo-taking phase. At this stage, they stated that they prefer applications called *Instagram* or *Huji* when they want to apply filters while taking photos. Apart from that, they said they used *WhatsApp* to share photos with their teammates instantly.

Recording videos

For video recording, students generally use their phone's camera, while some of them recorded the video via *Vimeo* or edited the video via this application. *WhatsApp* or *YouTube* was used to share the video with each other.

Taking notes

OneNote was used to take individual or simultaneous notes during the user research phase. Individual notes were then shared within the team via OneNote or *WhatsApp*. If the size of the file to be shared is large, *Gmail* or *Google Drive* is preferred. Being able to do the note-taking phase simultaneously can provide a great advantage for teamwork. All team members can contribute, and it is accessible to all.

Sharing and archiving data

The most common answer at this stage is *Google Drive*. Google Drive is preferred to share the obtained information within the team, archive and analyze the data. Other tools used for sharing information are *Gmail* and *WhatsApp*. In particular, the frequent use of WhatsApp and the fact that it can be accessed from both the phone and the computer encourages the students to use it, even the quality of the image while sharing is reduced.

Preparing presentation boards

Teams use non-online Adobe programs to translate research results into presentations. However, at this stage, the images and texts prepared to support the presentation are shared with the team via *Google Drive* or *WhatsApp*. At this stage, when they need extra research, they can look at Google and YouTube. Completed presentation sheets are generally shared with each other via *Gmail*, so that it is easy to access the file when printing for the presentation.

Teamwork

Communication

WhatsApp is the most common communication tool encountered in teamwork. The widespread use of *WhatsApp* and its ability to set up groups provide an ideal environment for team communication. However, in cases where written communication is not sufficient, the teams state that they have a group video call over *Skype*. Another application used like *Skype* is *Discord*. Apart from this, students often have the opportunity to communicate face-to-face during studio hours and when they are together at school.

Sharing information

Google Drive seems to be the most used tool for team file sharing; especially for transferring large files. But *WhatsApp* is also used for small size, text-based files and fast transfer. Another platform used for small files is *mail*. While *Mail* and *WhatsApp* can be fast and effective tools for instant sharing, *Drive* is more long-term, permanent and archival. When used regularly throughout the process, access to information at any stage of the process becomes easy.

Archiving data

It is seen that students use *Google Drive* more for long-term storage. *Dropbox*, which used to be very popular and used a lot, is little heard of this generation. In general, most of the students seem to have *Gmail* and are therefore more inclined to use *Drive*. They state that they use *WhatsApp* to archive files that they consider unimportant.

Task management

It was observed that the teams did not use a special tool for task management, which is an important part of a teamwork process. They stated that they are doing task division and planning over *WhatsApp*. It is seen that they use *Skype* when they want

to do the task division part face to face. Although a team attempted to use Slack, this usage process did not last long and people in the team forgot to use it.

Simultaneous working/collaboration on the same document and/or file

Teams, who spend their simultaneous working processes generally working side by side physically, do not have a clear method they use when they work remotely. While some teams are aware of each other by giving written information on *WhatsApp*, some prefer to talk simultaneously on *Skype*. Applications that allow simultaneous work such as *OneNote*, *One Drive*, and *Google Docs* were specified only by two teams.

4.4.2 Survey II

Until the second survey was conducted, the students passed three basic stages in the process. They applied the biomimicry sketch analysis method, which was the first step in the initial idea development phase. At this stage, they made discoveries by taking a nature walk accompanied by an expert, and they made sketches and analyzed inspirational sources from nature they found. In the next stage, they first developed their individual scenarios, then brought them together as a team and enacted their scenarios by body-storming. At the last stage, preparations were made for the preliminary jury. Presentation sheets and 3D models were prepared for the presentation. Since the survey participation is very low compared to the first survey, the answers will not be as inclusive as the first survey. In addition, it is seen that the motivation of the participants decreases towards the end of the survey and their response rates decrease.

Biomimicry Sketch Analysis

Biomimicry Sketch Analysis (BSA) Part I (individual submission)

- Documenting observation and exploring process,

At this stage, a site called *Asknature.com* was recommended for students to do research and get more information. That's why this site is among the answers. Apart from that, the students also did research on *Google* to get more information about this stage. They preferred *Google Drive* to archive the photos taken during the trip, and *WhatsApp* to share the photos and notes with their teammates.

- Finding inspiration from the internet

For the sketching activity, students were asked to select a sample in accordance with the biomimicry rules. At this stage, students were able to benefit from their trips and internet resources. They stated that they mostly use *Asknature* and *Google* on the Internet. It is seen that *Pinterest* and *YouTube* are the other platforms they use to find examples and get inspiration.

- Preparing the board

It is seen that they do not benefit from different platforms very much at this stage, where they make sketches on the examples they find individually. Some students stated that they examined the images of the samples they found to help their drawings. For this, the images were searched on *Google*. It is seen that they use *WhatsApp*, *E-mail*, or *Google Drive* to transfer their notes and photos from their phones to their computers.

Biomimicry Sketch Analysis (BSA) Part II

- Compiling diverse inspirations,

During the teamwork process, which is the second stage of the assignment, team members preferred *Gmail* and *WhatsApp* to share what they did with each other.

Google was used to do more research on the sketches they put together. *Google Docs* was also used to work together, and everyone wrote their comments.

- ***Working with teammates (decision making, task management, communication, etc.)***

Team members state that while working together at this stage, they use *Google Drive* to share information and photos with each other. *WhatsApp* is also preferred for fast sharing. *WhatsApp* is also the platform where team communication and decisions are made. At this stage, the points that come to mind are searched again on *Google*.

- ***Preparing biomimicry sketch analyses***

While preparing the presentation poster, *Google* is used when they need to do research, *Gmail* is used when they want to share something, and *WhatsApp* is used for communication.

Scenario Building

Step 1 Scenario Building (individual work)

During the scenario development phase, the students first developed their individual scenarios and then came together to form the team scenario.

- ***Understanding the themes (the shared home/dorm/office space and the personas in detail)***

It is seen that the students do a literature search before starting the individual study. *Google* is preferred for this general research, and *Pinterest* is preferred for media and visual research. *YouTube* is used to examine the behavior of the user group and its relationship to the environment.

- ***Developing scenario***

One student says she looks at examples on *Pinterest* to understand how the scenario development process works, while another student says she searches *Google* for

scenario frames, they get ideas for their own scenarios by examining examples. They are preparing for their own work by examining more examples on Google. It seems that *Google Drive* is used to store their work.

- ***Preparing presentation boards***

Very similar to the other stages, while *Google* is preferred to do research or find images while preparing a presentation, and *Google Drive* is preferred to store their work. Grammarly is used to control the texts in the assignment and *ODTÜClass* is used for the assignment submission.

Step 2 Transformation scenario (Teamwork)

As with other teamwork steps, *Google Drive* is used to share individual work with each other, and *WhatsApp* is used for team communication.

Step 3 Bodystorming (Teamwork)

WhatsApp was used when communication within the team was required, a search was conducted on *Google* for their questions about the step they are conducting, and the relevant documents were shared with each other via *Google Drive*.

Step 4 Evaluate/Reflect on/Sketch out (individual work)

It is seen that students examine similar examples before starting individual assignments, and *Pinterest* was preferred for this. They used the way of *e-mailing* themselves to archive their work files. At this stage, they shared their work files with their friends and communicated via *WhatsApp* to get feedback from their friends.

Preliminary Jury

Understanding the requirements of the pre-jury

Students state that before they start preparing for the pre-jury, they review the pre-jury brief on *ODTÜClass* and try to understand what is expected of them at this stage.

Working within a team (communication and division of labor)

As in other steps made by the team, *WhatsApp* is used for communication within the team and *Google Drive* is used for file sharing at this stage. Nothing specific has been specified for the task division and some of the conversations made over *WhatsApp* may be the content of this division.

Finalizing the ideas for pre-jury (making decisions in a team)

Teams generally preferred to do this stage face to face. However, when they needed it remotely, *WhatsApp* was used for communication and *Google Drive* for sharing.

Preparing presentation boards

While preparing the presentation poster, it is seen that they searched on *Google* to find the supporting elements (such as images and human figures) for the poster. It is stated that similar examples were reviewed on *Pinterest* for inspiration about poster layout and design. In this preparation phase, *WhatsApp* was used to communicate within the team and share the relevant elements.

Getting ready for oral presentation

It is seen that the students do not pay much importance to oral presentation, and they do not make a special study for it. *Grammarly* was used only for the control of the texts.

Making 3D presentation models

There was a little misunderstanding with the students about 3D model-making process. When referring to the physical model-making process, the students perceived the 3D modeling phase in the computer environment. At this stage, they stated that they did research on *Google* and *YouTube* to improve themselves or to find solutions for places they could not do.

4.4.3 Survey Evaluation and Interviews

The survey results show that the online tools that the students use at different stages do not differ much. The most preferable tool for research on that process at all stages is Google. YouTube and Pinterest can be used for subjects where they can get better results than visual information during the research process. While students can get more detailed information about the technical details of a certain product or certain user behavior on YouTube, inspiring examples or similar posters and designs can be viewed on Pinterest. Another platform that students refer to in researching the product and, accordingly, user comments is shopping and complaint sites. Product comparisons and user reviews provide students with a wide range of markets.

Due to the fact that the project involves a teamwork process, the need to share the research that the team members have done, the tasks they have done, and the notes they have taken arises. The most used applications for this are WhatsApp, Google Drive and Mail. WhatsApp is preferred for fast and instant sharing, while Google Drive is used for larger files or longer sharing. If the sharing size is suitable for printing out or to save time, sharing is also done via email. Another important point within the team is communication. At this stage, it seems that WhatsApp is the most popular and widely used application for instant communication.

This information was reinforced with findings from the interviews with three teams at the end of the project process. These interviews were evaluated, and statements

were categorized in terms of the online tools used and what they were used for. As seen in Table 4.6, similar applications were mentioned with the surveys' results. At this stage, in order to get more detailed information from the students, the whole project process was reminded, all the tasks they completed were reviewed, and some online tools that it was thought they might have used were asked again.

Table 4.6 Online tools and their intended use in line with the interview results.

Online Tool Usage

| | |
|---|--|
| WhatsApp | - Communication - Sharing - Note taking - Task division - Time management - Team discussion |
| Google | - Drawing - Research - Technical Details |
| Google Docs – Google Sheets – Google Slides – Google Forms | - Synchronous working - Task division - Task management - User Research |
| Google Drive | - Archiving - Sharing |
| ODTÜClass | - Assignment submission - Course material sharing - in-class sharing |
| Pinterest | - Inspiration - Research - Technical details |
| Instagram | - Inspiration - Market research - Research - Sharing |
| One Note | - Notetaking - Synchronous working |
| Blogs | - Market research - User research |
| Dropbox | - Archiving - Sharing |
| Facebook | - Assignment submission - Research - User research |

WhatsApp

In teamwork, it is seen that the most preferred communication tool by the students is WhatsApp. The interviews offered the opportunity to get more detailed information from the students about the content of this communication. The results show that one of the communication issues of *task and time management* including meeting decisions, division of labor, and deadlines of the tasks are proceeding through WhatsApp (e.g., Team 5 & 7a). Another issue discussed via WhatsApp is about making design decisions. Although design decisions are usually made in face-to-face meetings, when they need to make a decision while working remotely, it is seen that this is also carried out over WhatsApp. *Sharing* is one of the most common uses of WhatsApp other than communication. Documents and images that need to be shared with each other within the team are shared via WhatsApp in order to be fast (e.g., Team 7b). Although they complain that the quality of the images sent from WhatsApp has decreased, they continue this habit in terms of being quick and practical.

When we come together in the studio, we divide the work. We write it down on paper, take a photo and share it on WhatsApp. (Team 5)

We actually post a list of things to do on WhatsApp. A distribution of work such as who gets this? (Team 7a)

Turning and carrying the computer is a problem, so even if we work side by side, we send a link from the WhatsApp web instead of turning on a screen. (Team 7b)

With the increasing use of smartphones, people have become accessible at any time thanks to programs such as WhatsApp. Messages sent at all hours of the day and the expectation of answers increased the expectations of people from each other. This situation may cause discomfort for some students. It seems that not returning to the messages sent on WhatsApp, especially in group work, when he wants to spare this time for other work or himself, may cause tensions within the team. Redefining this

boundary in teamwork is critical to maintaining balanced communication between team members.

For example, I get notifications on the phone sometimes. While talking, for example, someone stays behind. You don't see it at that time. You are not answering. Then you have a problem with that person. (Team 4)

Using a very common communication tool for business as well can cause some things to be overlooked. Messages that are left behind and waiting to be answered can create problems for others in a team. At the same time, some functions cannot be provided long-term in a communication tool that is used for many things simultaneously. On the one hand, when they discuss the design decisions on a platform where they share the division of labor, the segment related to the division of labor loses its importance and visibility as it will disappear into the messages. Of course, WhatsApp, which is used very frequently, will provide a great advantage for rapid communication in teamwork, but it is not the right platform for organizing and conducting team organization.

Google

When it comes to research, the first platform that the students use is Google. Especially in the first weeks of the project, during the research phase, it is seen that the main research place for literature topics is Google (e.g., Team 5). Physical library use is very rare. While the topics assigned to the teams are researched through Google in the literature search phase of the project, information about the target user is also obtained from Google in the user research. These research topics expand on topics such as inspiring examples, technical details, presentation examples, and user tests in the later stages of the project. One of its interesting uses is when students report that they use Google a lot while drawing. They stated that they found the thing they were going to draw from Google and opened it on the computer and looked at

it (e.g., Team 4). For this reason, it seems that even though it is mostly used in the research phase, Google is an important research tool that students include at every stage throughout the process.

80%, maybe 90% of the Literature Search was run through Google. (Team 5)

For example, when I draw a character, I usually write to Google, and open it. I draw by looking. (Team 4)

Google Drive

Google Drive is an alternative platform to WhatsApp in terms of sharing. Although it provides a great advantage for team members to create a common folder in teamwork in terms of being used simultaneously, it seems that it is not as practical as WhatsApp for students. While some teams never used it, others benefited throughout the teamwork process. The students who use Drive state that they prefer it especially for sharing large files. They share files that cannot be shared via WhatsApp or that they do not want to reduce in size, with their teammates via Drive (e.g., Team 5). The most important feature that Drive actually provides to students is the ability to quickly access a document and file they want by creating folders. Although the files sent via WhatsApp provide a quick interaction at that moment, they lose their accessibility in later stages because they are lost among the old messages (e.g., Team 7). However, when properly named and classified in folders in Drive, shared files will be accessible at any time. This will make the work of the teams easier in the long run.

We used Drive more because the file size is big stuff. Also, so that the image quality does not decrease. (Team 5)

Drive was like a place where we kept some more refined information. And when you send it from WhatsApp, there is no possibility of categorizing it under folders.

Photos are flying. (Team 7)

At the same time, another problem encountered in team projects is that students cannot access the team project files, especially while preparing their portfolios later on. Different stages of their projects can stay on the computer of different team members. That's why regular use of Google Drive and regular archiving of all stages makes the whole process visible and accessible to all team members.

Google Doc - Google Sheets - Google Slides - Google Forms

In fact, Google Drive not only offers storage space but also allows teams to work on different platforms simultaneously. It was seen that the students were not very aware of these features while providing a great advantage even for work done at different times from a distance. In teamwork, which is generally observed in studio education, team members try to complete their work at one computer. While the person using the computer does the actual work, the others can only make comments at that time. One of the biggest shortcomings here is that they have not succeeded in making a good division of labor, but they don't see being able to work at the same time as a deficiency, especially for the Adobe programs. Platforms, where they can work simultaneously, would save teams a lot of time. Even if they're not doing the final work like Team 5, they've saved a lot of time in a system where parts are divided into a poster layout and all team members can track it through Google Docs. All the parts can be copied into Google Docs and checked by all the members. Similarly, Team 7 used Google Slides for a presentation and divided the work and everyone prepared different parts of the presentation. They state that although they experienced some difficulties in working simultaneously, this process saved them a lot of time. One of the most important points in teamwork is to be able to create and maintain a balanced division of labor. The method of working on a single computer does not make this possible, but platforms that allow simultaneous work or can be used jointly relieve the burden of team members in teamwork.

We used Google Docs. We copied the photos there before. Looks like this photo will be next to this post. Then we ported it to Illustrator. (Team 5)

We used Google Slides while preparing the presentation. Actually, we did it side by side again. ... Because there, for example, when we add something new, the next slide always slides if there is another employee below. But still, I think it was a comfortable thing to work on at the same time. Because a little bit actually speeds things up. It's nice when you can work on three people at the same time, even if it drops in half. (Team 7)

In addition to being able to work simultaneously, another feature is that all team members can access these documents whenever they want. Organizing a Google Sheets file in the form of a to-do list, as Team 7 did, and always making it accessible to all team members makes the process more transparent and balanced. Such a division of labor will motivate and ensure that all team members are equally informed about the process.

What should we look at until the next critique? We made their list. We thought we'd assign a color to their back and change the color after they've done that. (Team 7)

ODTÜClass

ODTÜClass is an online platform where METU students can see the materials related to the courses they have taken, be informed about the announcements, view the homework descriptions, upload their assignments, and many other similar activities. Thanks to this platform, students can access the materials related to their courses whenever they want. When examined in terms of studio courses, the project briefs, which were previously distributed as hard copies on the first day of the project, can be lost in the project process, but thanks to ODTÜClass, it allows students to return and review them at any time (e.g., Team 4). In addition, they have the opportunity to access their past assignments via this platform where they submit

all their homework. In addition, studio teams can bring together the researches of all students within the scope of the studio course and share them with all students through ODTÜClass. This not only increases the value of the work done but also creates a resource that students can refer to whenever they need it. A single platform where they can access all relevant information about the courses provides great convenience to students and instructors.

It is very nice; because we come back a lot in brief from time to time. We came back to see what they wanted from us. We've already looked at the calendar a lot.

(Team 4)

Pinterest

Another research platform popular among design students is Pinterest. Although a group of students has prejudices about the use of Pinterest, students still use it very often for different purposes. For students who cannot distinguish between being inspired and doing the same, seeing similar works or examples appears to be negative. I think that these concerns will decrease when the students are clearly shown how similar examples can be analyzed and how that can help them while developing ideas. Apart from this, doing research on platforms such as Pinterest where design examples are common, expands their vision (e.g., Team 4). Pinterest provides more refined information compared to Google Images, where they can also get detailed information about product details and technical information (Team 5 & 7).

It is useful for keeping up with the world and keeping track of what people are doing. (Team 4)

Because I can see all kinds of images related to my interests and they direct me to their site to help me understand their material. (Team 5)

When you look at Google Images, everything comes up. Everything turns out, but on Pinterest, there are some more flavorful things that we are looking for. (Team 7)

Instagram

Although it is not a platform that students benefit from within the scope of the project, it is seen that it supports them from different perspectives. They can keep themselves updated on the design world by following successful designers and companies (e.g., Team 5). They state that they can save or share with their friends what they see on Instagram that interests them, even if it is not related to other project topics, thinking that it will be useful for them at another time (e.g., Team 7). It is seen that a popular online platform can feed students from different angles when used correctly.

I follow designers and companies such as Vestel on Instagram. (Team 5)

Sometimes when we come across something different on Instagram, we also share photos with each other. (Team 7)

Apart from the online platforms described in detail above, it was seen that there are other programs that students use very little or rarely. But these programs such as Facebook and Dropbox do not seem to have a special contribution to the studio project phase or teamwork. They state that the popularity of *Facebook* and *Dropbox* is decreasing, and students do not use them unless it is necessary. *OneNote*, which has recently become popular among students, is used very little among students, although it allows simultaneous work among a team.

In the surveys, it was tried to obtain which online platforms the students used during the project stages and how they benefited from these tools, and this information was supported by the interviews. It was seen that the project stages did not have much

distinctiveness in terms of the platforms they used. It is seen that students frequently use platforms such as WhatsApp, Google, and Google Drive throughout the process. Due to the fact that the project is based on teamwork, the necessity and contribution of online tools in matters such as communication between team members, division of labor, project organization, and collaboration comes to the fore.

4.5 Summary and Discussion

These findings successfully illustrate the importance of online tools for industrial design education. The results also help us identify the design stages and the tasks for which students use the online tools the most, and learn the commonly used online tools. In addition, the findings reveal how industrial design students manage teamwork and how they benefit from the online tools while working in a team. Both surveys and notetaking during the interviews highlight some emerging themes that are categorized and listed in Table 4.7.

Table 4.7 Emerging Themes From the Research Stage I

| <i>Emerging Themes</i> | Emerging Statements and Problem Areas |
|--------------------------------------|--|
| <i>The necessity of online tools</i> | <ul style="list-style-type: none"> - Common and easy accessibility of online tools and smart devices - Maintaining to work out of the studio hours - The necessity of documenting each stage - Online platform as an archive - Easy accessibility of digital copies of project's documents such as briefs |
| <i>Teamwork</i> | <ul style="list-style-type: none"> - The necessity of working in a team - A better division of labor in a team - Better communication skills - Possibility of working from different places - Ease of communication - Significance of effective communication for teamwork - Informing team members easily - Easy accessibility of people |
| <i>Design Stages</i> | <ul style="list-style-type: none"> - Use of online tools as a first choice to access a piece of information - Easily accessing the videos for good examples for the technical details - Easy accessing the visual materials for inspiration and used for the presentation boards - Online blogs for the user research - Videos for the product evaluation - Shopping sites for user researches and comparing the brands and different models - Archiving their works on same platform |

The emerging themes consist of three main titles which are *the necessity of online tools*, *teamwork* and *design stages*. Common and easy accessibility of online tools and smart devices increase the use of online tools in their education. Easy accessibility of documentation, sharing, communication and archiving make popular use of online tools among the students. Especially for teamwork, online tools provide many advantages such as easy communication and the possibility of working remotely on the same document. On the other hand, when we look at the stages of the design process, online tools are used in the research stage most. Blogs, shopping sites and video channels are new platforms for user and product reviews.

CHAPTER 5

STAGE II: EXPLORING STUDENTS' EXPERIENCES AND PRACTICES OF TEAMWORK WITHIN THE CONTEXT OF A DESIGN PROJECT

This stage of the research examines the stages of the design process of a design project conducted within the scope of the ID 301 Industrial Design III, design studio course through enabling participants who are industrial design students, to document all the details about their teamwork experiences, strategies and practices with the help of an online tool. It also aims to collect students' practices, attitudes, behaviors and constraints throughout a design project within the context of a studio course.

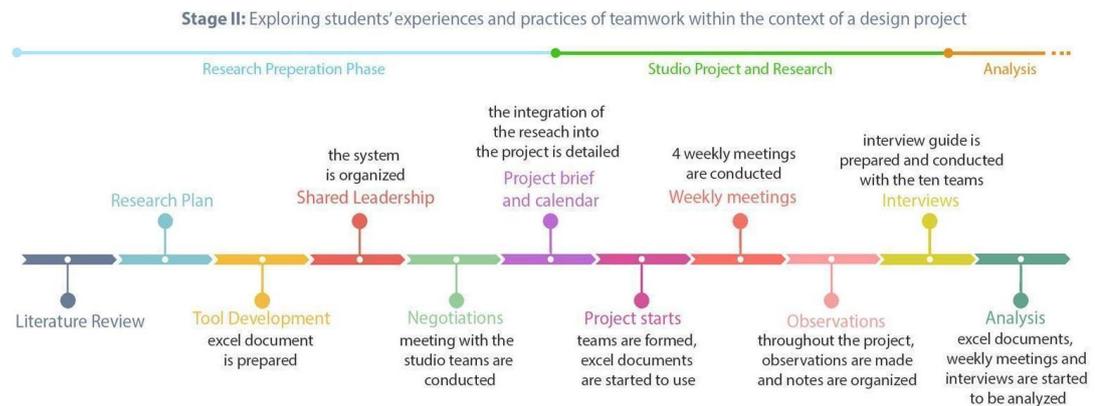


Figure 5.1 Phases of the Research Stage II

Considering the particular aim of this stage of the research, an online tool in Google Sheet file is prepared and recommended for the design students to have an in-depth understanding of the students' experiences and practices and for documenting all the stages of the teamwork and design process in detail.

The research is conducted based on the studio project titled “Healthy and Informed Eating: Engaging Sustainability Scenarios for Encouraging Children’s Healthy Eating Behavior in Collaboration with Meraklı Kedi and Nesibe Aydın Primary Schools” in the third year industrial design studio course, this semester (Fall 2019-20 semester). In order to manage this research, it is planned to be a part of a design project in order to encourage all the students’ participation. Considering the particular aim of this stage of the research, weekly meetings throughout the process and semi-structured interviews at the end of the project have been conducted with the teams for an in-depth understanding of the students’ thoughts, experiences, needs, and desires about the teamwork strategies in their learning process. In this process, an online tool via Google Sheets, is used to make the process more visible for both team members and the researcher; and to collect data. Weekly meetings helped the researcher to discover the general perception and teamwork experiences among the industrial design students and provided the opportunity to review closely the teamwork processes. The group interviews, on the other hand, provided more in-depth information regarding those perceptions and practices. The findings of both of these researches have supported and complemented each other.

The purpose of the weekly meetings is to discover the general tendency among the third-year industrial design students toward conducting teamwork, to identify the problems related to the teamwork during this process, and produce solutions to their problems, and identify new alternative working styles for a better teamwork experience. 40 students and 10 teams have taken part in the project at the beginning. After three weeks, one of the team had a serious problem involving personal issues, for this problem, one of the team members preferred to continue the project individually, and the others completed the process as a team of three students.

5.1 Preparation Process

Before the start of the semester, the teamwork processes were studied in detail. Specific tools and methods were identified, and necessary tools and documents were prepared. Before the classes started, the meetings with the studio team were conducted and they were informed about the research to be done during the first studio project and took their opinion. The researcher had the opportunity to follow the process of organizing the first project. Thus, the researcher was informed about the phases of the first project, the project calendar, and the expectation from the process. At this stage, the role of the researcher in the course was discussed and it was decided that it would be better for the researcher to take the role of consultant including observing the process and conducting regular meetings with the teams and informing the studio team if there is a problem that cannot be solved among the team members. Although the name of the researcher was mentioned as one of the research assistants of the first project, the researcher did not get involved in grading during the process of the project so as not to affect the credibility of the research data, to support the trust and transparency or open communication between with the researcher and the students. In addition, it was determined that the teams should not be graded from this process and it would be good to report on the working processes of the teams at the end of the project.

5.1.1 Online Tool Development

There are many online tools used to manage teamwork. Before deciding on the tool to be used within the scope of this research, popular examples of such tools were examined and common points were decided. The examples in the literature research were re-examined and the most used online tools (see Table 3) were considered. The findings were compared with the results of the research stage I. When deciding on which program could be used, the criteria of accessibility, ease of use and ease of

learning, and practicality became the key aspects. Accessibility is an important feature because each team member and also the researcher/consultant should be able to access this program very easily from their computer or their phone and be able to control the tool at any time. It was not considered a logical choice to make the students compulsory to use a paid application. Therefore, the most important criterion is that this application should be free and easy to access. It should take little time to learn how to use it because the studio course is very intensive in content. It is not possible for the students to spend time learning to use the program. This situation can also cause resistance from the students. Everyone experiences a different level of learning. Therefore, those who are forced or do not want to spend time can resist filling out the document. This makes the research process difficult. It is important to propose a tool that they are familiar with in terms of both encouraging participation and time effectiveness. Another point is that the ease of use of this program is important in a few ways. The first is that it does not take much time to learn for those who do not fully know the tool; second, not to spend a lot of time using it, the directions and interface should be very clear and simple, and lastly, when the process progresses, the time they spend for this tool will be important, so the students should perceive that they can do it very easily and quickly so that there is no loss of motivation in the later stages of the research.

All these important criteria indicated to us that the best tool can be excel. Google Sheets as one of the Google Drive apps is the most prominent tool in this regard for online communication. In the first phase of the research, the students stated that one of the most commonly used tools was Google Drive and G-mail. It is a very easy tool for them to access. So far, we can accept that students use Microsoft office programs; even if they did not use them, in the first year of the undergraduate programs, they become acquainted with the compulsory course named IS100 Introduction to Information Technologies and Applications. In addition, this familiarity shows that they can learn quickly and do not have any major problems while using it. On the other hand, Google introduced the online version of excel allowing users to work together which is very critical and important for teamwork.

Each member of the team could access the sheet easily and change anything they want. Also, for researchers, it is rather easy and quick to check the documents and analyze them due to the researcher's familiarity with and frequent use of the program. Examining examples show that Google Sheets is a prominent choice for the students to manage their work and/or task tracking. The points mentioned in the literature and common feature in the existing examples were taken into consideration in how to adapt this tool in industrial design education.

The Google Sheets consists of two sections. The first part is for the division of labor and task tracking; the second part is designed as a calendar to make it easier for the students to note down their meetings and to realize when submissions are. Some teams preferred to personalize the calendar and they used color-coding to indicate the online meeting, physical meeting and finished tasks separately. Moreover, some of the teams used the first-week calendar to specify their course schedule in order to arrange team meetings more practically, since the table showed when all the team members were available for meetings.

In the first part of the table, in order to make the division of labor more visible for both team members and the instructors, a field is created in which teams can list the tasks and mark who is responsible for these tasks. It is expected that the visibility of the work encourages the teams to make a division of labor and to distribute these tasks more equally. The table also provides the opportunity for the teams to specify the priority and status of the task. Team members can make comments on the related tasks and they can indicate the deadlines.

It indicates the importance and/or urgency of the relevant task.

It shows who is responsible for the relevant task and their names are marked under these section.

The tasks that are determined and distributed during the division of labor are noted under the relevant categories.

Students write the name of the leader responsible that period.

It shows when the task is started to done by the responsible person and when the deadline is.

It gives feedback on the status of the relevant task by the responsible team member. Not started
In progress
Completed

It shows the date that the leader has responsible of the process.

Each team members can write comments about the related task.

ID 301 2019-20 Fall / Project 1 / Team 1

PROJECT NAME: Healthy and Informed Eating: Engaging Sustainability Scenarios for Encouraging Children's Healthy Eating Behaviour

PROJECT LEADER: **Yasemin Çetlik**

TEAM NAME: Team 1

STARTING DATE: 03.10.2019

| No | Task Description | Assigned to | | | | Priority | Start | Due Date | Status | Comment |
|---|---|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|----------|----------|----------|-------------|--|
| 1 Scenario Building | | | | | | | | | | |
| 1.1 | creating two scenarios | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | High | 05.10.19 | 05.10.19 | completed | brain storming about new product ideas as a group |
| 1.2 | details for the first scenario | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | High | 05.10.19 | 05.10.19 | completed | detailing the scenario by thinking how the product should be used |
| 1.3 | details for the second scenario | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | High | 05.10.19 | 05.10.19 | completed | the scenario by thinking how the product should be used |
| 1.4 | storyboard 1 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Med | 05.10.19 | 07.10.19 | completed | composting process with using the tools is drawn |
| 1.5 | mock up 1 | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Med | 05.10.19 | 07.10.19 | completed | different tool mock-ups were made from cardboards |
| 1.6 | storyboard 2 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Med | 05.10.19 | 07.10.19 | completed | the important details about the card game, context and the players are shown |
| 1.7 | mock up 2 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Med | 05.10.19 | 07.10.19 | completed | game cards are developed by hand drawing |
| 1.8 | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | not started | |
| 2 Co-Design Workshop Preparation | | | | | | | | | | |
| 2.1 | finding new details and improvements to our scenarios | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | High | 07.10.19 | 10.10.19 | completed | |
| 2.2 | improving previous mock ups | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Med | 07.10.19 | 10.10.19 | completed | |
| 2.3 | preparing questions for the children | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Med | 07.10.19 | 10.10.19 | completed | |
| 2.4 | preparing paper materials for the activities | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Med | 07.10.19 | 10.10.19 | completed | |

Leader O1 | **Leader O2** | Leader O3 | Leader O4

Each leader has responsible from their own period and each of them has a separate page for it.

The high - low - med options specify the priority of the task. Three options are displayed when clicking the corresponding box and the determined situation is selected.

After the division of the tasks are listed under the task description section, whoever is responsible for the task is ticked by clicking on the box under her name.

The start and/or due date of the task is selected from the calendar that opens by clicking the related box.

Figure 5.2 Details of the Google Sheets I

It shows the days the leader is responsible for.

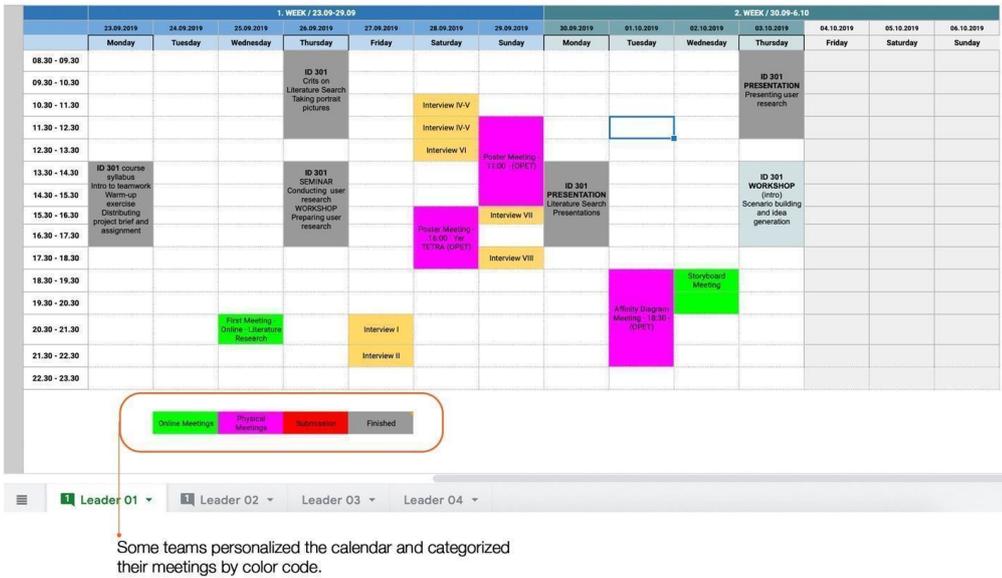
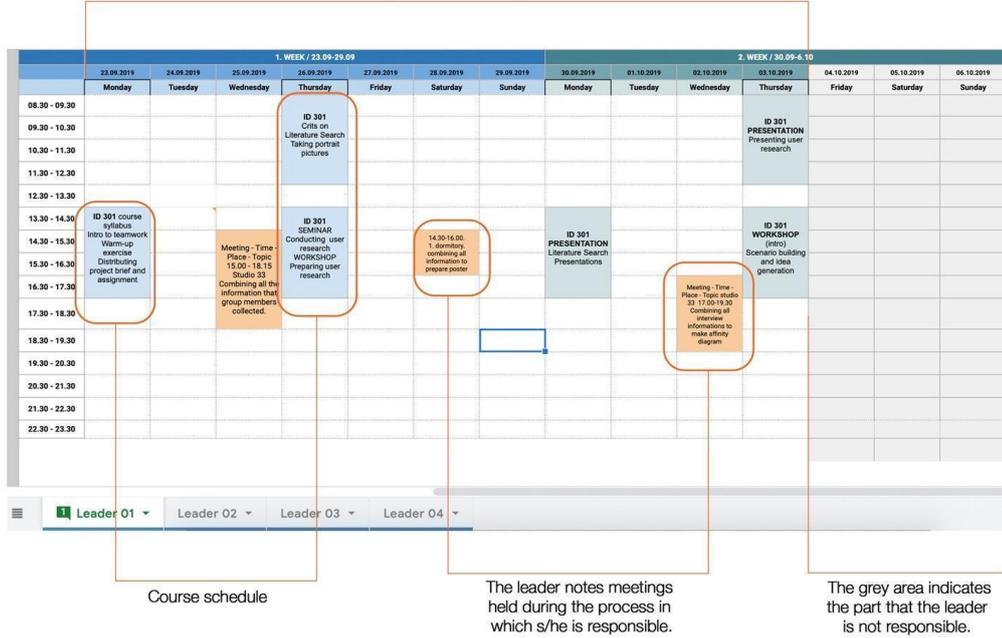


Figure 5.3 Details of the Google Sheets II

5.1.2 Shared Leadership

Students learn and experience best when they are actively involved in the process and work. In order to develop teamwork skills and effective teamwork experience, *shared leadership or rotating chair* is another critical point for effective teamwork as stated by Levin (2005). It is a critical learning outcome for the students to have this experience and take responsibility. Therefore, the process of the project is divided into four equally, so that each member of a team can select one project phase to lead the team experience in working together on shared and assigned tasks. Each leader is responsible for ten days. After the project started, the calendar was updated and the final jury date was changed, so the duration of the fourth leader’s responsibility increased by three more days.

Table 5.1 Shared Leadership Calendar

| | Dates | Topic | Leader |
|----------|------------------------|--|---------------|
| 1 | 23.09.2019 – 3.10.2019 | Literature search, User research and presentations | Leader 1 |
| 2 | 3.10.2019 – 14.10.2019 | Co-design workshops | Leader 2 |
| 3 | 14.10.2019– 24.10.2019 | Pre-jury and scheduled critiques | Leader 3 |
| 4 | 24.10.2019 – 7.11.2019 | Final screening and final jury | Leader 4 |

Each leader has a separate page in their team document. Each leader is responsible for filling their own Google Sheet document and updating it regularly. Other members have an opportunity to check the responsibilities and meetings from this document and make comments and give feedback about the status of the tasks.

On the first day of the design studio course, the researcher made a presentation and distributed a related document to give general information about the process and to provide suggestions about how a more effective teamwork process should be. Each team was asked to determine the leaders of each phase and the leader's tasks (Figure

5.4). In addition, it was recommended for them to determine their rules and strategies.

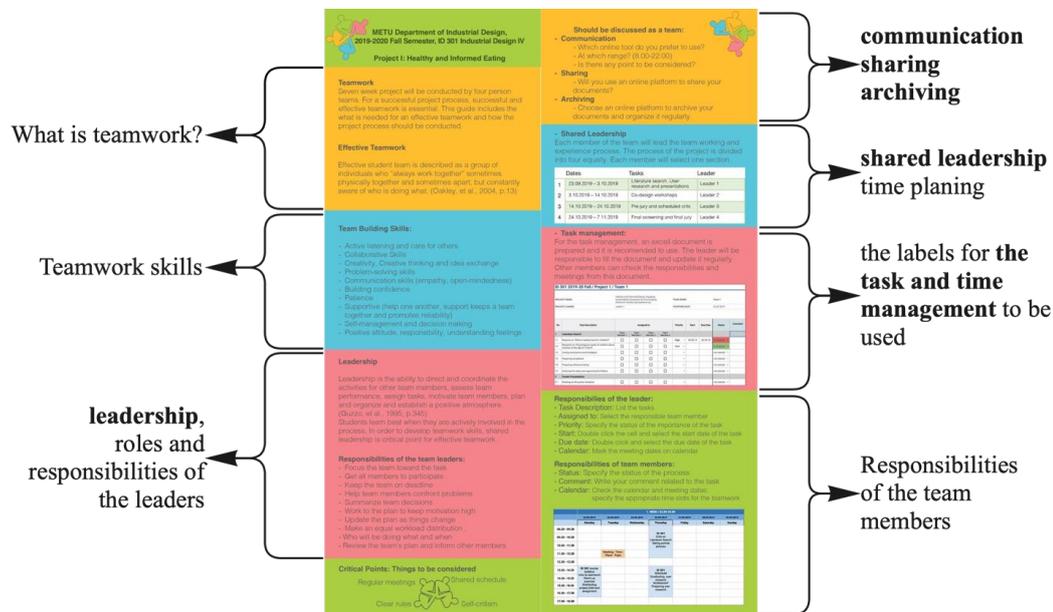


Figure 5.4 Teamwork Hand-out

5.1.3 Project Brief and Calendar

The design process of the project can be divided into four which are:

- Design Research (Literature Search-User Research)
- Ideation (Participatory design – Conceptualization) (Co-Design Workshops)
- Refining and Lo-Fi Prototyping (Pre-Jury)
- Final Screening and Final Jury (Final Feedback)

This categorization refers to the division of the tasks of the leaders. Each leader is responsible for one stage of the design process. This provides an opportunity to

define tasks easier and prevent the leaders from interfering with each other's field. Each phase lasts about 10 days, and so each leader is approximately responsible for 10 days. No guidance has been made on how to decide which team member will lead in which phase. Some of the team members prefer to choose to be responsible for the design stages that they think they are good at. Some of them prefer to make a random choice. This difference is evaluated and discussed during the interviews with the team members in terms of its advantages and disadvantages.

The researcher is only able to attend studio classes on Thursdays because of her own program. According to the project schedule, there are six Thursdays in the process except for the final jury. Two of the six involve the co-design sessions; so only four weekly meetings are organized (Figure 5.5). These processes generally coincide with the period of leader change, so it is planned to first discuss the process before the meetings with the existing leader; then the next process is evaluated with the next leader. If there is a problem in the previous weeks, first it is discussed how to solve this problem and try to develop solutions with the team members. Some of the problems are related to communication, inefficient work, unbalanced division of labor, etc. It is also needed to meet with some problematic teams apart from our planned meetings. Interim meetings become effective for assessing whether the proposed solution worked or not.

Project Calendar

| Week | TOPICS | MONDAY | THURSDAY |
|---|---|--|---|
| 26 September, Thursday First Meeting | 1 DESIGN RESEARCH / LITERATURE SEARCH What is this course about, how does it work and how is it evaluated? What is the project brief? How to collect data for the literature search? | 23rd September ID 301 course syllabus Intro to teamwork Warm-up exercise Distributing project brief and assignment | 26 Crits on Literature Search Taking portrait pictures SEMINAR Conducting user research WORKSHOP Preparing user research |
| 3 October, Thursday Second Meeting | 2 DESIGN RESEARCH What should we do in the field research and user observations? How to conduct user interviews? How to analyze our research findings? | 30 PRESENTATION Literature Search Presentations | 3 October PRESENTATION Presenting user research WORKSHOP (intro) Scenario building and idea generation |
| 7 October, Monday Meeting with Team 6 and 9 | 3 IDEATION & Participatory design What is a scenario and how do we use it? How do we identify design directions and generate creative design ideas? Here are our early ideas!! How to validate our initial designs? | 7 WORKSHOP Submission: Scenario building and idea generation for two diverse themes | 10 CO_DESIGN WORKSHOP in Nesibe Aydin Primary School |
| 17 October, Thursday Third Meeting | 4 IDEATION/CONCEPTUALISATION How do we evaluate our idea's using the workshop outcomes? | 14 CO_DESIGN WORKSHOP in Merakli Kedi Primary School | 17 Scheduled crits Feedback on your project Building Lo-Fi prototypes |
| 24 October, Thursday Fourth Meeting | 5 REFINING and Lo-Fi PROTOTYPING Refining your scenario and design solutions. What is a mock-up? How do we use it? | 21 PRE_JURY Presentation with full size mock-ups | 24 Scheduled crits Feedback on your project and presentation |
| 31 October, Thursday Short Meeting with Team 7 | 6 FINAL SCREENING: PRESENTING YOUR PROJECT This is the scenario we work with. This is how our idea is supposed to work and how it fits our scenario! | 28 FINAL FEEDBACK Final Evaluation in collaboration with Nesibe Aydin Primary School | 31 FINAL FEEDBACK Final Evaluation in collaboration with Merakli Kedi Primary School Scheduled crits Feedback on your project and presentation |
| 4 November, Monday General Observation and short reviews with the teams | 7 FINAL JURY: PRESENTING YOUR PROJECT This is our final scenario and design solution! | 4 November FINAL SCREENING Screening of design boards explaining design details Getting feedback on your project presentation and boards | 7 FINAL JURY PROJECT 1 START OF PROJECT 2! |

Figure 5.5 Weekly Meeting Calendar

5.2 Process

As mentioned before, on the first day of the course, a presentation was made in order to inform the students about the process including how they could work as a team effectively, what process they will follow, and expectations from them in the process. This information is also summarized in a hard copy handout distributed to the students. Throughout the process, the Google Sheets document is filled by the leader of each phase; weekly meetings are conducted with all team members and at the end of the project, semi-structured interviews are conducted with the ten teams.

Google Sheets Documents

On the first day, after the teams were determined, Gmail addresses were collected from the team members, and the Google Sheets documents that were created for each group separately were shared with them that evening. That day, I asked the teams to select their first leader for the first ten days and start using the sheet. But the first day was a very busy day for the students; the course syllabus, project brief, project calendar, project research brief, and their first homework were introduced and explained on that day. After this busy schedule, I explained the outline of my research and my role and expectations from the process. So, I couldn't be sure that the whole process was clear for the students because of this busy program. I decided to repeat this information at the first meeting. On Thursday, the first weekly meetings were conducted with all the teams and we went over the responsibilities of the leader, how to fill the Google Sheets online tool, and the points that they should pay attention to during the teamwork process. Thus, the process became clearer for the students.

It was expected that the teams would get together physically or online, before starting work, to define the tasks, make a to-do list, and divide the tasks equally. And then the leader would enter this task definition and distribution in detail in the Google Sheets file and make the process visible. Then, after the process starts, the group members would inform the other members about the tasks they are responsible for by changing the status part over this Google Sheets file and the leader would control and check the whole process. But generally, it was observed that the teams listed what was done, before the weekly meetings or after the planned work was finished.

All groups filled the tables without any resistance. During the jury week, the students were reluctant to fill the table due to the intensive process. I emailed and reminded the leaders to fill out the document as soon as possible. Throughout the project, although some leaders were not willing to use Google Sheets documents, the tables were filled completely. The process for all the teams became visible to both the teams and instructors.

Weekly Meetings and Observations

Weekly meetings took about 15 minutes with each team during the studio course hours. The teams prepared a list among themselves and determined the order to talk with me. Meetings were organized in that order. During these interviews, both notes were taken and audio was recorded. At the first meeting, the students were informed about this issue and their permission was obtained. These comprehensive notes and Google Sheets documents were examined before the meetings and tried to remember the issues that were discussed with the teams previously in order to have a more effective meeting and not to skip the problems or solutions discussed at the previous meeting. When the teams have some problems, we manage extra meetings with them out of the scheduled meeting program.

The mood of the meetings was a constructive and positive environment and open communication helped encourage the students both for the project and for teamwork. In the first week of the meeting, although at first, some teams thought that they had lost time there and wanted to return to work as soon as possible, towards the end of the project, the students waited for the meetings with enthusiasm. They stated that these meetings made them feel more positive, relaxed and good about the teamwork process.

5.3 Interviews

After the final jury week, the students went to Istanbul to attend the Design Week Turkey, so, the interview period started to be organized one week after the end of the project. All the interviews were scheduled face-to-face with the students. Special attention was paid to including all the members of the teams. Before the scheduled time, I went to the studio during the studio course and ensured that students would not forget the scheduled interviews, so I reminded them that there will be an interview session on the decided day. Despite all this effort, some problems were

encountered in the scheduled interviews. The biggest challenge was finding the common time of the students due to their intensive course schedules.

Table 5.2 Details of the Interview Sessions

| | Scheduled Interview Date | Interview Order | Duration |
|-----------------------|----------------------------------|------------------------|-----------------|
| <i>Team 1</i> | December 3, Tuesday, at 10.00 | 4 | 01:09:00 |
| <i>Team 2</i> | December 3, Tuesday, at 15.30 | 6 | 55:43:00 |
| <i>Team 3</i> | December 12, Thursday, at 11.00 | 8 | 01:13:00 |
| <i>Team 4</i> | December 2, Monday, at 12.00 | 2 | 01:15:00 |
| <i>Team 5</i> | November, 29, Friday, at 14.00 | 1 | 01:32:00 |
| <i>Team 6</i> | December, 2, Monday, at 16.30 | 3 | 01:28:00 |
| <i>Team 7</i> | December, 12, Thursday, at 14.00 | 9 | 01:26:00 |
| <i>Team 8</i> | December, 12, Thursday, at 16.30 | 10 | 01:28:00 |
| <i>Team 9</i> | December 3, Tuesday, at 12.30 | 5 | 01:12:00 |
| <i>Team 10</i> | December, 5, Thursday, at 11.00 | 7 | 53:39:00 |

Between 29 November - 12 December, 10 teams were interviewed for two weeks. Only one member of one team could not participate in the interview as she was sick. Because one student completed the project process individually, an interview was not conducted with him. All members of the other teams participated in the interviews. A total of 38 students and ten teams were interviewed. The interviews were carried out in Turkish. In order to get more information from the students about their teamwork experiences and design process, group interviews were conducted. The duration of the interviews was between one hour and one and a half hours. All the interviews were recorded with the consent of the participants. Conducting the interviews right after the project is finished helped the students recall their experiences easily.

The interview guide was developed before the interviews were conducted. Table 5.3 shows the details and steps of the interview guide that included three main parts. The first part was entry, and a few questions were asked to make the students feel relaxed and encourage them to talk. In the second part of the interviews, the questions focusing on teamwork, the use of Google Sheet and the role of leadership and weekly meetings, and how they manage their teamwork were discussed in detail. I asked them to make a comparison with their past experiences in order to understand the contribution of this planned process. In addition, we discussed the role of the researcher and the role of the Google Sheet document. We discussed whether this document should be used for grading and whether they want this document should be examined by the instructors during the process. At the end of the interviews, a final question was posed to get students' suggestions and recommendations about the use of Google Sheet in teamwork and design education.

Table 5.3 The Interview Guide of the Research Stage II

| <i>Stages</i> | Themes | Questions |
|----------------|--|---|
| <i>Entry</i> | An introductory question | -How would you describe studio course and design projects this semester? |
| <i>Process</i> | First Hand-Out | - How would you benefit from the hand-out distributed on the first day of the classes? - Did you need a source other than this information file during the process? - What would you expect to be included? - How can it be improved? |
| | Google Sheet Document – Task Management | - What are the contributions of using online tools to your teamwork throughout the design process? - Could you explain their advantages and limitations in more detail? - What were the most commonly used parts? Why? - What were the unused parts? Why? How can it be improved? - What can or should be added? - Are there any other programs or tools that you use for this purpose? If so, would you compare the recommended program with the Google Sheet file? |
| | The Role of Google sheet Document | - Would you like the Google Sheet file to be checked regularly by the instructors during the process? - What do you think about the grading of this process? - Would you prefer to take individual notes from this document? - What should be the purpose of this document in the project? |

Table 5.3 (continued) The Interview Guide of the Research Stage II

| <i>Stages</i> | Themes | Questions |
|----------------|---|---|
| <i>Process</i> | The Role of the Researcher | <ul style="list-style-type: none"> - What should be the researcher's role? - Would you like her to participate in the grading stages of the project? - Would you like her to report your work to the studio team at the end of the project? |
| | Team's work discipline | <ul style="list-style-type: none"> - Could you please briefly summarize your teamwork (weekly meetings, task management, division of labor) - When was the division of labor done? - How were the dates of the meetings decided? - When were you filling in the Google Sheet file? - What did the Google Sheet file contribute to meetings? |
| | Weekly meetings | <ul style="list-style-type: none"> - What do you think about the content, duration and frequency of our weekly meetings? - What contribution did they make to the project process? - What was the contribution of the Google Sheet file to these evaluation meetings? |
| | Leadership | <ul style="list-style-type: none"> - What do you think about shared/rotating leadership throughout the process? - When you reevaluate the project processes, who would be the leader in which process? Would you like to make such a change? - How to decide who will be the leader at what stage? - Who made the best leadership in the group? Why? What were the pros and cons of the other leaders? - Which leader was more effective in using the Google Sheet file during the leadership process? Which leader organized the division of labor more effectively? - How did you make use of the Google Sheet file during the division of labor? How did this affect your process? What are your suggestions for this? |
| | Previous Teamwork Experiences (Comparison) | <ul style="list-style-type: none"> - Can you compare your previous teamwork experiences with the teamwork process of this project? - What were the problems there? - Could these problems be solved with these tools and the strategies used during this period? |
| | Other Online Tools | <ul style="list-style-type: none"> - How did you organize in-group communication, sharing and archiving? - How did you benefit from online tools other than communication and archiving during the teamwork? - Was there a tool that you think could contribute to your process? |
| | <i>Conclusion</i> | Finishing Questions (Evaluation, Suggestions and other added) |

Throughout the group interviews, the students reminded each other about their experiences, especially related to the first stages of the design process. They also explained their previous experiences with the use of online tools in their teamwork. In addition, while explaining their thoughts and experiences, they gave examples from studio projects involving teamwork from the previous terms. Some students have experience in the use of other applications to manage their teamwork experience, they make a comparison between these applications and the provided online tool in a Google Sheet file. This comparison provides the evaluation of the Google Sheet document in detail.

5.4 Analysis

There are three different kinds of data for the analysis. One of them is the Google Sheet documents that the teams filled throughout the process, which shows how teams work, how they make a division of labor, and how often they schedule a meeting. Before the interviews, how the Google Sheet document was used was examined, and the details about this were discussed in detail during the interviews. The second one is the reports of the weekly meetings. The voice recordings were listened to, and notes were taken right after the weekly meetings to write a more comprehensive report not to forget the details. There are five reports for weekly meetings, four of which include all the teams. One of the reports covers the meetings with two teams due to the issues those teams experienced. Two teams requested a meeting to get advice from me because of their problems; an extra meeting was held with them on Monday, although usually the meetings were conducted on Thursdays. These reports led us to understand better the internal dynamics and working methods of the teams. The inferences of these reports will be explained in the following sections. A total of 38 students and ten teams were group-interviewed as a third step. In order to get more information from the students about their teamwork experiences and design process, group interviews were conducted. The duration of the interviews was between one hour and one and a half hours. The interviews allowed the students

to make a more detailed assessment of the process and gave detailed information. All the interviews were verbatim transcribed. Finally, the data was analyzed through thematic analysis (see Appendix L). The process provided a rich view since the data were collected from different channels such as observations, weekly meetings, Google Sheet documents, and in-depth interviews.

Interview Analysis

Statements were collected under the six main themes: *first-day presentation*, *team composition*, *task management*, *teamwork process*, *teaching teamwork*, and *shared leadership* (Table 5.4). On the first day of the course, a presentation was conducted to inform the students about the process, including how they could work as a team effectively, what kind of process they will follow, and their expectations. Also, hard copy hand-outs, including effective teamwork aspects and details of the process, were distributed to the students. Feedback and suggestions about the first day's informing process were gathered under the theme namely, *first-day presentation*. Another step taken on the first day was the forming of the teams. The process of forming teams can often be challenging, filled with different requests of the students. In studio projects, the students express their desire to form their own teams every semester. However, since this situation causes different problems for the educators, each studio team has a different application in this regard. The findings, in which the students expressed their opinions and preferences on allowing students to self-select their own team and forming teams randomly, were gathered under the theme namely, *team composition*.

Table 5.4 Themes and sub-themes of the analysis

| Theme | Sub-theme |
|---|--|
| Theme 1 <i>First day presentation</i> | Sub-theme 1.1: Hand-out - general review Sub-theme 1.2: Hand-out – leadership Sub-theme 1.3: Sample Google Sheet document |
| Theme 2 <i>Team Composition</i> | Sub-theme 2.1: Allowing students to self- select Sub-theme 2.2: Forming teams randomly |
| Theme 3 <i>Task Management</i> | Sub-theme 3.1: Google Sheet - Not well-known program Sub-theme 3.2: Google Sheet – Using on multiple devices Sub-theme 3.3: Google Sheet – Workload Sub-theme 3.4: Google Sheet – Task description Sub-theme 3.5: Google Sheet – Division of Tasks Sub-theme 3.6: Google Sheet – Checklist Sub-theme 3.7: Google Sheet – Updating Sub-theme 3.8: Google Sheet – Time management Sub-theme 3.9: Google Sheet – Not used parts Sub-theme 3.10: Google Sheet – Advantages Sub-theme 3.11: Google Sheet - Suggestions |
| Theme 4 <i>Teamwork process</i> | Sub-theme 4.1: Team Climate Sub-theme 4.2: Task management Sub-theme 4.3: Workload Sub-theme 4.4: Team meeting |
| Theme 5 <i>Teaching teamwork</i> | Sub-theme 5.1: The role of Google Sheet document Sub-theme 5.2: Process feedback Sub-theme 5.3: The control mechanism – grading Sub-theme 5.4: Collaborative design teamwork skills Sub-theme 5.5: Conflict management for researcher |
| Theme 6 <i>Shared Leadership</i> | Sub-theme 6.1: Leadership selection Sub-theme 6.2: The responsibilities and role of leadership |

An online tool based on Google Sheets was used to make the process more visible for both team members and educators throughout the process. The Google Sheet consists of two sections. The first part is for the division of labor and task tracking; the second part is designed as a calendar to make it easier for the students to note down their meetings and to realize when submissions are. In order to make the division of tasks more visible, a field is created in which teams can list the tasks and

mark who is responsible for these tasks. It is expected that the visibility of the work encourages the teams to make a division of tasks and distribute these tasks more equally. In addition, the document encouraged the teams to be more organized in terms of task and time management. The sections discussing how they used the Google Sheets document and how they benefited from it, how they set up their time planning, and the effects of these processes on teamwork were gathered under the theme namely, *task management*. Other issues such as team climate, workload, and team meetings affecting the teamwork process were not worked on. I gave directions to the teams on task management, time planning, and leadership; other issues were discussed together with the teams if only the teams expressed an opinion on these issues during the meetings. The issues related to how teams are organized are categorized under the theme namely, *teamwork process*.

The Google Sheet document is filled by the leader of each phase throughout the project. These Google Sheet documents were examined by the researcher each week. Weekly meetings were conducted with all team members regularly. The purpose of the weekly meetings is to discover the general tendency among the students towards conducting teamwork, identify the problems related to the teamwork during this process, produce solutions to their problems, and identify new alternative working styles for a better teamwork experience. It was planned to first discuss the process before the meetings with the existing leader; then, the following process is evaluated with the next leader. Apart from the Google Sheets document, some online tools were suggested to the teams to make their process more practical, such as using Google Drive for archiving and sharing and conducting online meetings via Hand-outs or Google Meets. The process-related evaluations, such as using Google Sheets, weekly meetings, grading decisions, conflict management process, etc., were gathered under the main theme named *teaching teamwork*. The issues gathered under this main theme were the areas that I suggested during the process. The most comprehensive of these areas was related to the leadership process; the teams experienced a process of task management from the beginning of the project. Students learn and experience best when they are actively involved in the process

and work. In order to develop teamwork skills and effective teamwork experience, shared leadership was recommended for effective teamwork. Peter Levin (2005) supports this situation and claims that "Frequently student groups opt to have a 'rotating' chair. It feels democratic – everyone has a turn at being chairperson – and it does not concentrate power in the hands of one person" (p.37). Therefore, the project process is divided into four phases equally so that each team member can select one project phase to lead and is responsible for ten days. The issues related to this newly experienced leadership process, including how leaders were selected, their responsibilities, and how this decision affected their process, are gathered under the main theme namely, *shared leadership*.

Theme 1: First Day Presentation

During the informative process on the first day, a presentation was conducted, and the instructions in the presentation were compiled in a hand-out and distributed to the students. The topics covered included the leadership process, the use of Google Sheets, and the general process description. At this stage, it was discussed how much the students benefited from this hand-out and presentation, whether they could answer the questions they had in mind about the process and whether this informing process was sufficient. These topics are categorized under three sub-themes: general review, hand-out leadership, and sample Google Sheet document.

Subtheme 1.1: Hand-out general review: (*the purpose, how it is used, and its efficiency*)

Although a detailed presentation was made on the use of the hand-out, the students generally did not give any feedback about the presentation. The presentation was made on the first day after the details of the project were announced. At this stage, it was observed that some students could not concentrate on the presentation much with the intensity and comprehensiveness of the other briefs (e.g., Team 7). For this

reason, the hand-out was helpful for them to have an overview and get basic instructions about the process.

It was described really well while presenting, but we probably didn't understand it at first because it mixed with other things (project briefs) (Team 7).

While some teams (e.g., Team 1) found the information provided about the process sufficient, some of them (e.g., Team 7 & 5) stated that they did not understand the importance of the process sufficiently, and they understood the detailed information about the process and its importance as time passed by. Although it was emphasized that this process is developed for increasing their teamwork effectiveness, their awareness of this increased, as they saw that this process was beneficial. Apart from its importance, the expectations from the process and what they should do, are not fully understood by some teams.

I think that was pretty revealing about what we are going to do (Team 1).

Its importance should be mentioned more; we later realized the value of it (Team 7).

We did not fully understand its importance in the first week (Team 5).

In the first week, it was observed that some teams did nothing from Monday to Thursday until the first meeting (e.g., Team 8). One of the biggest reasons for this is that they do not understand exactly what to do. For this reason, during the one-to-one meetings with all teams on Thursday, the details described on Monday were explained, and they were encouraged to choose leaders and answer the questions. Despite the three-day gap, the teams seemed to have adapted better to the process after that day. Although there were teams that thought of explaining this process in more detail on the first day, it was observed that *one-to-one meetings were more effective*. On the other hand, some teams stated that the presentation and the

document were sufficient and understandable, and they started the process thoroughly (e.g., Team 3 & 2).

Who will fill in where and how can be explained in more detail? (Team 8)

We read the document as it was our first time, and it was quite understandable.
(Team 3)

The document was informative and explained everything clearly. (Team 2)

Although this whole explanation process was thought to be sufficient for the students, this process was repeated at the weekly meeting when each leader changed. What the leader would do and the responsibilities were reviewed again. In general, students tended to learn the process from the ground up when the responsibility passed to them when they became the leader (as seen in Team 5 & 6). Since the transfer of knowledge is faster after the first leader, the process became easier for other leaders.

We learned how to fill the Google Sheet and what the leader should do while doing it (Team 5).

I learned how to use the excel document when I became a leader. (Team 6)

Teams (e.g., Team 4 & 5) stated that they did not use the document except on the first day and they do not need to see the document after the first day. It was assumed that it might be a guide for them throughout the first week they get used to the process; it was observed that the teams did not use the document except on the first day. Although some of the teams stated that they shared its photo in the WhatsApp group, they did not state that they were looking back.

I did not see it again after the first day. (Team 4)

I examined it the first day but didn't look later. (Team 5)

Students' perception is affected by the presentation of the instructions and the student's current concentration. Therefore, it is more effective to talk one-to-one with the teams about the process rather than the general presentation. However, considering that the number of students and also the teamwork processes are increasing gradually every year in undergraduate education, this supervision turns into a whole-day process, where you allocate a minimum of 10-15 minutes for each group instead of a half-hour general introduction. Moreover, weekly meetings also helped teams to get expectations and provide them with an opportunity to ask a question when they have.

Sub-theme 1.2: Hand-out leadership (*a guiding for leadership selection and the role of the leaders*)

The leadership process is one of the main themes of the research because leadership is one of the essential elements of task management and teamwork process, and this is the first time this leadership process has been enacted for these students. The leadership allowed students to consider teamwork from a different perspective and allow them to think about how they can improve and manage the process. Therefore, it is crucial to understand how the first perception of the leadership process is and whether the expectations are understood. Although the expectations from the leader were listed in general, they were at the level of suggestions, and in fact, each team was expected to define their own team rules, including the responsibilities of the leaders (e.g., Team 10). Except for giving leaders the task of filling out the Google sheet document, the tasks would differ from team to team. In the process, team leaders generally took on tasks such as organizing the division of labor, submitting assignments, and organizing and reminding the meetings. On the first day, the main tasks (e.g., filling in the distribution of tasks in the Google Sheet file and the weekly calendar to indicate the meetings) were explained in detail to the first leaders. Some teams (e.g., Team 1) did not understand precisely what to do, but some started the process right away.

We talked about what the leader should do on WhatsApp. (Team 10)

I didn't realize that each leader had a separate page, so I was undecided on where to fill in. (Team 1)

A few of the students had experience with online teamwork management platforms such as Trello and Slack. The students, who generally take an active role in student clubs, mentioned that they use such platforms to organize large groups and facilitate process management. Because these students were very few, some of the students who took the lead in the first week experienced some confusion. For this reason, they mentioned that they needed a more detailed explanation, especially for the first leader. Generally, the more they did, the clearer the process became for students, as explained by Team 7 & 10:

... especially a guideline for the first leader. (Team 7)

It could be explained in the hand-out that such things are expected from the first leader. (Team 10)

After the first week's experience, the other leaders were not hesitant about what to do. One of the most significant factors in clarifying the process was the one-on-one meetings with the teams in the first week. It is very typical to experience such an adaptation period in the first week of the seven-week project. On the other hand, only two teams out of ten fully understood and fulfilled the Google Sheet file. Except for one team, all teams had determined their first team leaders and entered the Google Sheet file. They waited until Thursday because they did not understand exactly how to do it. In the first meeting, the points that the first leaders did not understand were passed over, the expectations from the process were repeated, and some recommendations were given on how they could make a division of tasks. In the first week of the project, a research topic was given to the teams related to the project topic as an assignment. Some of the teams chose to follow a process in which all

team members would search for the same topic. I suggested the teams divide the research topic into subtopics where each team member can take a separate one. This division provided the teams with reducing the workload and doing more detailed research. After each team member searched their topic, I suggested coming together and sharing what they found with each other. These recommendations helped the teams to work more effectively. The team that did not choose their first leader (Team 2) stated that they did not choose a leader because they avoided responsibility although they understood the process. The student can avoid the extra responsibility of the studio class, even if this responsibility will have a positive effect on their process.

We got it, but we didn't; maybe that's why nobody wanted too much responsibility.

(Team 2)

Considering that leadership is a new experience for students, it is normal for the first leaders to have hesitations about what to do. In order to resolve these confusions, meetings with the first leaders can be made one-on-one from the first day of the process; the other alternative could be to encourage teams to discuss and decide on the leaders' roles from the first day. It is obvious that the experience of the leadership process helps students to understand the dynamics of teamwork better, as it provides the opportunity to evaluate the teamwork process from a different perspective. As Levin (2005) stated, the leadership process, including more responsibility and empathy, enables students to develop their teamwork and "charring skills" (p.37).

Sub-theme 1.3: Sample Google Sheet document

In order to clarify the expectations about how the teams should fill the prepared Google Sheet document, a sample page was created, and this sample page was included in each document shared with all the teams. On the sample page, how they could define a task and fill in the necessary places. Also, a sample calendar part has

also been added, and the course program and first assignment submissions for the first week were specified in the first week. While the detailed sample page was confusing for some teams, it was helpful for others, as explained in Teams 3, 4, and 9.

the sample Google sheet file was pretty understandable. (Team 3)

We understood better what and how to do it after looking at the sample page.

(Team 4)

The sample tasks confused me. I did not perceive them as if I had to rewrite them.

(Team 9)

It was observed that, on the sample page, the sections other than the task definition were very understandable and clear for the teams. However, to make it more understandable, the task definitions on the sample page were chosen for the research phase of the first week, and these definitions confused some teams. They perceived it not as an example but as a ready-made task that should be used. This situation was fixed in the first meeting.

Although I thought that the task definitions related to the project would be more understandable, since it was foreseen that there would be problems in describing the task they were doing, it was not fully assimilated from the first day that each team needed to detail and personalize these tasks. In the process, they always hesitated about how detailed they should define the tasks. Although giving an example guides the teams, it also limits them. For this reason, an explanation can be made on a sample page about a different project.

Theme 2: Team Composition

Considering that industrial design is a professional group that requires teamwork, teamwork is an indispensable part of studio education. The planning of the teamwork

experience has become more prevalent in design studio education with the increase in student numbers. As in the third year, long-term projects are carried out in studio education, and at least one of the projects in the semester is planned as teamwork. In addition, in the research phase, which is the first stage of projects, the students complete a 1.5 - 2-week process as a team in both individual and teamwork projects. In terms of learning to work together, long-term team projects in the studio provide the students with a good opportunity to internalize and learn teamwork management. The students may not be mainly interested in the process, so they may not have the skillset to work with their teammates and in which ways they can work effectively. Since they do not focus too much on the teamwork process, they prefer to team up with friend groups to easily carry out the process. However, this situation causes further issues for education problems: students who cannot find a team, international students and long-term team forming processes, etc. Levin (2005) emphasizes that:

Ideally, selection should be made by academics rather than by students themselves. You will have enough to deal with without being made to feel responsible for other students being excluded or guilty if you have argued for the inclusion in your own team of someone who subsequently doesn't get on with another member or members (p.23).

For this kind of reason, the third-year studio team decides to create teams randomly for team projects to achieve balance among the students. In addition, random teams allow students to get to know different friends, and experience real teamwork they may encounter in professional life.

Despite all this, if the project is teamwork, the students state that they want to create their own teams at the beginning of the project. The studio team once again repeats and explains to the students why they want to form the teams randomly. One of the students' most significant concerns is the possible disparity in the workload in their team and the same grades despite it. When this problem is resolved, the students' assumptions about *teamwork* and *random selection of teams* will reduce. On the other hand, setting the teams randomly can also be demotivating when s/he falls into

the same group with a friend s/he does not like, at the beginning of the project, or when a balanced working order cannot be established during the process.

It is one of the most challenging stages for the students to prevent their assumptions about each other in the process. Therefore, a teamwork setup in which the process is as transparent and fair as possible will make the students feel safe, and enable them to focus on the process better, as it will eliminate their anxiety. In fact, this subject is one of the main reasons for the emergence of this research topic.

Sub-theme 2.1: Allowing students to self-select

Despite being in university, the students often cannot decide what is suitable for their own development and education. They cannot avoid being grade and result-oriented. Therefore, when it comes to teamwork, the easiest thing for them is to be in the same team with their close friends. Instead of getting to know new people and establishing a common working environment, they prefer to manage this process with people they know. They think that the team they choose will help them have a better process (e.g., Team 1). While this may be the case for a group of students, it causes other kinds of problems for the rest of the class:

I thought that when we create our own team, everything can be better. (Team 1)

On the other hand, although some students (e.g., Team 7) think that they will feel a greater sense of responsibility towards their close friends, others state that this may cause some problems. When the students are in a group with their close friends, their expectations from each other may increase, and during the teamwork process, a problem experienced may affect their friendship, or the students may not fulfill their responsibilities fully with the thought that their friends will handle them (e.g., Tam 2). Therefore, in teams that are not close friends, they can talk about their expectations and responsibilities more clearly, and students may feel more responsible for each other. When the goal is to get high grades in general, the students

who do not know each other very well may make more effort to improve the project. However, in groups of friends, this may turn into expectations from each other.

You feel more responsible for having close friends. (Team 7)

When we create our team ourselves and are on the same team with our very close friend, sometimes I cannot tell her what to say when she did not complete her responsibilities. A little distance is always better. (Team 2)

Considering that, it is one of the educational needs of educators to carry out this process in an equal and fair manner, and provide equal conditions and opportunities for all students, it could be a better way to fulfill the team composition process under the control of the educators. For the students who do not have close friends, this situation can also become chaotic. They may not be able to form a team, and may have to impose themselves on other group members. This situation can create a negative effect on those students who could not make a positive start to the process at the beginning of the project. Starting the process in a balanced way under similar conditions could be preferable for educators. A student who has to be included in a close group of friends may encounter different problems as well. That student may not own the team as much as that group of friends, or communication problems may arise. This can cause the student to break away from the process and make him/her become a student who does not fulfill his/her duty even though he/she does not want to. A student from Team 9 gives an example from her past experiences and states that:

Since I did not have many friends in my class last semester when the teams were determined by us, I was left out and asked if I could go and join a team. ... everything was done, and I was left out. (Team 9)

This situation can be evaluated differently for students. The student who joins the team later may complain about being excluded and disconnected from the process.

On the other hand, that group of close friends complains that if that person does not ask anything, they are not involved, and they have to do everything. Such problems will arise less in the team's work where everything is discussed and jointly decided by starting from scratch. Otherwise, those who are included in friend groups that already have close communication within themselves will not be able to decide how to be a part of this process because they are not aware of this order, and they will feel excluded and will not be able to get the necessary efficiency from that project process.

Sub-theme 2.2: Forming teams randomly

"If your teachers do not take responsibility for the selection process, why don't you all – i.e., the whole year-group – get together and choose a random method and apply it" (Levin, 2005, p.23). As Levin suggested to the students, the responsibility of choosing the teams should not be given to the students. Educators who carry out the process should take responsibility for this process by considering and involving all students. It minimizes possible problems and enables students to complete the process under equal conditions. In addition, this experience provides the students with learning how to work with other people who they do not know as this is the case in professional life. While some students (e.g., Team 9) respect the idea of creating a random team, being aware of the fact that they will not be able to choose their teammates in the future, some students overreact and personalize this situation. They insist on working with their group of friends. Acquiring teamwork skills should be one of the learning outcomes. They can experience this best in random groups in studio projects:

Random is more professional. Everyone will learn to do that job together, whether they like it or not. Professional life is something like that; after all, you don't choose your own colleague. (Team 9)

Students need to learn to work with people of different personalities (e.g., Team 1). It should not be forgotten that this is a process that needs to be learned. Some of the students (e.g., Team 6) were aware of this situation and made an effort to make the process more effective for themselves. The students who start the process with the viewpoint of seeing this process as a skill to be acquired not only focus on the project output, but also make an effort to pass the process better and develop methods accordingly:

Somehow, we have to learn to work with all kinds of people. (Team 1)

If I could work successfully with this group, I would have accomplished something for my own personality because that will never be where I will have to work with people I can choose. I can team up with people I don't like, but if I can achieve this, it will be a great success for me. (Team 6)

If the project is teamwork, although the students' first reaction and desire are to form their own teams, there is also a group of students that wants this process to be random. There is also a neutral group that does not react to it, although they do not want to form their own groups. Therefore, if we want to ensure fairness among students, and if we want to provide an environment where they can acquire new skills, random selection of teams would be a better choice. As Mittelmeier, Rienties, Tempelaar, and Whitelock (2017) state that according to their study focusing on cross-cultural teamwork, "nearly all participants (19 of the 20) noted that the opportunity to work with diverse peers was a positive challenge that could help them gain essential skills" (p.158).

Theme 3: Task management

Sub-theme 3.1: Google Sheet - Not well-known program

It was critical to propose an online tool that students were familiar with to encourage participation and time effectiveness, not taking much time to learn for those who do not fully know the tool. Asking them to learn a program they do not know at all can

be a problem for the sustainability of the process. Therefore, it was decided that Google sheets could be an accessible tool for teams. Although it was assumed that Google Sheet is a well-known program, some students do have not enough experience in it. One of the teams (e.g., Team 4) states that Google Sheet scared her a little bit, and so she mentioned that she was afraid while making changes and filling the table. Although it is a program accepted by everyone, some students had difficulties while using it because it is not a program used frequently in the industrial design department, as seen in Team 5.

I can personally say that excel scares me a little bit because I saw that when I slide something, everything goes into each other. So, I did not want to touch too much.

(Team 4)

I last used the Excel in high school. (Team 5)

The expectations on the Google Sheet were very low, and the content of it was planned to make it easier to use. There was no need for extra use other than just typing something in the required cells and clicking/checking some cells. However, when they wanted to add and delete lines, that caused a problem for some students. Because task and time management parts were side by side, the changes made affected each other. That part caused some difficulties for the students. Throughout the project, the students who had difficulties while using Google Sheet asked for support. Nevertheless, the number of those who had problems was very low.

Some students who have experience with different teamwork management programs, such as Trello, indicate that, although its interface is more straightforward and enjoyable (e.g., Team 4a), not everyone is open to learning a new program (e.g., Team 4b). The students who are the members of the student communities with a large number of participants, experienced in Trello stated that this is short-lived, as not everyone in the community was open to using it. The processes continued to be run over WhatsApp (e.g., Team 3). Although google sheet was chosen not to be

affected by this assumption, this bias continued in some students. A frequently used program within the department may be more practical regarding students' access and familiarity.

I prefer to use Trello; it is enjoyable. (Team 4a)

I tried to use Trello in the community last year; it didn't work at all. Not everyone could use it comfortably. (Team 4b)

People prefer to talk on WhatsApp rather than getting used to something new. (Team 3)

The students' profile changes with each new semester. In addition, the programs used by the students and their preferences may also be renewed. Therefore, rather than imposing one program, several programs can be recommended. Nevertheless, the critical point is to determine the essential points that should be in the program, such as the definition of a task, task lists and due dates. Students and educators have become much more experienced and aware of the online tools with the pandemic process. Miro is a trendy collaborative working area for design students. During this period, the students were advised to use Miro for teamwork management also. Therefore, the student profiles should be well observed, and the online collaborative program to be used should be preferred accordingly. Being online and collaborative is essential for team members to use the program at any time and simultaneously.

Sub-theme 3.2: Google Sheet - Using on multiple devices

Google Sheet is an online platform that can be used on both computers and mobile phones. Although this feature allows students to access the sheet easily and whenever they need it, some students stated that they would not prefer to use it from the mobile phone. They also indicated that (e.g., Team 1 & 6) they were very uncomfortable using the Google Sheet from the mobile phone because it is necessary to slide the

screen to track all parts of the sheet. It is challenging to examine the sheet as a whole from the small screen. It can be challenging to keep track of a comprehensive document such as Google Sheet from the phone or the small screen. Google Sheet is a complex application to follow from the small screen.

I think it's a little difficult to keep track of them on the phone. Scroll, slide, scroll, the lines get mixed up; I also prefer the computer, see everything. (Team 1)

I get very uncomfortable while opening the excel files from the phone. Because it is necessary to slide everything. (Team 6)

Easily ***accessible and easy-to-use*** programs will provide great convenience to students in terms of use. It is negative for them that they have to open their computers to do the team management process. Although it is better to review and manage comprehensive documents on large screens, they should be easily accessible from small screens such as mobile phones. Considering how often smartphones are used, having to turn on the computer appears to be a disadvantage for students. Although the students should be on the computer more than on mobile phones during the pandemic situation, such programs should be available on different devices, and this opportunity facilitates and eases the process for student engagement.

Sub-theme 3.3: Google Sheet - Workload

The project's process is divided into four equally. Each team member selected one project phase to lead the team experience in working together on shared and assigned tasks through adopting a shared-leadership approach. Each leader was responsible for ten days for filling their own Google Sheet document and updating it regularly. Other members of the teams mainly preferred to stay away during this process. Although the responsibility of the sheet belonged to the leaders, it was seen as an extra and tiring ***task to fill*** Google Sheet documents, especially during the busy periods of the project, such as jury weeks (e.g., Team 6). Even though they only used

it for about ten days while leading, spending extra time on task management came to students as a tiring task:

Something to write to Google Sheet has accumulated. Hocam, the workload of it was exhausting. (Team 6)

Team members were only interested in the Google Sheet file while they were leaders. Team members did not follow and track the file while other leaders were responsible. This process turned into an individual use rather than a collaborative effort. According to the students (e.g., Team 1 & 10), the biggest reason for this was that the notification was not sent when the leader made an update. A more **interactive platform** used by all the team members can increase team awareness and participation. When a leader changes or enters a task, a **notification** could be sent. This interactivity increases their interest in this task management:

We don't do this because it's Excel. If this is an app and I get a notification when someone enters, I will take it out and look at it. It also goes easy. (Team 1)

When the excel is filled, it might be better if the mail is gone, notification. (Team 10)

WhatsApp, the primary communication platform for the teams, became the first choice while team members needed to send a file or inform each other. The students prefer to talk on WhatsApp regularly. It is hard to break this habit and expect them to check a platform that does not continually send notifications (e.g., Team 6, 7 & 10). It is not easy to break habits and routines, and include a place where no reminder comes into the seven-week project process. Therefore, it is an expected result to use only whoever is the leader. The students tend to prefer to choose the shortest and fastest way to communicate and get informed:

People prefer to talk on WhatsApp rather than getting used to something new.
(Team 3)

We are very active on WhatsApp. In fact, we do the distribution of tasks from WhatsApp and then transfer it to excel. (Team 6)

We were not writing some things in excel because we were constantly talking on WhatsApp. (Team 7)

It is easier to write the task section on WhatsApp; it is not a very accustomed process to do this in excel and then check it from there. (Team 10)

Although the students prefer WhatsApp for quick and instant communication, the task management page allows the team members to follow up on upcoming meetings and division of tasks (e.g., Team 3 & 8). Important information shared on WhatsApp loses its **visibility** as time passes among old messages. This information, which is kept in an online program such as Google Sheet, allows students to remember and follow the process whenever they want:

Compared to WhatsApp and mail, it is easier to find out what we do and when we meet. (Team 3)

Although we usually talked about what to do on WhatsApp, sometimes when I forgot, I was checking in excel. (Team 8)

During the interviews, some students suggested adding new parts to Google Sheet (e.g., Team 3); however, it is obvious that adding new parts makes the process more complicated. The main consideration for such as tool should be keeping it as simple as possible, not taking much time, and keeping motivation. For the task management process, task description, identification of the team member who will do that assigned task, and due date appear to be enough; for the time management, meeting dates, meeting topics, and submission dates could be sufficient:

A part could be added to the excel file where we can share the notes that we received during the critique sessions. (Team 3)

The other unexpected usage was when they filled the Google Sheet. The planned process is suggested to fill the document after the division of tasks was done and followed throughout the process. However, most of the leaders had filled in Google Sheet after completing the tasks and used it as **documentation**. Although it is difficult for some teams to fill out this document (e.g., Team 10a), they preferred to note it down on paper rather than the online application; the teams generally stated that they were happy to see what they did, on which days and how many times they met at the end of the week (e.g., Team 10b). This allowed them to see how the process was going and made it easier to plan for the next week:

...because it was easier for me to write it on paper than to write it in an application, not everyone is open to using a new application. (Team 10a)

We were writing here what we did. I think it was good to be able to see what we were doing at the end of the week from afar, but still, writing is a bit of a problem. (Team 10b)

Although they were not **open to learning a new program**, the requested documents were filled during the process in general. Only in the last week, during the jury week, the students had problems filling out the document. Several reasons for this were observed. First of all, during the jury week, the teams may prefer to work side by side, in this case, because they can be aware of each other; they do not need that type of documentation. Second, the workload and stress during jury week prevent teams from using it. Another reason is that until the jury week, the teams usually have a working routine, and they may not need it. Despite the fact that a few reminders were given to the teams after the jury to fill in the missing places, the leaders of the two teams did not enter the necessary information about the last week. In order to make

up for the missing parts during the interviews, the jury week was quickly summarized.

Sub-theme 3.4: Google Sheet - Task description

The general problem among the students was the definition of what they did or will do. They do not know how to define what they will do. Students state that it was difficult for them to define what they will do (e.g., Team 8). *Task description* was a learning process. They learned how to describe the tasks and how to divide them throughout the process. This process made it easier for them as part of the learning process on how to manage tasks in teamwork.

Task description was hard for me. What should I write here? It was difficult to define what we did. (Team 8)

We anticipated that the task definition part would be problematic because it is one of the problems that we frequently encounter in the literature. For this reason, a sample task management page was prepared and shown to the students (Figures 5.6 & 5.7). However, that also caused other problems. First leaders perceived the exemplary tasks as what needed to be done. This caused confusion in the first week. I went over at the first meeting that I shared with the teams to show how I expected them to write a task that was just an example. They had to rewrite the tasks according to their own research topics and their own processes.

ID 301 2019-20 Fall / Project 1 / Team 1

| | | | |
|----------------|--|---------------|------------|
| PROJECT NAME | Healthy and Informed Eating: Engaging Sustainability Scenarios for Encouraging Children's Healthy Eating Behaviour | TEAM NAME | Team 1 |
| PROJECT LEADER | Leader 1 | STARTING DATE | 23.09.2019 |

| No | Task Description | Assigned to | | | | Priority | Start | Due Date | Status | Comment |
|------------------------------|---|--------------------------|--------------------------|--------------------------|--------------------------|----------|----------|----------|-------------|---------|
| | | Team Member 1 | Team Member 2 | Team Member 3 | Team Member 4 | | | | | |
| 1 Literature Search | | | | | | | | | | |
| 1.1 | Research on "What is healthy food for children?" | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | High | 23.09.19 | 26.09.19 | completed | |
| 1.2 | Research on "Physiological needs of children about nutrition at the age of 7 and 9" | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Med | | | in progress | |
| 1.5 | Listing conclusions and strategies | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | in progress | |
| 1.6 | Prepering storyboard | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | not started | |
| 1.8 | Preparing reference listing | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | not started | |
| 1.9 | Archiving the data and organizing the folders | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | not started | |
| 2 Poster Presentation | | | | | | | | | | |
| 2.1 | Working on the poster template | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | not started | |
| 2.2 | Editing the texts | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | not started | |
| 2.4 | Preparing the poster | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | not started | |
| 2.5 | Odtuclass and printed submission | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | not started | |
| 3 User Research | | | | | | | | | | |
| 3.1 | Preparing the interview questions | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | not started | |
| 3.2 | Translating the questions | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | not started | |
| 3.4 | Arranging three families to conduct interview | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | not started | |
| 3.5 | Interview I | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | not started | |
| 3.5.1 | Taking notes | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | not started | |
| 3.5.2 | Auido recording | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | not started | |
| 3.5.3 | Take photos | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | not started | |
| 3.6 | Interview II | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | not started | |
| 3.8 | Evaluating the interviews and deciding the findings and insights | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | not started | |

Figure 5.6 Sample Task Management Sheet

| | 1. WEEK / 23.09-29.09 | | | | | | | | 2. WEEK / 30.09-06.10 | | | | | | |
|---------------|---|-----------------------------------|------------|---|------------|------------|------------|--|-----------------------|------------|--|------------|------------|------------|--|
| | 23.09.2019 | 24.09.2019 | 25.09.2019 | 26.09.2019 | 27.09.2019 | 28.09.2019 | 29.09.2019 | 30.09.2019 | 01.10.2019 | 02.10.2019 | 03.10.2019 | 04.10.2019 | 05.10.2019 | 06.10.2019 | |
| | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday | |
| 08.30 - 09.30 | | | | | | | | | | | | | | | |
| 09.30 - 10.30 | | | | ID 301 Cris on Literature Search Taking portrait pictures | | | | | | | ID 301 PRESENTATION Presenting user research | | | | |
| 10.30 - 11.30 | | | | | | | | | | | | | | | |
| 11.30 - 12.30 | | Meeting - Time - Place - Topic | | | | | | | | | | | | | |
| 12.30 - 13.30 | | | | | | | | | | | | | | | |
| 13.30 - 14.30 | ID 301 course syllabus Intro to teamwork | | | | | | | | | | | | | | |
| 14.30 - 15.30 | Warm-up exercise | | | ID 301 SEMINAR Conducting user research | | | | ID 301 PRESENTATION Literature Search Presentations | | | | | | | |
| 15.30 - 16.30 | Distributing project brief and assignment | | | WORKSHOP Preparing user research | | | | | | | | | | | |
| 16.30 - 17.30 | | | | | | | | | | | ID 301 WORKSHOP (intro) Scenario building and idea generation | | | | |
| 17.30 - 18.30 | | | | | | | | | | | | | | | |
| 18.30 - 19.30 | | | | | | | | | | | | | | | |
| 19.30 - 20.30 | | | | | | | | | | | | | | | |
| 20.30 - 21.30 | | | | | | | | | | | | | | | |
| 21.30 - 22.30 | | | | | | | | | | | | | | | |
| 22.30 - 23.30 | | | | | | | | | | | | | | | |

Figure 5.7 Sample Time Management Sheet

Deleting and adding a row in the task management part was quite problematic. Since there were no two separate columns, steps such as adding and removing rows affected the two tables (task and time management parts) next to each other, and this made students feel like they had done something wrong and prevented them from exploring this program, which they did not know very well, and using it flexibly (e.g., Team 4 & 5). The other confusing part was related to the comment section. The comment part is formed to provide the students with extra space to give feedback to each other about the related tasks meaning that every team member could write something. Since only one line is apparently reserved for the comment part, and the responsibility of the Google Sheet mainly belongs to the leader, the responsible person for that field is also perceived as a leader. It is not clearly understood that that area will be used for the interaction of all team members. So, some students are confused about who will comment and what will be written about what (e.g., Team 6). This confusion makes some students reluctant to use it:

I can personally say that excel scares me a little bit because I used it in my summer internship, and I saw that when I slide something, everything goes into each other.

So, I didn't want to touch too much. (Team 4)

So, deleting and adding a row was quite troublesome because it affected the side part. (Team 5)

The fact that the comment section has only one line gives the impression that only one person will do it. In other words, I was the leader; I was taken over there.

(Team 6)

In the task management section, in addition to defining the task in general, some problems were encountered about the person who did the task. Ideally, one person is responsible for one task; but in some cases, more than one person or the whole team could be responsible for a task. In this case, the students had difficulties in how to transfer this process to the table. Those teams were advised to mark all members who

contributed to that task. Some teams tended to do all the tasks together rather than divide them into sub-tasks. The teams were encouraged to *divide the tasks* to work more effectively and to save time. After the suggestions, although the teams preferred to work side by side physically, they divided the tasks, gave them a specific time, and then brought together what the team did. They discover that they can work more effectively with a good division of labor. Being side by side during the work made it easier for team members to help each other or to discuss and decide together when one of them had a problem.

Sub-theme 3.5: Google Sheet - Division of Tasks

The teams used different methods for the division of labor; they generally first defined the tasks together, and then managed this process together to decide who wanted to do which task (e.g., Team 7 & 8). The leaders were only in charge of the *organization of the process*. The decision-maker was the whole group decision, not the leader. Some teams stated that they thought the leader would tell them, you do this, you do that. However, the responsibilities of the leader were to be sure of the task to be done by everyone, and there is no missing task, and this whole process goes smoothly:

We were listing the tasks on the excel file, and everyone decided what to do by ticking their name. (Team 7)

Tasks were determined first, then a division of tasks was done. Who wants to do what? (Team 8)

It was easy for the team to divide the tasks in the first stages of the design process, especially in the research phase. The research topics were divided among team members. Then the topics researched by different team members were brought together and presented. It was not difficult to make a balanced division of labor and write it down while developing design scenarios during the idea development stage

also. The studio team helped the students in this process by arranging their expectations according to the four-person team. However, they had difficulties in determining the tasks and writing down the division of labor in the model-making processes they worked with physically (e.g., Team 3). Even though they divided the model parts among themselves, there was no clear distinction as it was written, as they helped each other when they finished their own tasks. It is hard to make a *clear division of tasks* in works that are done physically together, such as model making. Similarly, during the final jury week, the students had an intense work process and had difficulty in making a division of labor at this stage, as the tasks were very interconnected and the team members were in constant communication and helped each other (e.g., Team 6). The division of tasks made sense when tasks were done individually or remotely. In another scenario, although the teams make a division of tasks from the beginning, this distinction may change as the design process progresses. Considering the iterative nature of the design process, new tasks can be added, or some of them can be removed, or team members support each other like model making and jury week process (e.g., Team 4). Their inability to make a clear distinction between the task description and task division forced the students to fill the sheet:

While it is logical to divide work into tasks in literature research, it is very difficult to make task descriptions and separate them during the model making process together. (Team 3)

During the literature search phase, the division of labor was very defined, we did not know each other very much, but in the final jury, everyone was in control of every stage. (Team 6)

The division of labor is done first, but these definitions can change in the process. When one of us finished his tasks early, he helped the others. (Team 4)

In addition, Google Sheets file provided the opportunity for the students for *self-assessment and comparison* with other team members. This process increased the awareness of the students and provided balance in the division of tasks (e.g., Team 1). The division of labor was made in a way that all team members can see, this allowed the team members to question themselves, and they were able to check whether what they did was sufficient for a more balanced division of labor. It is tough for students to make this comparison in unwritten situations. It can be difficult for them to make this comparison as they cannot follow exactly what their other teammate is doing. Self-assessment helps to eliminate the most common problem of unbalanced division of labor in teamwork.

*The document increased the **visibility of work**, and this provided a neutral environment within the team. Everyone was looking at the tasks entered in the table, for example. He was saying, "I have little work, let me get a job." (Team 1)*

Some teams prefer to use WhatsApp for the division of tasks; they found it easier to do this via WhatsApp, which they use very often, rather than Google Sheets. Although it is challenging to reach the desired message via WhatsApp, it is much easier for students to use this application, which is very *easy to access* (e.g., Team 10). It was difficult for the students to open their computers and find the link to access the Google Sheet. It is an understandable decision that they prefer to manage this process from the platform they are in constant communication with:

It is easier to write the task section on WhatsApp; it is not a very accustomed process to do this in excel and then check it from there. (Team 10)

Encouraging the division of tasks gives students an advantage in terms of time and effectiveness in teamwork. In a *well-balanced division of labor*, students will be able to produce better quality tasks in less time and avoid unnecessary long working

hours. In addition, it is critical for the management of the process that this should be visible to all team members and easily accessible at any time.

Sub-theme 3.6: Google Sheet - Checklist

The students define the Google Sheet document as a kind of an *online checklist* that every team member could see and track the process (e.g., Team 4). The feature of online providing team members to make the process visible to all members. On the other hand, it also facilitates the check and control to see if there was a task left. The document shows the finishing tasks, what they should do then, and who did what (e.g., Team 1). It was beneficial for them to *keep track of finished works* and to see what has been done, what has been left, and who has done it before. The ability to evaluate the whole process through online documents eases managing the teamwork process.

It was a kind of an online checklist that everybody could see. (Team 4)

I think it was beautiful because it makes the work visible. It was nice to see what we did, what to do, etc. (Team 1)

The teams who preferred to fill in the document after the process was completed found the opportunity to review the process while writing the tasks. This provided them to reconsider the process, so the missing or not done tasks could be easily noticed and completed (Team 3). It provided a controlled process like a checklist. Some of the leaders who filled out the document right after the division of tasks stated that they could easily *list their status* and what remained by checking the tasks during the process (e.g., Team 8). In both uses, the task description gave teams increased control over the process and allowed them to be more organized.

While I was filling out the document, I realized that we forgot a small place. (Team 3)

I was checking to see if there was work left. (Team 8)

The fact that the tasks are written on an online platform that can be seen by all team members facilitated the responsibility of the leaders. In addition to task management, the *common calendar* also provided an advantage to the leaders in terms of time planning and simplified the complexity of scheduling. Meetings and deadlines on the calendar also served as a temporal checklist. The more visible the process in team projects, the greater the awareness of team leaders and team members about the process. *Making this process visible* on an online platform facilitates access and raises awareness of all team members compared to just being in a team member's notebook.

Sub-theme 3.7: Google Sheet - Updating

In general, the teams preferred to fill the Google Sheet document after the process was completed. Sometimes this could be in the form of writing down what was done that day right after the meeting (Team 6&9) or what they did this week at the end of the week (e.g., Team 10). *The end-of-day evaluation* appears to be much more effective and contributes to the team process more compared to filling in the weekly. Those who try to fill it out at the end of the week are very likely to forget some tasks, as they usually try to remember the process and write. Those who filled out the report at the end of the day were able to fill it out more accurately and quickly because everything was so new. In addition, at the end of the day, it would be easy to determine the deficiencies by reviewing what has been done that day while filling out:

Leader filled in the excel at the end of the meeting or after going back home (Team 6)

We filled excel right after doing (Team 9)

Excel was filled at the end of the week, just last minute. (Team 10)

The teams that filled it in later are aware that this decision is not a good idea, and they state that it is difficult to write by remembering (e.g., Team 6). Although it is explained how to fill the document, the students decided on their own how and when to fill out the document. The only point we could encourage them in this process was to make sure that the sheet comes fully to the weekly meetings. When I gave this to the leader's responsibility, there was no team that did not attend the meeting or attended the meeting without a table. But it is very difficult to interfere with how they fill it. The teams who had problems necessarily used it as suggested to follow the process. However, the teams that did not have any problems in the process preferred to fill the document at the end of the day:

Filling the excel after the work was done was not good. We forgot what we did.
(Team 6)

On the other hand, the main aim was to run the task management and design process together. Tasks should be added to the document as they are defined, and the process should be advanced by the division of tasks as they are added to the list, and the tasks for the next step should be determined on the document as they are done. Some leaders stated that they came to the meeting by listing the tasks that needed to be done that day so that when they met, they could quickly divide the tasks and go to work so that they did not waste time (e.g., Team 3). Some teams emphasized that at the end of the meeting, they determined what to do until the next meeting and entered the document immediately so that it was visible to everyone (e.g., Team 9). In both ways of using it, the teams had a more effective task management process for teamwork management.

The leader determined the task list, what to do. When we got together, we were dividing the tasks. (Team 3)

Sometimes we wrote about what was shared what to do in the house or in the coming days. (Team 9)

Although the teams did not react very much to this new order, they encountered some difficulties such as who should fill in the document, how and when, especially in the first weeks. It was observed that due to the students seeing this as an assignment, they had *difficulty in allocating time*, especially as the process got busy (e.g., Team 10). It will be more effective to convince students that this process is not an assignment but a tool for them to spend their teamwork processes more effectively:

The design process was already intense, and it is very difficult to spare time for this. (Team 10)

Sub-theme 3.8: Google Sheet - Time management

There were two important places in the document that supported the scheduling. One is *defining the task's due date*. They had to indicate who had to finish the written task and by when. In processes where due dates are not determined, team members can abuse each other, and thus cause a loss of time. Determining when they need to complete that task provides an incentive to members to do that task (e.g., Team 1). Another and more comprehensive one was *a weekly calendar*. And in this calendar, it was stated when they would hold a meeting, how many hours they worked, and when the assignment of that week was:

It was good to see due dates. (Team 1)

Google Sheet document encouraged teams to make a plan and divide the tasks. The teams came together, especially during the course days, and decided on the next meeting day and determined the tasks to be done until that day (e.g., Team 6). The meeting days were the due dates of the determined tasks. One of the indicators of

how important it is to be planned is that none of the teams work till morning during the project process, and some even did not work on Sunday for the first time in their lives (e.g., Team 5). In well-planned teamwork that was not left to the last minute, the students saw that this process was not a burden for them; on the contrary, it was an experience where they could share their responsibilities and have a better process:

We were talking about what to do and when to meet right after class. Then we were preparing the to-do list. Before the division of labor, we were going over the list and exchanging ideas. (Team 6)

For the first time in my student life, I never did homework on Sunday. At the end of the course, we come together and plan what to do on Monday; we list the tasks and determine when to do these things. (Team 5)

The necessity to fill in the document forced the teams to be planned, which contributed to their processes (e.g., Team 5a). When the teams that preferred to work together met and determined what to do and started to work. Making a weekly plan also facilitated the individual plans of the team members. Since it is ***planned from the beginning*** in a team of four, the team members can spread individual work over the remaining days. In the opposite case, it can be challenging to create common times for meetings or assignments left to the last minute due to the ***differences in individual calendars***. This causes disruptions in the process. Determining the time from the beginning for the steps that need to be done together makes the process planning much more manageable (e.g., Team 5b). Also, as mentioned before, it was beneficial to determine meeting dates from the shared calendar, including team members' individual programs (e.g., Team 10). Leaders can set a common time on the calendar. In addition to the individual calendars, the time of the meeting could be determined easily by checking the days and hours from the calendar of the previous leader. As the academic program of the students did not change much during the semester, the process in the past weeks guided the leaders. ***Seeing the whole process on a calendar***, on which day to meet, which day is due, and how

many days are in between, facilitated perception and enabled them to plan their time more effectively:

When we met, we were planning a week just because we were going to fill it. (Team 5a)

It was nice to plan ahead and know what to do and when the next meeting is (Team 5b)

The calendar part helped us to find a common time because we were very busy. (Team 10)

Since one of the teams was not very planned throughout the process (e.g., Team 7), towards the end of the process, long working hours due to lack of planning caused other problems. While discussing the problems, it was decided that the main issue was that they did not *set due dates for the tasks*. When they started to put due dates for the tasks, they had a much smoother process:

We lost time because we worked unplanned (Team 7)

A well-designed process in terms of tasks and time management reduces the workload of students in teamwork. The Google Sheet has contributed to the prevention of potential problems by encouraging the teams to be planned. The tradition of working until the mornings before the juries were not lived through with good planning. Works that are not left to the last minute and being able to plan ahead provide a significant advantage in terms of process management in teamwork.

Sub-theme 3.9: Google Sheet - Not used parts

There are different usage scenarios and perspectives about the task management interface; however, the *task description* and *assigned parts* are the most used parts

by no means. Regarding the priority, status, and dates parts, the students have different ideas. During the interviews, the students frequently mentioned that the "**in progress**" part was not used. It could not be very logical to indicate a task situation in short-term tasks (e.g., Team 3).

We didn't use the "not started" part much. We generally change its status at the end of the process. While filling the tasks, we made them "in progress," and after finishing, "completed." (Team 3)

When some teams (e.g., Team 4) came together for the meeting, they decided to work face-to-face and finished the tasks together after discussing what to do and dividing the tasks. In such cases, it does not make sense to follow the process through Google Sheets. Since they are side by side, they are aware of each other and can stay in contact. In another scenario, the teams come together and divide the tasks and leave. However, they may not feel the need to follow each other in this short time because their to-do list is usually completed in 1-2 days, and they meet again after a few days. At that time, they are already in communication over WhatsApp. It does not seem reasonable to expect **the status of the tasks** to be monitored from a different platform such as Google Sheet for teams in constant communication with each other for short periods (e.g., Team 8). These features could be more beneficial for long-term projects, like a one-year project:

As we prefer to work face-to-face, we didn't use due date, status parts. (Team 4)

The starting and ending date did not work for us, as it was a short-term task. They were tasks that we started in the morning and finished in a few hours. (Team 8)

There are three main categories, such as "To Do, Doing and Done" across the task management programs like Trello, Asana, and Miro To-Do-List (Figure 5.8, 5.9 & 5.10), and the tasks are replaced under these categories. However, **to-do lists and done lists** are critical for students in short-term education projects; the doing column

is not needed as the time required for the tasks is usually a few hours. Controlling and checking these two lists would be enough for students to manage their processes. Considering frequently used and unused places, the first important step for student teams is to make a to-do list and define the tasks. They are then assigning these tasks to the team members by dividing the tasks and lastly being able to see the finished tasks when they are done. Simply, this setup worked fundamentally in teams. While some teams preferred to use other features, some did not.

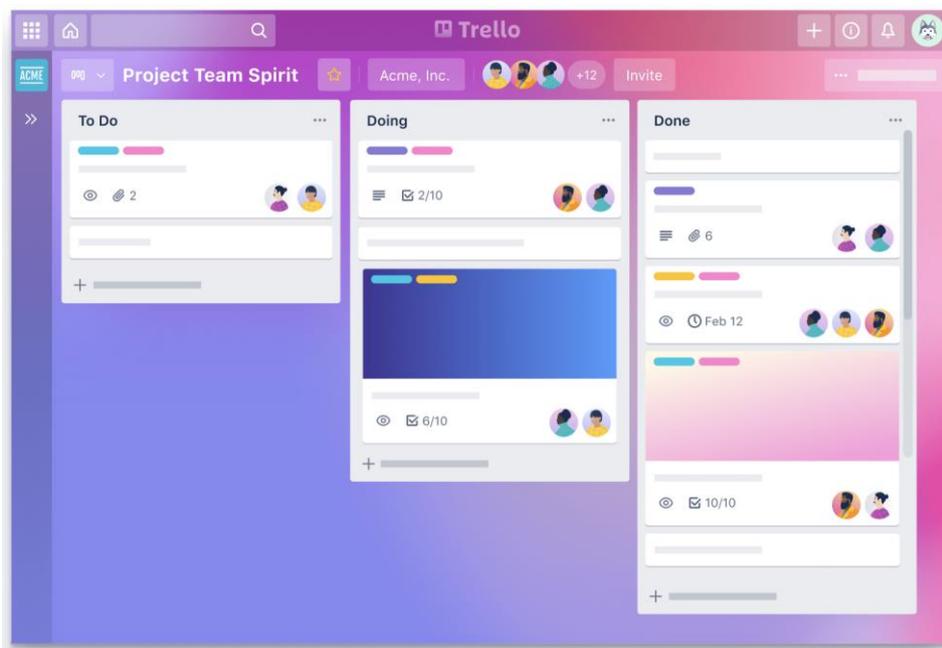


Figure 5.8 A screenshot from Trello, Three columns: To Do, Doing, and Done

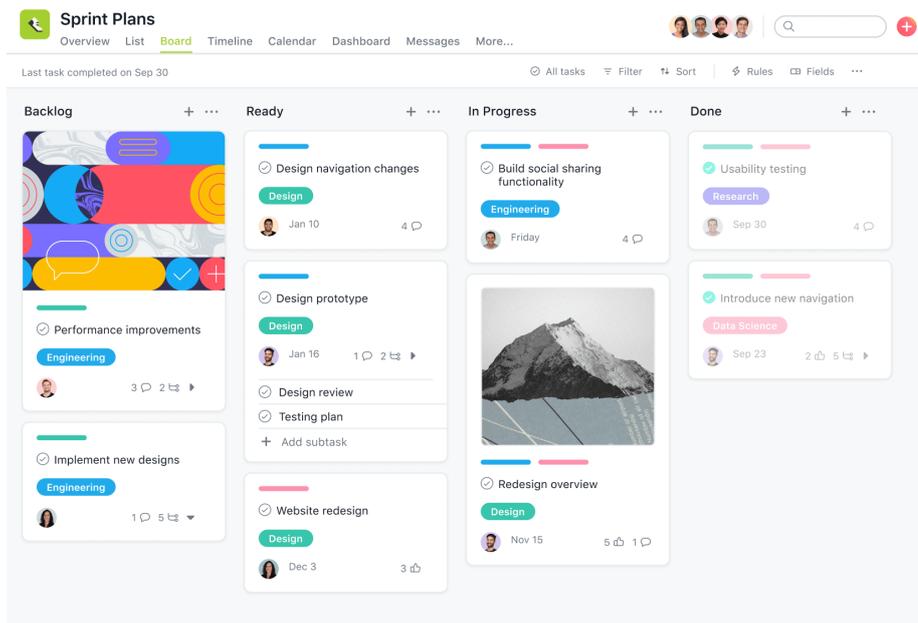


Figure 5.9 A screenshot from the Asana, Four columns: Backing, Ready, In progress, Done

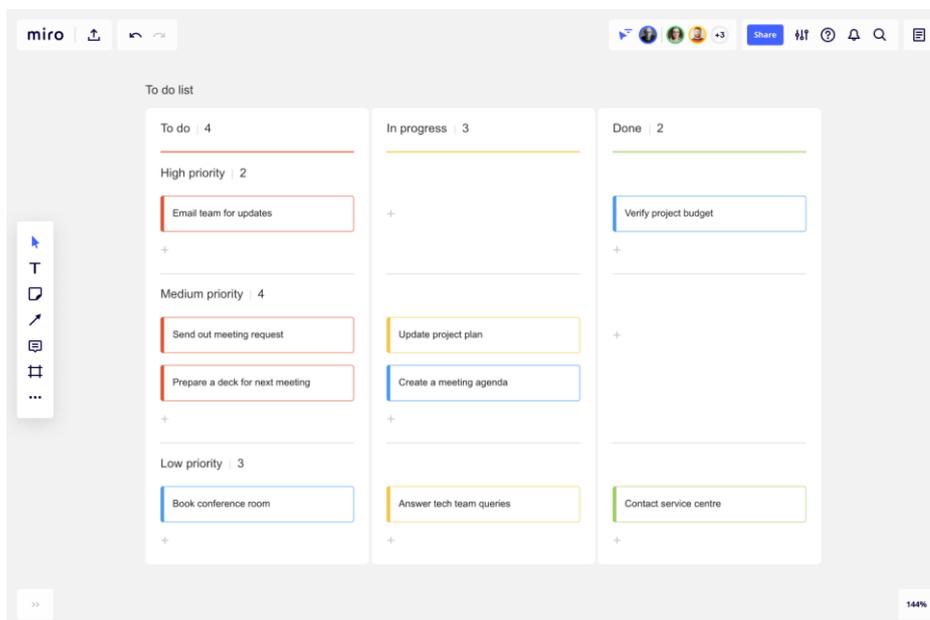


Figure 5.10 A screenshot from the Miro To-Do-List, Three columns: To-do, In progress, Done

It was expected that the teams would set deadlines for the tasks they determined, but the teams that preferred to work face to face considered that this was found unnecessary; it is thought that it should be used during remote working (e.g., Team 8). On the other hand, *deciding a due date*, even when working face-to-face, can make the process effective. One of the teams had difficulties with time management. They generally prefer to work in the studio environment together; however, the time they spent on the whole task was observed much higher compared to other teams. When we discussed it, we realized that they could not work very efficiently during the time they came together. When they came together, first they discussed what to do, divide the tasks and work side by side. This *working style* caused different problems among team members. While some team members concentrated on and tried to finish the given task as soon as possible, the others had to spend much more time, which caused an unbalanced workload among team members. This had come to the level of blaming each other among the team members. Since they thought that they would work better together because they thought that it would be easy to intervene with each other, therefore, it was recommended to set deadlines. For the final preparation, they set a deadline for the tasks after the division of them and decided that everyone would be expected to complete the work in that time. It was observed that this solution brought them productivity. It also prevented the loss of time and enabled them to work as a team more effectively (e.g., Team 7):

The deadline can be good when working from a distance rather than face-to-face.

(Team 8)

After we started putting deadlines, we had a more efficient process. (Team 7)

Another less used part was the *start date*. When teams come together, they usually decide what to do and make a division. As soon as the division of tasks is done, the person who does that task usually starts doing it. At this stage, the moment the teams that entered this in the sheet wrote the tasks, the process of task management actually started (e.g., Team 6). The start date did not make much sense for those who entered

during or after the process. The purpose of asking them to specify the start time was to calculate how much time they spent on that task. But in these scenarios, this was hardly possible. Since there were hourly tasks rather than daily, it was not possible to *calculate and compare* them. So, as a result, since the start date of the task didn't mean anything, the teams passed it after a while by marking the same day as the ending.

The day the task is entered, it starts at that moment. No need for a start date. The due date is enough. (Team 6)

Another little-used part was the *comment section*. In the comment part, the students generally stated that they did not understand what they should write. Since those who want to write something think that it would be more effective and faster to do it via WhatsApp instead of there (e.g., Team 9). It is difficult to compete with WhatsApp because it is a much faster and frequently used communication tool. On the other hand, Google Sheets file is very valuable just to ensure continuity. Some teams used that part to give more detailed information about the division of labor, while others used it to provide additional information on the subject (Figure 5.11). But the number of users was very low. In addition, students generally did not prefer to provide extra information since even filling out the table was seen as a waste of time. Keeping it as *short and straightforward* as possible would make it practical to use:

We have never used the "comment" part. I wanted to use it to share a link, but I couldn't succeed, then I sent it from WhatsApp. (Team 9)

| No | Task Description | Assigned to | | | | Priority | Start | Due Date | Status | Comment |
|----------|---------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|----------|----------|----------|-------------|--|
| | | Pelinsu Ayas | Yasemin Çetink | Demet Doğanay | Ecem Güven | | | | | |
| 1 | Scenario Building | | | | | | | | | |
| 1.1 | creating two scenarios | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | High | 05.10.19 | 05.10.19 | completed | brain storming about new product ideas as a group |
| 1.2 | details for the first scenario | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | High | 05.10.19 | 05.10.19 | completed | detailing the scenario by thinking how the product should be used |
| 1.3 | details for the second scenario | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | High | 05.10.19 | 05.10.19 | completed | the scenario by thinking how the product should be used |
| 1.4 | storyboard 1 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Med | 05.10.19 | 07.10.19 | completed | compositing process with using the tools is drawn |
| 1.5 | mock up 1 | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Med | 05.10.19 | 07.10.19 | completed | different tool mock-ups were made from cardboards |
| 1.6 | storyboard 2 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Med | 05.10.19 | 07.10.19 | completed | the important details about the card game, context and the players are shown |
| 1.7 | mock up 2 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Med | 05.10.19 | 07.10.19 | completed | game cards are developed by hand drawing |
| 1.8 | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | not started | |

Figure 5.11 Team 1, Leader 02, Scenario Building

Finally, another part that was not fully understood and used very little was the **priority part**. Teams often did not understand what to use it for. Its main purpose was to indicate **the priority and urgency of the tasks**. But in short-term projects, teams did not need such information. For this reason, the teams marked all of the tasks high, thinking as if that had to be done for all tasks (e.g., Team 5). Teams that need sorting or priority prefer to do it verbally (e.g., Team 3), so they did not follow it in the Google Sheet. Since the sheet is used before or at the end of the process, not during the process, the follow-up process and related parts did not work properly:

Priority options low-medium-high did not use much more. Short-term tasks had no priority; all will end by tomorrow anyway. (Team 5)

Since we expressed the order of priority verbally, we did not need to state this in excel. (Team 3)

In conclusion, in the studio courses, when the projects are short-term projects, some properties of the Google Sheets file are deemed unnecessary, and they can be more beneficial for long-term projects like in progress, start date, and comment parts. On the other hand, some features may be unnecessary for the teams that prefer to work face-to-face always. Since they come together to work, the date of starting the task, the status of the job, and the priority become meaningless.

Sub-theme 3.10: Google Sheet - Advantages

The Google Sheets document encouraged teams to be planned and well-organized (e.g., Team 1). Having to fill out the file every week regularly forced teams to ***plan the week ahead of time***. It allowed the teams to ***determine the to-do list first*** to write the tasks. The obligation to mark the names after the list was created promoted the division of tasks. The next step after the division of tasks was to set a deadline and plan the next meeting. Being planned made the teamwork process easier and more effective:

To-do list. When and what should we do? It was helping you then in terms of making a plan. (Team 1)

The fact that the tool used was online available, enabled the team members to control this process at any time and to ***intervene simultaneously*** (e.g., Team 4). In addition, the fact that each leader has a separate sheet allowed the leaders to ***check the past process*** quickly. The previous steps helped the leaders plan the next step easier in terms of time and task management. Making the process so visible and easily accessible was one of the planned targets, so considering the feedback from the student teams, that goal was achieved. Compared to other popular platforms such as WhatsApp, the adaptation of Google Sheets for this tool has made it very ***easy to access information about the process***: who did what, at what stage of the project, on which day, how much work was done, what kind of division of labor was made, it was very easy to follow (e.g., Team 3a). Normally, when the teams divided and defined the tasks specifically, they usually did it on paper and shared its photo on WhatsApp. However, this sharing was losing its effectiveness as it became very difficult to access over time. The visibility and easy accessibility of the whole process facilitates both the decision-making process for ***task division*** and ***meeting dates***. In addition, some tasks done during the design process can be repeated in the

process. In such cases, the teams gain time in terms of finding out who did the similar task retrospectively, and asking him to do that task again or getting information about how he did it, or learning about and using previous research findings. It will save time for the team as the team member prevents repetitions (e.g., Team 3b):

It was great that it was online because I always kept it open on the computer, and I could see the tasks immediately. (Team 4)

Compared to WhatsApp and mail, it is easier to find out what we do and when we meet. (Team 3a)

I look back on who has done what and consult her about the work done to provide time efficiency (Team 3b)

While the visibility of the process made it easier for students to plan the process, the process also became ***visible and transparent for the instructors***. This proved to be evidence for both educators and teams against the problems frequently encountered in teamwork. When teams that have problems reflect this to the educators, it is seen that team members may blame each other for task distribution and workload. However, it is challenging for the instructors to intervene in the situation with the complaint of a student without any concrete evidence. It was easier for the teams facing a problem to articulate this than in their previous experience, as the Google Sheet clearly shows how much support each team member has at what stage and which meeting they attend (e.g., Team 5). In addition, it was observed that the process was visible to the educators, providing ***self-control and self-assessment among the team members***. Some students had the opportunity to compare their processes with their friends to see how much they worked compared to the other members (e.g., Team 9). While distributing the tasks, team members wanted to take more tasks to be no less than someone else. It made team members fairer. It provided ***self-evaluation*** for teams. For students who tend to take too much responsibility, the team members who have extravert and dominant traits restrain themselves and give

other friends an opportunity to participate in the process. It also allows those who take less responsibility to realize this and balance the situation. Thus, when the process proceeds more evenly, problems arising from work distribution and workload are prevented:

"I contributed more; he contributed less." But when you look at the document, "No, it's not like that; everyone contributed this much." There is such a thing as proof. I think such a thing is very good in team projects. (Team 5)

For example, I was checking the excel document. Did I work less than my friends, did I work harder? If I have worked less, I will work a little more. Let me take more responsibility or have taken too much responsibility; let me give it to others. (Team 9)

In the 10-day calendar prepared for each leader in the time management section, the lessons were given in the calendar. It was recommended that each leader take note of the team meetings and submissions. Seeing the process on the calendar and being able to easily control how many days are left and what they should do in a time provided convenience to the teams in terms of planning. Some teams (e.g., Team 3) ***personalized the calendar area*** with color codes, and different color codes increased the ***visibility and awareness of the process***. It also provided the interaction in the program (Figure 5.12). While some teams only enter team meetings, some team members enter their personal schedules, making it easy to find the appropriate time for teamwork when everyone is free (Figure 5.13).

We prefer to use color-coding to indicate online meetings, physical meetings, submissions, and finished. (Team 3)



Figure 5.12 Team 3, Leader 1, color coding



Figure 5.13 Team 9, Leader 1, personal calendar

In the first week of the project, the leader of one of the teams did not attend any meetings in the first week, did not contribute to any assignment, and did not give the necessary information to his friends about this unexpected situation. When this

situation was discussed at our meeting in the second week, the student talked about personal problems and illnesses and said that he would make up for it, but he did not. Usually, it was not possible for the team members to express the problem so clearly, and the student could also deny it, or the instructors could not fully understand the seriousness of the situation. The visibility of the process helped the instructors monitor the process at an earlier stage before it became a bigger problem to ensure a fair process for all team members. It might not be possible for the instructors to make the evaluation process fair without such evidence. The fact that students and team members who work hard and those who do not work at the same level receive the same grade would reduce the student's motivation. But a more transparent process would eliminate this problem and *provide a fair environment* for students. This confidence also contributes to students' less problematic and more effective teamwork. On the other hand, it creates a trustworthy environment for teammates who do not know each other very well and enables them to work more comfortably and collaboratively. While it is easy for a close friend group to be aware of each other in the process, it would be easier to follow the process and evaluate the process in groups that are new to each other or do not know each other very well (e.g., Team 5):

As we always see each other every day, we knew what we were doing; we knew how we worked. That's why we didn't really need to follow up, but If I was in a group with people I don't know, I would need it more. (Team 5)

With the help of Google Sheets, a *transparent and visible teamwork* process enables early detection of problems and provides solutions before these problems grow and become unmanageable. In addition, while making the process easier to plan, it allows students to review the process and easily notice the missing points. One of its most important contributions is to evaluate the situation impartially when an unexpected problem occurs. In teamwork projects, one of the biggest concerns of students is that those who work less than me will get the same grade as me. Google Sheet breaks

this judgment and shows that if there is a huge difference in the students' workload and participation, this would be reflected in the evaluation process. Students' assumptions about teamwork started to change gradually, and they actually experienced that well-planned teamwork would facilitate their process and save time.

Sub-theme 3.11: Google Sheet - Suggestions

While discussing the advantages and shortcomings of the Google Sheet, the most prominent request was about the *instant notification* when a change is made to the document (e.g., Team 6 & 10). It can be said that it is a very justified and expected request. Considering the other applications which are popular among the students, this is a habit and expectation from this kind of application. Without the instant notification, the visibility of the document decreases, and this reduces the interaction among the team members about the task management. The responsibility for the adaptation of Google Sheet was shared between the leaders, and the use of the program was ensured. However, the interaction of team members on the document could not be enhanced. One of the biggest reasons for this is that whichever leader was responsible that week, s/he usually filled the document, and each team member waited for his own time. However, if other team members are notified when changes are made to the document or new data is entered, there will be more interaction within the task and time management, and this process could be more efficient (e.g., Team 8):

Notification or, for example, mail goes. "You have been assigned such a task. Have you started this mission?" A question is asked. (Team 6)

When the excel is filled, it might be better if the mail is gone, notification. (Team 10)

It would be nice if we all used it, not just the leader. It could be more efficient. (Team 8)

Another requirement that stands out is the need to show the *intensity of the tasks*. The fact that the equal distribution of names does not necessarily indicate that the distribution of work is balanced. Some tasks can be completed in a few hours, while others can take a few days. To show this distinction, they want a section that specifies how long the task will last (e.g., Team 9). The fact that different tasks finish at different times makes it difficult to calculate *the task division equality*. Although the start date and due date were made to show how many days that task was completed, this planned process did not work effectively because the duration of the tasks was usually hourly. The majority of students actually want to show instructors what they've done and how much time they've spent. Because they want to be seen how much effort they put into the process rather than the result of the project. So they think it would be nice to have an extra part where a detailed explanation can be given for each task (e.g., Team 7). Considering that the workload of the tasks may be different from each other, it can be effective to ask to *specify the workload* for a more balanced division:

Something can be added where you can also specify the workload of the task.
(Team 9)

A short text box could be opened next to the place where we ticked our name, and it could be written what she did in that task. (Team 7)

The students faced some problems due to physical location in Google Sheets. The general logic in it is to scroll down the sheet. However, each sheet was divided into two vertical sections, and the right side was used for task management and the left side for time management. This caused the first leaders to struggle in the first week (e.g., Team 6). Some leaders stated that they did not notice the calendar part. They had to scroll the page sideways to see that part. A layout where *incorporating task and time management parts* could be on the same screen could facilitate the perception of the teamwork process.

When I was the first leader, I hadn't even noticed the calendar part. People generally go down but don't go right. (Team 6)

Google Sheets document gives the instructor information about teams' working experience and planning, not the progress of the project. Although the document was only used for the task and time management, there was nothing specific to their design projects, some students thought it could be combined, and both the teamwork process and design process can be examined from this platform. **Documents related to each task** can be added next to the related task, and it also makes the process visible (e.g., Team 7). On the other hand, this addition can complicate the process while **making visible and interlinked both teamwork and the design process** on the same platform. In order to see individual contributions, especially in team projects, students are asked to submit an individual sketchbook. While it is easier to follow the student's own process in one-to-one criticisms in individual projects, this becomes more difficult in team projects. That's why individual sketchbooks help to differentiate between team members. The fact that the design process was also visible on an online platform brought the students to the idea that this process should be a digital sketchbook (e.g., Team 5). They think that **having their design processes visible on an online platform** in individual and team projects can be beneficial both for their instructors and for the guest jury members in the final jury. During the graduation projects of the fourth-year students, it is made compulsory for the students to keep a blog, and the process of the students throughout the semester is made visible. This provides advantages for both students and instructors. This usage will be adapted to other studios as the use of online platforms becomes widespread with the pandemic situation:

The document of the task done can be added next to the task part. (Team 7)

For individual projects, an excel document can be used as a digital sketchbook. The jury can see not only the final product but also the process passed up to that stage. (Team 5)

Another add-on request related to the process was that the notes in the critiques could be taken on this platform (e.g., Team 3a). The teams often make a division of labor during the critiques sessions. While one of the team members explains their process, another person takes notes, and the other asks questions. The notes taken are then discussed by the team. These notes affect the progress of the design process and the decisions to be taken for the next step, so they are shared with all team members. It is essential that it is visible to everyone. ***Keeping design critiques notes on an online platform*** so that those can be accessed and examined by everyone at any time can contribute to the design process. Some teams prefer to use other online platforms like Google Docs for critiques and team meeting sessions (e.g., Team 3b). It was recommended that a separate area could be created so that the process could be monitored on a single platform:

A part could be added to the excel file where we can share the notes we received during the critique sessions. (Team 3a)

Google docs are used for meeting notes. (Team 3b)

Although teams realized that managing the teamwork process helped them, they found some places in the Google Sheet unnecessary. One of the biggest reasons for this is that it is a short-term project, and the students prefer to work side by side physically, and they are well aware of each other as they constantly meet for other common lessons (e.g., Team 10a & Team 10b). Apart from this, there were some students who proposed ***a more interactive structure that included the design process*** by making this process more comprehensive. Although there are some reservations and complaints about using it, such structures will become a part of studio training over time, thanks to online tools that have entered our lives more and more with the pandemic. It would be a more preferable and interactive alternative to evaluate individual contribution, especially in teamwork processes:

Since we were always together and in communication, we were aware of each other, and we did not feel the need to look at excel. (Team 10a)

If we were working remotely and it was a longer project, we would need more. (Team 10b)

Theme 4: Teamwork Process

Subtheme 4.1: Team Climate

Whether students are close friends or not, those who come together for team projects have different backgrounds, skills and working styles, so it is usual for them to get confused when they come together. Even if it is structured teamwork, individual differences affect the process and success of teamwork. In unplanned teamwork, individual differences, especially motivational differences, affect the team process more. Team projects turn into an exhausting process for students. Trying to make up for the deficiencies of other teammates, reduces the students' desire to work as a team. One of the other biggest reasons for the lack of motivation is that the individual performances of the students in teamwork are not evaluated and they get a single grade in the result they completed as a team (e.g., Team 1a). This situation causes comfort for some students and students to avoid taking responsibility. Even students who are seen as very successful in their individual projects can avoid responsibility in teamwork projects (e.g., Team 1b).

one project and one grade make some team members run away with the feeling of someone will make it anyway. (Team 1a)

some students who are good at their individual work may choose to take less responsibility and leave the work to other teammates. (Team 1b)

While some students tend to reduce their own workload by putting too much responsibility on others, a group of students also state that they feel more responsible

in teamwork (e.g., Team 8 & Team 9). Getting single grades encourages those students to do their best so they don't want others to get low grades because of them. These students, whose *individual project performance* may be lower than their performance in teamwork projects, can display a much more successful and motivated performance due to their responsibilities to others. This feeling can cause those students to get tired more in projects. Being able to increase the sense of responsibility towards each other, could encourage students to perform more motivated.

When I don't do something, I won't affect someone else's grade. I miss this so much; 7 weeks was a long process. (Team 8)

Responsibility towards someone. You are more motivated because you feel responsible for other team members. (Team 9)

Different working styles and preferences are one of the most challenging points for students in teamwork. While some students prefer to work in the studio in a crowded and interactive environment, some students find it more effective to work alone in their homes or dormitories (e.g., Team 5). However, students misclassify their friends who do not work in the studio environment as non-workers (e.g., Team 2a). The number of team meetings or time spent together is not an indication of good teamwork; a good division of labor after joint decisions can bring an effective result. (e.g., Team 2b). In teamwork, if there are such differences in the group, they need to create a working method that can adopt both methods. An order in which team members do not interfere with how and where each other will complete their tasks could be an ideal working environment for teams. Otherwise, forcing students who prefer to work at home to work in a studio environment will affect their motivation and performance and this process becomes challenging for them (e.g., Team 2a). At the beginning of the project, it is important for the groups to determine this and act accordingly in terms of each other's performances.

I feel more comfortable when I go home and work there longer, rather than working in the studio environment. (Team 5)

There are those who think that the time spent in the studio is proportional to the work. Working with those people in the same team was very challenging for me. (Team 2a)

Working together constantly is not an indication that we are doing good teamwork. If we do a good division of labor and work separately, we are going through a good process. (Team 2b)

The **random team forming** process, despite the prejudices of the students, helped to break the prejudices of the students about each other and to give each other a chance. This chance allowed the students to get to know and communicate with each other, and provided them to get out of their restricted closed world (e.g., Team 9). Groups that did not know each other at all managed a good process with the help of the Google Sheet. The students discovered that they can also make good teamwork with their friends they do not know (e.g., Team 10). While such groups use the sheet more carefully and diligently, the use of it was more problematic in groups that knew each other (e.g., Team 2). Since those groups were always together and in constant communication, they thought that they did not need this sheet. Teams who know each other better tend to work face-to-face generally, and this working style reduces the need for the sheet. However, they stated that they can use it more carefully when they are in groups with people they do not know (e.g., Team 5). In addition, students who had problems with each other **learned to be professionals** with this opportunity (e.g., Team 7). They managed not to reflect on their personal problems in their work and learn to overcome this and create a common working area. This is a good experience, good awareness, and success for them. Students who always prefer to work with a close group of friends on educational projects restrict themselves and prevent them from learning new things. Students who prefer to interact with the same friends all the time are limited in this frame. However, communicating and working

with different students broaden their viewpoints, and students add much more to each other. One of the most beautiful and effective learning environments in higher education emerges through the social dialogues that students develop and interact with each other.

This process enabled people who did not know each other to communicate with each other, to see how far we were from each other and how little chance we actually gave each other. (Team 9)

It can work better in teams that are not very friendly. (Team 10)

The reason we didn't need the excel file was lucky because we were a group that got along well, and the project was not too complicated. (Team 2)

Since we are friends who know each other very well and are always together, WhatsApp was enough for us and sometimes we don't even need it. If there was a team that I did not know before, I would follow everything more. (Team 5)

Although we had personal problems, we looked professional and I think we managed the process well, everyone did their responsibility. (Team 7)

Personal characters are another factor that affects the teamwork process. While some students can be more extroverted and talkative, some students can be quiet and shy. Considering that students with different characters would come together in the same group, a rotational leadership process was applied within the team in order not to affect each other negatively. Each of the students was given an opportunity to show themselves in this system, where a group member led each 10-day period. An attempt was made to establish a balanced system within such a team. Some students stated that this really stabilized them (e.g., Team 3). A student who realized that she is still leading even though the leadership process was over learned to restrain herself. On the other hand, it creates an opportunity for students who prefer to remain recessive in teamwork, where normally dominant characters are present. The student who felt that he had to stay recessed all the time would lose his motivation and desire,

so his contribution to the team would gradually decrease (e.g., Team 2). However, in a process where relations progress in a more balanced way, students will be able to advance in a more controlled process.

This system and process provided auto-control. Although my leadership process was over, I realized that I was still involved in something and stopped myself.

(Team 3)

Because dominant characters in the team dominated the process, I prefer to be a recessive character just so that there would be no problems in the process. Finally, the process did not go well for me, and I lost my motivation for the project.

(Team 2)

In a teamwork process where everything is well-designed, the failure of one of the team members to fulfill their responsibilities can cause trouble in the teamwork process. Some students (e.g., Team 3) stated that they had similar processes in their past experiences. Despite the division of labor, the fact that some team members come to the meeting without fulfilling their responsibilities or not attending the meetings without a reason increased others' responsibility. Another team (e.g., Team 5) likened the teamwork process to marriage and stated that they take on the responsibilities of others to avoid problems. Students who want to have a problem-free process can afford to take too much responsibility and make up for the shortcomings of others. But at the end of the process, they naturally want it to be differentiated as a grade. In order to prevent this, Google Sheet was used to observe what responsibility each team member took and whether they completed that responsibility or not. But other than that, students' different working methods and processes can cause them to misunderstand each other. A group (e.g., Team 7a) that chooses to work side by side attributes long working hours to each other's slow work and sees this process as an intervention in their private life, as it sees time stolen from their own time. It will be good in terms of in-group dynamics that division of labor is made after the decision-making processes and then everyone completes their

own responsibility on their own terms. But this requires good time and task management. Another point is that with the widespread use of the internet and smartphones, the possibility of people reaching each other at any time can cause some pressure within the teams. A student who does not want to think about the homework after a certain time can be compelled to do so by a message on his phone. On the contrary, ignoring the messages causes communication problems within the team (e.g., Team 7b). Therefore, it is very important that such ***rules are discussed and clarified*** from the very beginning of the process.

We had team members who came without doing the task given or did not attend the meetings, although we did the division of tasks. We carried out a four-person project with two people. (Team 3)

Teamwork is like a marriage. You're suffering from your teammate in order not to have problems. "OK. Don't come, I'll do it." (Team 5)

The different working speeds of her teammates overwhelmed me. I also have a private life. yes ok let's spare time for teamwork but unnecessary time wears me. (Team 7a)

WhatsApp was not checked regularly. It is necessary to check the phone, every hour. You take your phone, and enter WhatsApp, but you do not look team's messages! (Team 7b)

Different personal characteristics and different working preferences affect team working processes. It is important for students to respect these differences and create a common working space. Intensive course schedules and different personal interests could be a problem in creating shared time for team meetings. Bringing together different working styles will provide flexibility to students. It is one of the easiest ways to be face to face when decisions making process, but then to divide the tasks and leave. Teams should learn to divide tasks and work separately and bring together what has been done and then review together. It would be good for the teams to hold

a meeting from the first day where all team members will tell their expectations from the teamwork and find a common path. The decision should be made on what kind of working method they will follow. Taking this decision from the first day will prevent problems that may arise in the process. Otherwise, creating solutions as problems arise could negatively affect teamwork, especially in short-term educational projects.

Subtheme 4.2: Task Management

Process management is an important factor in effective teamwork. On the first day of the project, the teams were advised to discuss and decide what kind of working method they would follow, but the teams were able to clarify this later in the project. In the first weeks, it was observed that some of the teams did not divide the tasks, and even if some of them listed the things to be done, everyone did the same thing (the whole team looked at a single computer, etc.). In the first week's meetings, it was suggested that the teams could continue to work remotely or face-to-face, after making a clear division of labor to manage an effective process. The teams adopted this method in the process and generally the teams made the decisions together, divided the work, and then continued to work face-to-face and support each other (e.g., Team 9) or choose to work from the distance (e.g., Team 2). another alternative is that although the teams worked remotely, they were able to *manage the process simultaneously* together thanks to online collaborative platforms. Some teams (e.g., Team 3) prefer to use online platforms such as Anydesk while preparing presentation boards and all team members contributed to the process. The division of labor process also revealed the steps expected from the teams in the Sheet (e.g., Team 5).

When we meet, we were talking about what to do, dividing tasks and starting to work. We preferred to work side by side. (Team 9)

We generally prefer to work individually after making task division. Everyone could do their tasks whenever they wanted. (Team 2)

While I was editing the presentation boards to be written on the sheet, I was saying "Look, I have reserved so many places, write texts accordingly." (Team 3)

When we met, we were talking about what to do and how to do it. It automatically defined what we write the excel document. (Team 5)

While the teams were dividing the work, they generally listed the things to be done first and then chose the desired task from the list on a voluntary basis. In this process, students generally distributed work according to the field and skills they are good at (e.g., Team 2a). But when there are people who want to do the same task, how to determine it can be a problem. Therefore, it may be easier to distribute work in groups where students who are ***good in different fields come together***. One way to achieve this diversity is to randomly create teams. When students form their own teams, it can be difficult for them to make a fair division of labor. In the friend environment, some students can take more responsibility and make up for the deficiencies of their friends (e.g., Team 2b). Although they do not complain in such cases, their prejudices about teamwork increase due to the workload. Another point that facilitates the work distribution process is the definition of the project and the project details (e.g., Team 3). Students can organize more easily in situations where the desired tasks are suitable for teamwork and will be divided within the group. It becomes difficult to be organized in undefined and uncertain tasks. A ***well-constructed design process*** helps students manage their own processes better.

It was easier for us to divide tasks as we all have interests in different fields. Problems can arise when more than one person volunteers for the same job. (Team 2a)

when we created the teams ourselves, active group members took on too much responsibility during the division of labor and the process was very tiring for them even though you didn't cause any problems because the others were their friends. (Team 2b)

The project brief, of which all stages were explained in detail, also contributed to this process being overcome without problems. (Team 3)

As good task management breaks down students' prejudices about teamwork and makes them look more positive. Good task management ensures equal load distribution on students (e.g., Team 5). This also eliminates the problem that students have reservations about teamwork. In a more equitable environment, students work more productively and are motivated (e.g., Team 10a). This planned work carried out jointly can also set an example for students' individual work (e.g., Team 10b). In some cases, students may find it difficult to manage their own processes in individual projects. In team projects, the exemplary study system can also help them build their own individual systems.

It was the most regular team assignment, I've ever done; and the only team project where everyone in the team got equal tasks. (Team 5)

It was beautiful, it was productive, we had expectations from teamwork. It was good for time management. (Team 10a)

I loved to be able to say that what needs to be done was done when I got home. I really miss that task and time management right now in my individual program. (Team 10b)

Task management, which is one of the main cornerstones of teamwork, shows the power of teamwork by reducing the workload of students when well-designed. Therefore, an ***effective division of labor and time planning*** will make teamwork effective. This will reduce students' negative experiences and change their perspectives on teamwork. And even this will contribute to their individual success.

Subtheme 4.3: Workload

Expectations are higher in teamwork compared to an individual project. Despite this, it can be thought that a good division of labor and time planning will reduce the workload of the team members and they can have a more comfortable period (e.g., Team 5). *In well-managed teamwork*, the process is pre-planned and team members know what to do step by step, so they move forward safely through the project. It also helps them think of a plan B they can implement if something goes wrong. In a structured process, team members can more easily spare time for their other individual responsibilities too.

It was very enjoyable for me too. That's why my workload is very divided. I was much more comfortable than the individual. (Team 5)

As it was the first project of the year and they were conducting this seven-week-long process for the first time, the project, in general, was tiring for the students (e.g., Team 7). However, since the experienced studio team planned all the steps in accordance with teamwork while constructing the project, it became easier for the students to adapt to the process, construct the weekly steps, and divide the work (e.g., Team 9). The fact that the project steps are structured according to teamwork provides a great advantage for students who have been working as a team for such a long time for the first time and guides them.

It was exhausting when we were in the process but now when I look back, I could say, we worked well. (Team 7)

The management of the project process, in general, was also very good. It was very suitable and convenient for teamwork. (Team 9)

Individual differences within teams cause teams to adopt different working methods. Some teams preferred to divide the work and fulfill their responsibilities in different

environments individually, while others preferred to spend this process side by side, as they decided together how to work more effectively. Although it is observed that the students spend more time in the side-by-side study method compared to individual work divided, they create a more interactive working environment in simultaneous process management (e.g., Team 6). This contributes more to the development of students by supporting the *learning process from each other*.

we weren't working at home, so working together was more efficient although it took longer (Team 6)

Despite the good implementation of all the suggested steps, sometimes there are setbacks in teamwork that affect the process. Having different programs individually and finding a common time is one of the most common problems. Teams that have difficulty in *finding common time*, especially on weekdays usually have to do their work on weekends, which makes them tired psychologically. During rest and socializing times, long weekend working hours can increase the tension of the team (e.g., Team 6). Another thing challenges teams was decision-making processes. *Prolonged decision-making* processes can be tiring for teams, as individual contributions are not sufficient in idea development and decision-making processes and team leaders do not take the necessary initiative. The teams were advised to build this process well, to know how to stop, and by the leader's management of this process and to announce a decision as a result of voting. Despite this, these processes were tiring for some teams (e.g., Team 8). No matter how much it is designed, some unpredictable situations can adversely affect teamwork, such as different individual programs and unequal individual contributions in the decision-making process.

We met a lot, especially on weekends. (Team 6)

Those 7 weeks were very intense for us. there is a situation of understanding each other in the teamwork process and we cannot make a decision in any way. (Team 8)

When teams work effectively on a well-designed project, students' individual workload is expected to decrease. While most teams provide this situation, in some teams, a lack of individual motivation, intense individual programs, and individual differences can complicate the process and increase the burden on team members. Such teams may be offered alternative recommendations specific to their situation. Especially digital tools can offer a different perspective to teams at this stage. For example, being able to meet online provides many advantages in terms of time.

Subtheme 4.4: Team Meeting

In the 7-week project, the teams had tasks to complete each week. Despite the different working methods, the teams had to meet every week for these tasks. While the schedules of the team members are very similar in some teams, it is not difficult to *find common working hours*; some teams had trouble finding the time. In order to facilitate the meeting organization process, in the first week, I asked the teams to write down everyone's schedule on the sheet so that they could see their shared unbooked time. This would make it easier for them to decide on the day and time when they wanted to hold a meeting. While some teams did this, some did not choose to do it, but at the end of the process, they regretted not doing it (e.g., Team 6).

I wish you had analyzed and entered our free time. (Team 6)

While some teams could not find time to work at all during the week, some had the opportunity to work together during the week. Despite this, it was observed that all teams met and held meetings at the weekends. But meeting times varied from team to team. The teams that had the opportunity to work during the week started the weekend prepared and finished their work in a short time, while some teams spent longer working hours together. However, this situation was discussed with the teams working abnormally long hours and ideas were exchanged about why they lost so

much time at what stages and how they could work more effectively. Because it has been observed that the extended working hours wear out the teams and reduce the quality of the work done. It was suggested to these teams that they could hold an *online meeting during teamwork*, especially if they could not find time during the week. It was observed that a few groups that applied this were satisfied with this situation and were able to progress more effectively and quickly (e.g., Team 6). In addition, the online meeting is an advantage, especially for students who do not live on campus or have a busy schedule, that provides students to attend the meetings at any time and from any location. On the other hand, some teams state that online meetings were better for dividing the tasks and discussing the issues; however, it was not efficient while generating ideas (e.g., Team 10). Online platforms provide a great advantage, especially for the teams that cannot find time during the week and for shorter meetings. With teams that have difficulties in meeting organization and timing, the division of labor, time management, and expectations from the leader were also reviewed, and alternative solutions were created, and it was observed that the meetings of those teams ended at more reasonable hours in the following weeks.

The online meeting made us very comfortable. Compared to the physical meeting, it took less time. (preparation and transformation) (Team 6)

the online meeting was useful for dividing the tasks, but it was not very useful in generating ideas. (Team 10)

For more effective time planning, it was stated that it would be effective for the teams to determine the target for that day and divide the work accordingly, if they had not done it before, in the meetings. While some teams finalized this process during the week and met only to do the determined work division at the weekend, others did the division of labor first (e.g., Team 7). Although setting goals and division of work may seem like simple steps, when not done, teams lose a lot of time, and this reduces their motivation. In order not to forget what was said during the meeting, some teams preferred online platforms for *documenting the meeting process* (e.g., Team 3),

while others shared their photos in the WhatsApp group to write it down in their notebooks. The teams used different methods, especially in the meetings where they developed ideas and discussed ideas. The groups that lost a lot of time in this process were told that they could vote and leave the last initiative to the leader. Other than that, some teams chose to make a comparison and decide by writing down the advantages and disadvantages of the ideas (e.g., Team 6). These methods helped teams in dead-end situations and saved time.

When we got together, we were first deciding what to do together, then dividing the task and starting to work. (Team 7)

google docs is used for meeting notes. (Team 3)

If there were too many ideas, we were eliminating if we could no longer find anything on it. We were writing the pros and cons of our ideas (Team 6)

In order for having a smooth and effective teamwork process, it is important that the team members first share their individual schedules with each other and determine their common time from the beginning to be able to decide on team meetings easily and quickly. The teams with time constraints should not hesitate to use online platforms that facilitate the meeting process. In order to use the meeting time in the most effective way, it is important to set goals, distribute work, and know and acknowledge how to say OK to a majority of votes rather than unanimous votes in deadlock situations. These simple steps will help teams have more effective team meetings.

Theme 5: Teaching Teamwork

Subtheme 5.1: The role of Google Sheets document

In this team project, the students went through a teamwork process that they were not used to and had not thought about before. In this process, weekly meetings, a

one-to-one follow-up process and Google Sheets became the main elements of the process. This process helped students learn how to make more effective teamwork and solve potential problems. Seeing and evaluating the whole process through the Google Sheet help teams to evaluate the process better (e.g., Team 1). The Google Sheet provided many advantages to the students by making the teamwork processes visible. One of them was *the weekly calendar part* of the Google Sheet. The calendar part is the most used and beneficial part for them. To check meeting dates and see the whole week provides many advantages. It allows them to handle the process as a whole by incorporating suggestions for the next week's planning during the meetings (e.g., Team 2). Being able to review the previous weeks guided the teams while making plans. Seeing clearly on which day they could hold a meeting, who did which task and how much time they spent on that task, enabled them to plan their time and process more effectively. Although the teams preferred to use WhatsApp actively, it can be difficult to find the desired message among so many messages (e.g., Team 3). That's why Google Sheets file offers them an environment where they can handle the process more clearly and quickly. Although all important information is shared on WhatsApp, it loses its visibility among old messages.

to see and check what happened and when, what is next. (Team 1)

to see and remind the meeting dates. For example, sometimes we were really looking back. We met for 3 days, then when shall we meet. (Team 2)

It was very useful to be able to check the meeting time and date in the calendar section compared to the WhatsApp messages. (Team 3)

Since the teams had not used any online application for the teamwork process, they followed different processes while filling out the Google Sheet. It was suggested to note *fill immediately after making the distribution of tasks and decisions* (e.g., Team 1). However, some teams chose to take notes after the process was completed. Some team leaders even stated that they first noted the meetings in their notebooks

and then added them to the document (e.g., Team 10). Noting down on a paper is not suitable, it can be the easiest way but not the most effective one. It is individual use, not collaborative that other team members could not see it. Although the advantages of writing before and after the process were different from each other, the fact that recording the whole process provided transparency and visibility, which appeared to be one of the biggest advantages.

after the meeting, entering the details (for the division of the tasks, etc.), and if certain, specify the details of the next meeting (Team 1)

we had to write down the meetings. I wrote it down in my notebook all week. then I switched to excel. (Team 10)

Documentation of the team process increased the awareness of the team members about the process and supported their participation in the work on an equal basis. This also supported communication within the team (e.g., Team 1a). Teams, which had difficulty in making a balanced division of labor when the process was not visible, now contributed equally to the process of all team members because it was visible. For some students, it was observed that its visibility was a source of motivation (e.g., Team 1b and Team 5). Transparency of the process increases students' sense of responsibility.

regular follow-up and documentation increase the awareness and provide good communication (Team 1a)

There may be people who want to take the job just to make it visible. (Team 1b)
so people are afraid of "What did he write to me? there is a little task for me? We are now distributing the tasks. I took a little duty today. " (Team 5)

In most of the past experiences, it has been observed that the problems stem from the distribution of tasks and the related miscommunication. When students encounter

a problem, they expect support or sanction from their instructors. However, in such a situation that comes with a problem, the instructors can only listen to students and make sanctions that cannot satisfy the students based on verbal expressions (e.g., Team 2 & 9). The lack of concrete evidence puts both sides in a difficult situation. Making the process visible and planning regular follow-ups relieved the students psychologically. The fact that when there is a problem, it is easily visible and the perception that the instructors can intervene in the situation under these conditions enabled the students to focus more on their own processes (e.g., Team 5). Relations within the team were able to progress more balanced.

When the process was not visible, when a problem occurred, it was reflected to the teachers and there was no evidence, teachers could not do anything. (Team 2)

It was invaluable to prove the problems we expressed, otherwise no one could prove it to anyone and perhaps nothing could be done. (Team 9)

If something happens, we write. Anyone not working? " You know, this created a psychological comfort for everyone. (Team 5)

In general, although the teams were skeptical of the process at first, they used it more effectively and consciously as they saw the benefit in the following weeks. But in some teams, this situation did not go beyond doing just to make it happen. On the other hand, they stated that the purpose of this process was because it was not conveyed effectively enough (e.g., Team 10). However, although the first day of the project focused on how the students could work as a team more effectively in the classroom presentation and hand-out, it was not a very effective presentation for the students. Being independent of the research process and added to the project process can make the perception of students more positive. On the other hand, some teams stated that although they know that it is an item that is not even graded, they see it as an advantage and feel more comfortable while filling it (e.g., Team 4). It was filled

with the awareness of how it would be more understandable and effective to them, not in a way that educators would see and evaluate.

We did not know much about this contribution to us now. We did something for your research, but if we thought it would contribute to us, then I think we could follow it with curiosity and interest. (Team 10)

The fact that this would not be graded gave us comfort while writing the names of the tasks, we wrote them in a way we could understand them. (Team 4)

Some teams thought that (e.g., Team 2) for teams who can manage the process well and do not have any problems, this document can be seen as extra work. Although it is easy to keep the process in mind for short-term and not very crowded teams, making the process visible provides them with different advantages: awareness, being able to go back in the process when there is a problem, and time management. The students tend to aim at finishing the process, not learning something from the process. They refused to use the online tool, although they thought they have advantages.

Since everybody fulfills all their responsibilities, we don't need to control the process or take note of it. the excel document can be more beneficial in a professional environment. (Team 2)

Subtheme 5.2: Process Feedback

Considering that this research process is educational for the students while constructing the teamwork, *weekly feedback meetings* were held in order to better understand their process and produce solutions for their problems. In weekly meetings, 15–20-minute meetings were held with all the teams and how they spent that week and the problem were discussed. In this process, I aimed to increase the motivation of the students by displaying a completely positive and neutral attitude

and enabling them to share their problems easily. The interviews showed that this attitude really worked, and the students felt comfortable (e.g., Team 1). As I observed, a neutral environment of the meetings makes students relaxed and willing to participate in this process (e.g., Team 6). Otherwise, it could be difficult to complete this process, especially during the jury weeks (e.g., Team 4). Meetings became more productive the moment the students decided that I was **supporting them to have a more effective process** (e.g., Team 9). It can be said that the last meetings were more effective because it took time to gain that trust. But in general, it is observed that problems peak in the middle and towards the end of the process in teamwork. For this reason, it has been a great advantage for students to benefit more from the meetings during the most difficult times.

the meetings were always neutral from such a different side even in problematic teams. (Team 1)

I think your attitude was very critical in the process. It made it enjoyable to participate in this work. otherwise, we would complain. (Team 6)

It is more of a control mechanism, but well. In order to understand and improve us, not to judge us while controlling. I guess it's more like a person who makes constructive criticism. (Team 9)

If no one had checked this out, maybe we would have filled it for a while, but then we would probably have stopped filling in our busy periods like jury week. (Team 4)

Throughout the process, the teams defined these meetings from different perspectives. While some teams describe it as **support** (e.g., Team 2), some see it as **psychological relief** (e.g., Team 9 & 8), some as **problem-solving** (e.g., Team 3), and some as **getting advice**. All these roles changed according to the attitudes, current status and progress of the teams throughout the meeting. When teams with problems came, we tried to understand what the problem was, and then we came up

with solutions together (e.g., Team 7). We discussed how teams with time problems can use their time more effectively. We talked about the experience of the leader while the leader transformation and discussed how the next one can have a better process. There was no talk about the project they did during this whole process (e.g., Team 6). No such request came. With the increasing number of students, the time devoted to the design critiques is gradually decreasing. For this reason, it is impossible to evaluate the teamwork of the students and give them feedback in this process. Handling this process separately is also desired by students. Our only focus was on the teamwork process. The main goal was how a more effective process can be experienced, by always thinking about this, we ***evaluated the past experiences and developed recommendations*** for the future. Generally, this process proceeded extemporarily. So far, a wealth of knowledge from literature and the light of experiences as a student and studio assistant has guided me during the meetings.

You were a support, hocam. (Team 2)

It was nice to be able to explain our team dynamics and ideas to someone other than the studio team. weekly therapy. (Team 9)

Talking to you was comforting. (Team 8)

During the weekly meetings, it was good to be treated as an outside eye and to suggest that if there is a mistake and evaluate the previous leader and make suggestions for the next leader. (Team 3)

Evaluating the previous process with you and talking about why there was such a problem brought a solution. (Team 7)

The focus of critique sessions with the educators was our design processes and we were talking about it and getting information; but the subject of our conversation with you was our teamwork and we could talk about it. We were learning how to improve our process even if it wasn't a big problem. (Team 6)

In studio projects, especially in long project processes such as 7 weeks, students can lose their motivation after a while. One reason for this is that at the end of a tiring first few weeks, some students cannot gather their energy, while others have difficulty in carrying out the process due to some external factors. Regular follow-up and regular meetings made the students more active, supported their motivation and allowed them to adapt to the process better (e.g., Team 3 & 9). Having a control mechanism gives the team members an advantage over each other. They can motivate other team members more comfortably. Otherwise, it can be difficult to convince such a new thing to use it in their team. Even just hearing that what they are doing is right improves the psychology of the students in a positive way (e.g., Team 5). In addition, it brought a balance within the team in this regard. It made it easy for all team members to move forward in a balanced way and it has been observed that even knowing that there will be meetings motivates the teams in general (e.g., Team 4). On the other hand, third-year university students are expected to take their own responsibility and create their own discipline. Since this responsibility only affects herself in individual projects, the student usually does not worry about what she or he has to endure. But in teamwork, losing a team member in the middle of the process makes the process difficult and affects all the members. For this reason, the activity that will *stimulate the motivation of the students in the teamwork* process will contribute to the balance within the team and the progress of the process.

Our motivation increased when the meeting went well (Team 3)

Maybe that person who will not work has to be motivated to work just because he is controlled. This is a good thing. (Team 9)

Yes, you worked, you are doing well." Even saying it increases our motivation a lot. (Team 5)

The meetings remind us that we need to keep up to date, we should not stop this thing, we need to follow this. It was promotive. (Team 4)

As mentioned above, in the weekly meetings I was giving advice to students about what to do next week, how to schedule a time and how they can develop their working process. This talk increased the students' *awareness of time management* (e.g., Team 5 & 10). One of the most important points in teamwork is to be able to plan well. My observations showed me that the students started the process without making a plan, which caused them to lose time, resulting in long meetings that did not end and even lasted until the morning. For this reason, I tried to show that they can progress this process much more easily by proceeding with a good plan. In accordance with this purpose, giving suggestions for the next week's planning and presentations during the meetings were seen as beneficial. They were not good at time management. I was giving suggestions for effective time management and also we were doing the schedule together (e.g., Team 1). Weekly meetings allowed the studio team to evaluate the retrospective process and solve problems immediately, if any, to make a better plan for the next week (e.g., Team 2 & 6). I think it was much more effective to talk about the deficiencies and give suggestions over the past process. Evaluating the process concretely during the process increased students' awareness.

I think we learned planning while talking with you. Our meetings with you taught us the importance of planning. (Team 5)

you are encouraged to be organized. (Team 10)

giving suggestions for the next week's planning during the meetings was helpful to plan the next week and guided us while planning the process (Team 1)

It was very good that you could see the past and make suggestions for the future. (Team 2)

It was nice, it was good to get comments on our previous week. You give us a suggestion, this was improving us. (Team 6)

The students during the interviews stated that the meetings held were very valuable and contributed to their processes. Another issue that was discussed was the *frequency and number of these meetings*. While the teams found the meetings sufficient in general, some teams stated that these meetings could be held more frequently, especially in the first weeks (e.g., Team 4, 6 & 9). Most of the teams for the general speech on the first day were not clear about their expectations from them and how they would conduct the process. Although this process became somewhat clear with the one-to-one meeting held in the first week, in the second meeting, the process became clearer for the students. Considering that they are doing this process for the first time, it is normal for students to experience such indecision. In order for this process to be completed within the first week, one-on-one meetings with the teams could be held on the first day. Incomprehensible points could be cleared up on the following lesson day as well. But this will be extra time-consuming for the educators who carry out this process. Therefore, a detailed written document including examples and steps, and routine follow-up in the process may be a more effective method in terms of time.

especially the first week's meeting was good. To talk about points that we don't understand. (Team 4)

in order to better understand the process, more frequent interviews could have been done at first, then it can be reduced. (Team 6)

More frequent meetings could be held at first to better adapt to the process. (Team 9)

In studio courses, students are followed and guided by educators with regular criticism. The main focus of these crits is the design process. Students who study for the critiques have the chance to receive critiques at every step they developed. Critics occupy an important place in the project calendar. However, in these regular follow-ups, students can only get a chance to show the final product and get criticism over

it. It is not possible to follow the studies and processes carried out until that stage. But the interviews showed that the students want their instructors to see the process up to that process as well as the result (e.g., Team 3 & 7). In some cases, despite spending a lot of time, not being able to make progress or not reaching the desired level, it is expected that the *effort spent is seen by the educators* and value the process. The filled-out Google Sheets file showed how much time the students spent, and this situation was evaluated one by one in the meetings, which was pleasing to the students (e.g., Team 5a). It was a motivation for them to feel that what they did was worthwhile. Regular one-to-one follow-up also provided early detection and rapid resolution of problems (e.g., Team 5b). It is very important in terms of the teamwork process to detect the problem from the beginning and to intervene and solve it immediately, to prevent team members from wearing each other too much. Since the students had problems with teamwork in their past experiences, they were hesitant to help because they perceived this situation as talking behind someone's back and complaining (e.g., Team 5c). In terms of the educators, it will be difficult to produce a solution without concrete evidence, so this situation leads to conflict. In this process, sharing the problems and producing solutions together made the students feel comfortable. Regularly filled task and time management documents supporting weekly meetings will be useful for *monitoring exactly what teams do and how much time they spend in the process* and whether there are any problems at these stages, which is a valuable step for students and contributes to their processes.

I wish the teachers could see how we work (Team 3)

It would be important for educators to be aware of the effort given. (Team 7)

a friendly conversation gets better. We need to tell someone how much effort we put into it, and these weekly meetings could take a little bit. (Team 5a)

It is a very valuable contribution that someone follows the process of teamwork closely and can timely intervene in case of a problem. (Team 5b)

When I had problems with my old teamwork, nobody intervened, I was not told whether I was right or wrong. I felt like going and saying something to the instructors will be complaining. (Team 5c)

Although the general attitude and thoughts of the students towards the weekly meetings are very positive, it is not possible to follow the students so often in a normal education system. Since I was not one of the studio team members, I was able to spend a lot of time with the students. However, it is unlikely that one of the studio team will devote that much time to it. On the other hand, putting the teamwork process in writing and knowing that the educators can refer to this document when necessary, can motivate students and solve some problems. In addition, at the meetings that will be held once in the middle of the project, although not weekly, feedback can be given about how the processes of the teams are going. Considering that the second half of the project was more intense, the feedback will have a positive effect on the students. At the end of the project, a report on teamwork can be received from the students and a meeting can be held when necessary.

Subtheme 5.3: The control mechanism - Grading

The instructors agreed that this whole process should not be graded, it was discussed with the students whether they would like such a control process to be graded or not. Since it is very difficult for students to do something voluntarily during the education process, they often turn into tasks that are matched with small percentage grades. Students *feel more responsible for the stages they know will take grades*. Therefore, if we had said that the Google Sheets file filling process would be graded, maybe it could be filled in more carefully and regularly, but this would not meet our expectations from the process in general. Even the team, who thought that the grade was the way to get the student to do something, stated that this situation was against the purpose of the process (e.g., Team 1).

The easiest way to get everyone to do it might be to give some points. But grading it a bit deviates from its purpose, I think. (Team 1)

If this process was graded, the biggest problem the teams pointed out is the objectivity of the process (e.g., Team 1, 2, 5, 8 & 9). The comments and notes of the students on the Google Sheets file and in the meetings would be completely grade-oriented and would lose their credibility. The students might not reflect on this objectively and this could also affect the team climate negatively. In addition, grade anxiety can push students to act differently, and this negatively affects their learning process. Since grades would be given, the teams would be more careful while filling in the table and they would spend more time on each sentence they wrote (e.g., Team 4). This would cause the process to slowly drift away from its purpose. They were trying to do what should be, not what they actually did. In this process, real problems could not be identified, problems could not be solved, and the process could not be an instructive process. Creating a neutral environment and not grading the process enables students to be more objective, which enables them to intervene in teamwork more effectively and give suggestions in a more comfortable way. If we want students to be straightforward, it is best to stay away from the grading process. On the contrary, the grading process could have caused the students to lose their interest in the process by lowering their motivation on the subject (e.g., Team 6). This will negatively affect the learning process and the focus will shift to how to get the best grade rather than learning how to manage an effective study process.

If it was graded, we would lie. (Team 1)

*If we knew that this process would be graded, we wouldn't be objective to you.
(Team 2)*

Normally I don't tell everything if I know it will affect my grade. (Team 5)

If it had been graded, we would have filled it out differently. (Team 8)

The grading definitely reduces the sincerity because when it is graded, the things you write there start to be insincere. You can write things that are not real. (Team 9)

If this were graded, we would spend more time on how to write tasks. (Team 4)

If you had given us a grade, we would not be able to speak comfortably and we would have done this process very angrily. (Team 6)

Although the teams agree that this process should not be graded, one of the biggest problems encountered in teamwork is the unbalanced workload and the problem of getting the same grade despite this. For this reason, the students stated that in a bad scenario or situation, it would be good to use these tables and meetings as evidence to influence the grade individually (e.g., Team 1 & 3a). Even knowing that these tables can be used in a bad scenario will increase the motivation and responsibility of team members for the given tasks. In such a case, ***keeping written evidence of work done*** will minimize potential problems. There are also those who think that the whole process should be evaluated in terms of individual learning success and affect the grade (e.g., Team 4). In order to see the individual contribution to teamwork, individual sketchbooks are usually collected and evaluated and the difference between team members is tried to be revealed. Similarly, those who support the teamwork process can be graded individually by measuring who goes through the process better and individual effort. However, at this stage, which criteria (e.g., ***a balanced division of tasks, time planning, leadership or individual contribution to teamwork***, etc.) should be graded and which ones should not be graded can create a problem. It is a difficult process to create and grade the measurement chart of these criteria. This process was not built on grades, but on how design students would conduct a good teamwork process (e.g., Team 3b). That's why the aim is to teach students the teamwork process and how it should be like that. Associating everything with grades in education causes students to move away from the main focus. For this reason, creating an environment where they can easily share their experiences and

even problems and create solutions together has provided an advantage to the teams (e.g., Team 3c & 6).

Grading could be used in bad scenarios. In very negative situations, I think it would be better for everyone to know that what you do may come back to you like this. (Team 1)

In very problematic situations, this table can be used as evidence. (Team 3a)

It should be graded. After all, I think teamwork is important that we learn this too, it should definitely be graded, like sketchbook (individual effort). (Team 4)

I don't think this is sth to grade. This is a method and we tried it and succeeded. This document is how we go through the process, something made for us, not for the educators. (Team 3b)

Not being graded was relaxing and I did it with more pleasure. (Team 3c)

It was very comforting to know that you will not grade us and to speak Turkish. (Team 6)

Although the students did not want their work to be evaluated, they stated that it would be good to evaluate both their designs and processes in the final jury, especially since I closely followed all their processes (e.g., Team 1 & 2). They think that it would be fair to evaluate their processes in the final, since I followed exactly how much effort they put in and what kind of process they went through. The neutral environment of the meeting and to have the opportunity to examine their whole process give confidence to students to be graded by me. In addition, the fact that someone who follows their processes so closely is there in the final gives students' confidence while presenting their final designs (e.g., Team 5). Although this is a reasonable request, in a similar process in the next project, students may have prejudices against the instructor because of the grade given. Therefore, it may be a

good idea to give feedback to other educators and give a short report on how teams' processes are going.

I think it was okay even if you gave a grade. It might be because I think you are evaluating objectively. So, it wouldn't be a problem if you took grades. (Team 1)

Since you have the opportunity to observe our process in detail, I don't see any harm to grading and it would be better. (Team 2)

As someone who knew our process closely, it was nice to be on the final jury, (Team 5)

According to their past experiences, the students tried different methods to demonstrate ***individual contribution in teamwork***. In general, the idea of ***evaluating their teammates and friends did not seem reasonable*** to the students. Because factors such as friendship and sincerity, especially originating from Turkish culture, prevent students from being objective (e.g., Team 1 & 8). In both good and bad ways, the students may take advantage of this process. Every team member can be given the highest grade despite the problems, or they can give a team member they don't like a low grade even though s/he does not deserve it. Generally, students do not prefer to be in such a situation. They point out that the idea of evaluating their own friend will prevent them from being objective because of personal relationships (e.g., Team 6). However, students who are able to be objective argue that this will be effective (e.g., Team 10). It is thought to be an effective solution especially when there is a big problem. But in general, it does not seem fair to provide this objectivity and to affect the results of the students as grades. On the other hand, if this grading process could be supported with written documents that show team performance, these grades could be more valuable.

giving grades to each other after finishing the project, personal problems and friendships affected grading and so, that was not objective. (Team 1)

He wrote me good things; I can't write anything bad to him. (Team 8)

I think it is very wrong for a person to grade someone who is his / her teammate in such a project because we have social relationships, individual disagreements, experiences, something, and it is very difficult for us to be objective in this regard.

(Team 6)

He went to the jury with us, who never attended the assignment. We evaluated each other at the end of the project. I gave it zero. It was a good method. (Team 10)

Evaluation of team performance and/or individual performance in teamwork is very difficult but must be done. Knowing that it can be used at least when there is a problem, if not under all circumstances, will affect the performance of students in teamwork and reduce potential problems. In teamwork processes, it should be an important criterion for students to at least keep track of the task management including divisions of tasks and the details of team meetings and make that visible to all members. If team members are to be requested to evaluate each other's processes, supporting evidence must be available. Otherwise, the evaluation cannot be objective and may negatively affect the teamwork process.

Subtheme 5.4: Collaborative design teamwork skills

In a structured and planned process, teams realized that teamwork is actually a good process when executed well, and even reduces individual workload too (e.g., Team 1). Also, the students realized that with a good division of labor and good time planning, everything can be finished in a reasonable time (e.g., Team 5). It has been observed that in general, especially in teamwork, students complete their submissions at the last moment and spend long working hours. It is a good contribution for students to *discover the importance of time planning* for both their individual and teamwork. In addition, this reduces students' biases toward the teamwork projects. These positive contributions caused students to question why this process was not taught earlier, maybe in the first grade. However, in first year

students have different concerns, just started university, a different discipline, they have not done teamwork before, and they have no idea how to do it. First-year students have different priorities. Another reason is that teamwork projects are usually one-week long. One week is not enough to teach or improve the teamwork process. However, certain rules and important notes can be reminded before all the teamwork processes. Until they come to the third year, they all change in this regard. They have all learned a lot and can focus on new things easily.

The best thing I've learned about teamwork is that it really can be good. If done properly, teamwork can be a good thing that can reduce workload. (Team 1)

If you plan properly, everything catches up. (Team 5)

In first year, such a study can be done, and the teamwork process can be taught. (Team 2)

Subtheme 5.5: Conflict management by researcher

When students encounter a problem in team projects, they either ignore it and try to make up for the deficiencies with their own efforts, or the teams that fail to do so reflect this situation to the studio instructors for help. Apart from all these, there may be methods used by the educators, such as the evaluation of team members at the end of the project and regular reporting on each other's progress during the process. In either case, we are not actually teaching students how to come up with a solution when faced with a problem. However, during this research process, possible problems were noticed before they grew in regular meetings, and since solutions could be produced immediately together, no big problems were encountered in the teams during the project process.

The teams used the regular meetings for their problem-solving process, as they knew that when there was a problem, they could easily explain it and that a solution would be found (e.g., Team 1 & 4). In the meetings, all team members are encouraged to share teamwork related problems, then the problem was defined clearly and we

discussed how we could overcome it together and develop solutions together. ***Talking about problems interactively while producing solutions together*** made it easier to find the most suitable solution for that team. This gave positive feedback to the team's performance. All the while, the teams learned how to handle the problem. Although I am conducting this whole process as a researcher, team leaders can easily ensure this flow within the team.

"Anyway, you will see Itir Hoca this week, you can tell her." (Team 1)

We did not have a problem, but if we did, the meeting would be a good opportunity to convey it. (Team 4)

Due to the feature of the Google Sheets, I was able to encourage teams that were not aware of their problems or were hesitant to tell them despite all the opportunities (e.g., Team 1). When the team encounter a conflict, they thought that there is someone they can ask for help. We were able to talk about possible problems by questioning a small anomaly in the table together. The Google Sheets online tool was used as evidence that reflects the teams' processes. Even if it was a little difficult, we could find the problems under the discussion of the unbalanced work distribution in the tables or the reason for the very long meetings, even for the teams who were afraid to talk about their problems based on their previous experiences. This helped us find a solution before it got too big. Knowing that the whole process would be discussed in detail in the weekly meetings gave the students confidence (e.g., Team 6). Some students are better at explaining, while others are not. In this case, the data in the table give us clues about the problems and for conflict management, the weekly meetings had a significant impact.

during a problematic situation, the process shown in the excel file can be evaluated. (Team 1)

Discussion through the excel file in the weekly meetings was like therapy where we solved problems. (Team 6)

Students think it would be good if someone outside the team manages the process of identifying team problems and generating solutions (e.g., Team 1 & 2). However, up to a certain point, they need to ***acquire the skills to solve problems within themselves with the guidance of a leader***. The important thing in this process is that everyone takes the floor and explains the problem, as a result, the leader can define the problem with a somewhat neutral and general view, and produce a solution by talking together. In this whole process, they need to be able to be open to communication and solution-oriented (e.g., Team 3). Of course, support can be requested from the studio team for problems that cannot be solved themselves, and in this case, support can be obtained from regularly kept tables as evidence of the problem. This process will increase the problem-solving, leadership and communication skills of the teams. Only the most important point will be to encourage students in this regard.

someone who manages and consults this teamwork process can be a key element in the studios. (Team 1)

Well, a problem can actually be solved, but one has to think about it and organize it. Someone outsider might be better at finding solutions to problems. (Team 2)

being moderate and positive is important, when faced with a problem, stay calm and try to find a solution. (Team 3)

Problems seem to be one of the indispensable elements of teamwork. Even teams that thought they get along well, may encounter minor problems. The important point is to ***produce solutions before the problems grow***, to gain this skill within the team first, remind the leaders that this is a responsibility, and encourage them to ***make regular documentation to avoid possible problems***. Since these two conditions are provided, the teams will be able to better organize the process within themselves, and the educators will be able to help the teams more easily.

Theme 6: Shared Leadership

Subtheme 6.1: Leadership selection

Another skill that students should acquire during the teamwork process is leadership. For this reason, I think it is important for students to experience this skill, especially in an educational project. It is critical that all students experience this experience and try themselves in this position in equal educational conditions. Another important point is that giving the leadership responsibility to a single student in educational projects or not being a leader causes different problems. Lack of leadership causes disruptions in the teamwork process, especially problems arising from lack of organization. For the sole leader, it may destabilize relationships within the group, and it would be unfair to delegate this responsibility to a single student. All these reasons brought us to the rotational leadership process in this process. In this process, each team member would lead 10 days of the 7-week project. Due to the feature of this rotational system, all students had the opportunity to test their managerial skills, albeit briefly (e.g., Team 7). If a leader is chosen, it is usually expected that the most successful student, who with the highest academic average, will be the leader, and other team members may accept this situation (e.g., Team 5). However, good academic success does not mean that s/he will be successful in leadership. Even so, it should not prevent other students from experiencing this process and role as well. All these reasons point out that a rotational process for equal conditions in education projects will bring much more fair and successful results.

It was nice that everybody tried this. (Team 7)

I have higher grades, I know better. " and other team members leave it to him. I think everyone should be given the opportunity, equal chance., to be a leader.

(Team 5)

In the *rotational leadership system*, the project process was divided into four equal parts: the research phase, the co-design phase, the preliminary jury and the final jury

process. It was expected that each team member from the four-person team would choose one of these stages and lead the 10-day process. In this process, the teams were left free to decide how they would divide. But at the end of the process, I realized that in this process, certain clues can be given to the teams, and they can make a more conscious distribution than randomly. In this process, some teams applied their own tactics and rules in this regard (e.g., Team 9), while some made a distribution according to their personal schedules (e.g., Team 6), and some made a random distribution (e.g., Team 7).

we decided strategically. I bought the codesign session because I love children very much. Y... took the preliminary jury section because she was disciplined. (Team 9)

we decided from the beginning who is the leader when., according to our personal calendar. (Team 6)

I asked the first week, does anyone want to be a leader? no. Then I thought it was easier for the first week anyway and I became a leader. (Team 7)

During the interviews, ideas were exchanged with the teams on who would take which stage would be better or how the leadership stages could be determined. The most dominant subject in this process is the first week and the last jury week. In the first week, it was thought that a more energetic and more social person who could ***integrate team members more easily and revive the team spirit*** (e.g., Team 2), or someone who had previous experience in this matter would be more effective (e.g., Team 3a & 4). Since the attitude of the first leader is a factor that affects the whole process (e.g., Team 3b), it may be important for someone who is willing, experienced and energetic to be the first leader. A good start not only sets an example for other leaders, but also increases the motivation of other team members to do better. On the other hand, considering that it is the most stressful and intense period for the jury week, it was stated that more disciplined and more motivated group members who can cope with stress better would be better (e.g., Team 5). A leader who is less

motivated or stressed will find it difficult to assemble the group and organize the process during the jury week (e.g., Team 9a), so a highly motivated leader will conduct it much better. Leader selection can be made according to the requirements of the process *personal traits can affect leader selection*, such as being more social in the first leader or better stress management of the leader in jury week (e.g., Team 9b). That kind of strategies could support and enhance the teamwork process.

personal traits can affect leader selection, such as being more social in the first leader (Team 2)

Those experienced in leadership can be good candidates to be the first leader. (Team 3a)

It may be better for someone with previous experience in these matters to be the first leader. (Team 4)

The first choice of leader affects the attitude of the teams towards this situation. (Team 3b)

In the final period, someone calm can be the leader. (Team 5)

I think I could be a better leader if I were the first leader. Because I am a very stressed person. That's why I can't manage situations very well. (Team 9a)

The draw is very wrong. I think anyone can manage a certain process. For example, while some can adapt very easily to that entry process, some of them who don't panic can lead the final process. (Team 9b)

Another suggested strategy is that leaders can be chosen based on their interests and experiences. In terms of the project topic, those who thought that it could be more effective in the development of ideas due to the individual interest in the subject of the project can lead the idea generation phase (e.g., Team 5 & 6). The project specifically focused on children as a special user group, and co-design sessions were held with children for two weeks. It was suggested that it would be good for people

who think that they can manage the process better with children, could take that process (e.g., Team 3). *Interest in project subjects, experience with the target group, and interest and experience in project stages* can be some of the issues that team members can consider while determining their leadership stages. Personal interests and personal characteristics come to the fore at this stage.

Leadership can be determined according to the areas in which we are good. (Team 5)

Leadership selection could be done according to the experiences. (Team 6)

She could get the co-design part because she got along better with the children. In the final part, an enthusiastic person whose motivation does not fall easily can be a leader. (Team 3)

Apart from choosing a leader, when I asked them to choose the best leader in the whole process, what qualities should be in a good leader, and why they thought that way, certain characteristics came up. One of them is practical (e.g., Team 2). Because, although it may seem like a long project, leaders who are practical, who make the decision-making process easier and who can act quickly in time planning can build the process much more easily. Apart from that, another feature that stands out is motivation (e.g., Team 4). The students who tend to lose their motivation in a long and tiring process may have difficulty in leading and managing the process. Another feature is being organized. Leaders who can adapt to the process immediately and make good time and task planning make the process of their teams easier. In the meetings, I supported the leaders by increasing their motivation and giving suggestions about how they can be more effective in good planning. The recommendations from these meetings allow students to develop more effective leadership.

Best leader was practical, and quick on decision making. (Team 2)

Best leader was motivating and regulating. (Team 4)

Another important issue affecting the choice of leadership is the number of students in the teams and the equal division of the project process depending on the number of team members. The processes that can be divided equally according to the number of team members will ensure equality within the team. It will also be sufficient for each team member to carry out this task for approximately two weeks. It will be difficult to adapt and progress to the task in a period of one week. A task longer than two weeks can also cause students to get tired of this task. If necessary, maybe the number of rotations can be increased. As mentioned above, the personal characteristics, personal interests and experiences of team members are important elements that can help students decide which stage to choose for leadership.

Subtheme 6.2: The responsibilities and role of the leaders

Despite the fact that all students take on different responsibilities in the rotational leader system, experiencing this task has changed the students' perspectives on leadership and teamwork. The students stated that they appreciate the provision of this equality and the opportunity for everyone to have this experience (e.g., Team 2 & 5). It also helped some students overcome their fears and anxieties and unlock skills they had never used before (e.g., Team 3a). At the end of the process, it was a great gain to see that it was not an experience to be afraid of and to be encouraged in this regard (e.g., Team 3b). Equal educational conditions and opportunities will ensure that students can relieve their possible anxieties. The shared leadership process helped to equalize the balance among the team members. It created an opportunity for students who had not taken leadership before to experience this and created a more comfortable environment and allowed students to discover themselves (e.g., Team 8 & 9).

It was nice that everyone had this experience, and this provided equality. (Team 2)

Shared leadership creates equality within the group. (Team 5)

I was afraid at first when you said everyone will be a leader. I didn't want to take that responsibility, but after the first leader, I said I can do it too. (Team 3a)

Actually, it wasn't a terrifying experience. In other words, I think it is very valuable that everyone has such an experience in an education project. (Team 3b)

Because some people never lead in their lives. They pull back but it has to be here. So it tastes. Everyone tastes it. (Team 8)

It is very nice for everyone to experience that leadership and get that responsibility. For example, everyone's different abilities emerge. I think it is very valuable for people to be able to show them, to express themselves. (Team 9)

In the introductory presentation of the project on the first day, a brief introduction was given to the students, about what is the role of a leader in a team. But it was emphasized that the task of filling out and organizing the Google Sheets online tool belongs to the leader. The definition of other tasks became clear in the process. Each team defined differently the leader's work, but the common point of all teams was to fill out the Google Sheets file. Apart from this, the tasks specified by the teams are: making reminders (meetings, tasks, deadlines, etc.), making submissions (uploading assignments to the ODTÜClass), making distribution of the tasks and following the tasks, being a moderator during the meetings and increasing the motivation (as seen Table 5.5).

Table 5.5 The responsibilities of the leaders based on teams' reported

| | Filling the Google Sheet | Making Reminders | Making Submissions | Following the tasks | Beings a moderator | Making distribution of the tasks | Increasing the motivation |
|---------|--------------------------|------------------|--------------------|---------------------|--------------------|----------------------------------|---------------------------|
| Team 1 | X | X | | | | | |
| Team 2 | X | X | | | | | |
| Team 3 | X | X | X | X | | | X |
| Team 4 | X | | X | | | | |
| Team 5 | X | | | X | | | |
| Team 6 | X | | | | X | X | |
| Team 7 | X | | | | | | |
| Team 8 | X | | X | X | | | |
| Team 9 | X | | X | | X | X | |
| Team 10 | X | | | | | | |

Giving the responsibility of the Google Sheets file to the leader as a task, contributed to the regular filling of the document. Otherwise, everyone would expect this task from other team members and there would be setbacks. It can be said that this task works well for the leaders in all teams, despite some setbacks. On the other hand, assigning this task to only one person could cause different problems, such as the student could get bored with this task and not want to do it, and as a result, could not show enough care (e.g., Team 3a). Another most common task that appears among the leaders was the online submission of assignments. Although I did not tell anything about this task, the teams created such a sense of duty within themselves, and it worked very well. **Regular and timely submission of assignments** is important for studio education. When a person defined in the team did this task, possible problems were prevented. While it is enough for only one person from the team members to upload, sometimes each of the team members uploads the same thing or

different stages of an assignment, making it difficult to arrange and check the assignments for the studio team. For this reason, the leader's taking this task gave an advantage to both parties. It also creates an opportunity for the leader to check the latest work. Another task leaders made was being a reminder. Some team leaders have carried out the process of *reminding the meeting day, the due date of the assignment, or the task list* in order to move the process forward in a more controlled manner. This increased the awareness and responsibility of the leaders about the process. In connection with this, some leaders also organized the tasks to be done and provided regular control of it. They followed up on whether their teammates did the given task and at what stage they were. This follow-up provides a great advantage to the teams in case of a possible setback in terms of time planning. In some teams, the leaders tried to motivate their teammates with a performance far above the expectations and support each other in the process. Leaders in another team *moderated the meetings and managed the discussion environment within the team* under equal conditions and, when necessary, made the final decision. Since all these tasks are not written, sharing of experience in leader exchanges will help leaders to complete these tasks easier (e.g., Team 8). All these tasks contributed to the more effective progress of the team process and enriched the leadership experience of the students. Having a leader who did all this planning, organizing and reminding helped the teams to have a more effective process (e.g., Team 10). In general, the role of the leader and the planned progress of the process ensured that the process went through with the least amount of problems (e.g., Team 3b).

Shared leadership was good for sharing the responsibility and not constantly carrying this responsibility. It was also good for filling the Excel file. The same person wouldn't want to do this all the time. (Team 3a)

When leadership changes, the old leader can tell the new one what he has done. delivery of duty. (Team 8)

I think there should be a leader in the team, it will be effective in tidying up the process. (Team 10)

*I think one of the biggest reasons why the class is so good for the general is that this planned process (excel, shared leadership...) **Being a leader increased the sense of belonging and responsibility.** (Team 3b)*

Another phase where teams have difficulties and lose time is the decision-making process. They went through a decision-making process regarding the design-related decisions and the division of labor within the team. At this stage, each team applied its own method. Especially in the task distribution stage, the teams generally adopted the joint decision-making process and divided the work according to the good characteristics and wishes of the team members (e.g., Team 1 & 2), while one team that may be the only team that leaves the process of making the division of labor to the leader (e.g., Team 6). At this stage, leaders took advantage of who had done what in the previous week. But I think it was a big responsibility for a leader in a studio project. Trying to be fair is not an easy process, and it needs to be done in a way that all team members agree with and have their opinions expressed. At this point, it was suggested to the leaders that they could only manage this process, listen to the demands and draw up the appropriate list accordingly. Similarly, during the design decisions process, warnings were made that these decisions should be taken by the whole team, not the leader, but that the leader can **manage the decision-making process, request a vote when necessary, and prevent unnecessary waste of time.** Giving the whole group's responsibility of decision-making to the leader, especially in an educational project, is a great responsibility to be given to a student. When the leadership process is announced, the students thought the one who gives orders and tells them what to do. However, the roles of the leader in this process could be only to follow the tasks, to remind the meetings and deadlines, and to fill the document regularly not getting the whole responsibility.

Shared decision making while the division of the tasks (dividing tasks according to their good sides). (Team 1)

While dividing the tasks, we decided as a team. The responsibility of the team leader was to fill in the excel document. (Team 2)

Trying to be fair while distributing tasks was tiring. (Team 6)

Apart from what they do, it has been observed that the leadership title imposes a different sense of responsibility on the students. They stated that the students who became leaders examined the process with a different perspective, responsibility and motivation, and they worked harder in that direction (e.g., Team 1, 5 & 7). The task of what stage they are in, following the tasks to be done, arranging the meetings, and following the process increased the domination of the leaders over the process, and I think that this has a positive effect on the general motivation of the students in the project (e.g., Team 6a). This difference provides team members to own their work more and contribute more to the process. In addition, the leadership role encouraged the students and allowed them to convey their ideas more easily, perhaps in situations where they would not be silent under normal circumstances (e.g., Team 4 & 6b).

The shared leadership increases the sense of belonging and responsibility of all team members. This provides balance within the team. Otherwise, some team members can be more dominant while others prefer to stay in the background.

Being a leader gives more responsibility. "Let me do it now". (Team 1)

Being a leader felt responsible. I think it was good to be a leader in terms of dividing the work and being planned. (Team 5)

The title of leader gives responsibility. Shared leadership provides everybody to take and to feel this responsibility and that forces us to work harder. (Team 7)

Shared leadership really made sense. I am also very satisfied. Because you understand and learn the process when you become a leader. There was responsibility, I have to do something for the others and think of everything and so on. That was nice. (Team 6a)

The leader felt a sense of responsibility, let's do a division of tasks. maybe he wouldn't say normally, but he did. (Team 4)

being a leader gave us the right to intervene in the process. (Team 6b)

Although leadership gives students extra responsibility, it is observed that this gives them comfort when they are not leaders. That prevented some students from the feeling of being alert all the time (e.g., Team 6 & 10). Even, knowing that there is a leader, the leader will think and organize and having a defined person to do these things relieved them. In fact, in long-term teamwork projects, sharing this stress among team members prevents them from getting tired throughout the process in general. There will be some periods that the leaders will get tired of this responsibility when constantly undertaking this task. However, this short-term, fast-paced task allows students to be more dynamic within the team (e.g., Team 3).

"I'm not the leader." trying not to think about everything. (Team 6)

I was able to put myself back a little because someone took the responsibility for leadership. I like it. (Team 10)

The change of the leader kept it very dynamic and created a new excitement. (Team 3)

Documentation of the team process is one of the main tasks of the leader. Depending on this task, process monitoring and reminders seem to be tasks undertaken by the leaders. In addition, the teams' assignment tracking and submission increased the responsibility of the leaders. Since feeling more responsible will increase students' sense of belonging and motivation, performing this task alternately, even for a short period of time, increases their awareness of the process within the team. At another point, providing equality through shared leadership divides the responsibility and ensures a fair balance for the workload.

5.5 Summary and Discussion

The process provided a very rich view, since the data were collected from different channels such as observations, weekly meetings, excel documents and in-depth interviews. All the data is analyzed in detail and themes are categorized and strategies are defined to facilitate a more effective teamwork experience. All these research stages and results highlight some important points. Some of the prominent themes according to the results of the research and the problem areas and emerging statements related to those themes are brought together in Table 5.6. These themes, which emerged as a result of interviews and observations, and related findings are briefly summarized below.

Table 5.6 Emerging Themes from the Research Stage II

| <i>Emerging Themes</i> | Emerging Statements and Problem Areas |
|--|--|
| <i>Introduction</i> | *Significance of the face-to-face meetings in terms of understanding the process and expectations |
| <i>Team Forming</i> | *Fair, equal and problem-free team building process *Ensuring diversity within the team for effective teamwork |
| <i>Task Management via online tools (Google Sheets)</i> | *Encouraging students to use online tools (familiarity and time effectiveness) *Easily accessible and easy-to-use programs *Using on multiple devices (mobile phone, computer and tablets) *Perceiving filling out Google Sheet file as an extra and tiring task *Time to use the tool (after / before the completion of the process) (process tracking – documentation) *Flexibility of the tool - allowing for customization *Necessity of instant notification when making a change in the document to provide interactivity *Necessity of the definition of the task, who will do it, when it should be done *Visibility of the teamwork process and easy of process tracking *Being the process visible and transparent for the instructors *Providing self-assessment and raising awareness with visibility in the division of labor |
| <i>Division of Labor</i> | *Difficulties in defining a task (task description) *Difficulty of distinguishing a clear division of tasks in the process of physically working side by side *Keeping track of to-do, doing and done tasks (online and accessible checklist) *Importance to specify the workload for a more balanced division |

Table 5.6 (continued) Emerging Themes from the Research Stage II

| <i>Emerging Themes</i> | Emerging Statements and Problem Areas |
|-----------------------------|--|
| <i>Time management</i> | <ul style="list-style-type: none"> *Significance of the use of common calendar in terms of time planning and following the whole process *Challenge to find common time due to the individual differences *Significance of setting due dates for the divided tasks |
| <i>Team Working Methods</i> | <ul style="list-style-type: none"> *Challenges of different working styles, preferences and personal characters of the team members *Necessity of determining the team rules and working method from the first day *Significance of the well-managed teamwork process *Taking advantage of online platforms (online meetings, documenting the process, keeping notes) |
| <i>Conflict management</i> | <ul style="list-style-type: none"> *Attitude of the instructor following the process (creating a neutral environment) *Significance of the weekly meeting conducted with the instructor *Monitoring exactly what teams do and how much time they spend in the process *Stimulating the motivation of the students for better working environment *Significance of talking about problems interactively while producing solutions together *Necessity of acquiring the skills to solve problems within themselves with the guidance of a leader |
| <i>Leadership</i> | <ul style="list-style-type: none"> *Providing equal conditions in an educational project (shared leadership) *Determining the leadership stages in terms of interest in project subjects, experience with the target group, and interest and experience in project stages *Defining the responsibilities of the leader *Regular and timely submission of assignments by leaders *Difficulties on decision-making process and conflict management *Increasing the sense of belonging and responsibility in leadership |

Introduction

In teamwork projects, on the first day of the project, the project brief was explained in detail to the students and project calendar and stages were given. Necessary information about teamwork was given at the end of this busy day too, it was seen that this general introduction was not very useful for students to understand. It may have been difficult to perceive the expectations because they were not used to such a teamwork experience. However, one-on-one meetings with the teams on the next course day were much more effective in terms of clarity of the process. Although the one-to-one meeting is much more effective, it can be difficult to do this under the

circumstances including the number of students, the intensity of the project calendar and the program of the educators.

Team Forming

As discussed in the literature (see section 2.3.3), there are different methods of forming teams. Among these methods, the random option was applied in this project where the research was conducted. For a fairer and more equal environment, this process was conducted under the supervision of educators. This prevents possible problems that may occur among the students such as the exclusion of foreign students and students with few friends and power imbalances. However, students' prejudices against this random forming method continue. In addition, diversity within the team helps students develop their communication and managing skills for effective teamwork. Such an environment is a more suitable environment for the development of teamwork skills. The students mentioned that they experience different problems when they team up with their close friends. Although it is appealing for them to team up with their friends, they need fewer acquaintances and differences in gaining teamwork skills.

Task management via online tools (Google Sheets)

In terms of simultaneous monitoring of the task management process in teamwork, control by all team members at any time, and ease of documentation, it has been seen that it would be better if it was carried out with the help of an online tool. For this purpose, Google Sheets online template, which students will not spend much time on learning and can use easily, has been preferred. Because it has been seen that students may have prejudices against a new program they do not know and have encountered problems while learning that tool. In addition, considering that smart products are an indispensable part of the new generation, it will be a positive effect on students that the tool can be used on different devices.

The use and follow-up of the tool were given to the leader to ensure the continuity of the process and each leader made this task for only 10 days. Although they were

not required to check the document every day during this 10-day period, this process was seen as an extra responsibility for the students as they had not done this before. It was very difficult to ensure the continuity of this, especially during very busy processes such as the jury week. Reminder emails and messages were sent to the students constantly. The way each leader used the tool was different. Some of them divided the tasks, entered the document and started to work. On the other hand, some of them filled out the document just for documentation purposes after the tasks were done. In order for the process to benefit the teams most effectively, the documentation should be done immediately after the division of labor and all team members could check this list at any time.

While discussing the advantages and shortcomings of the Google Sheets file, the most prominent request was about the *instant notification* when a change is made to the file. It can be said that it is a very justified and expected request. Considering the other applications they use, this is a habit and expectation from them. Without this, the visibility of the file decreases and this reduces the interaction in the document and it becomes the responsibility of the leaders only. There are different usage scenarios and perspectives about the interface; however, the *task description* and *assigned part* are the most used parts by no means. Regarding the *priority*, *status* and *dates* parts, students have different ideas. Another requirement that stands out is the need to show the intensity of the tasks. The fact that the equal distribution of names does not necessarily indicate that the distribution of work is balanced. Some tasks can be completed in a few hours, while others can take a few hours. To show this distinction, they want a section that specifies how long the task will last. Although the online tool had some problematic aspects, it gave students certain *flexibility* and *customization* like the team that uses the calendar effectively with different color codes. This flexibility feature can offer good alternatives to teams that prefer different working methods.

The obligation to use the document forced students to do task division. This encouraged them to decide what to do first in the division of labor, who would do them, and by when. The fact that these can be controlled by all team members and

even educators at any time provided an opportunity to follow the process. This visibility also enabled students to see their own position in the process, compare themselves with the other's performances, and increase their awareness of the process. This has increased students' commitment and responsibility to the project.

Division of Labor

Although the necessity of using the document enabled the students to divide the work and the team members to determine which task to do, it was seen that the students had difficulties in phrasing what they would do. Although they clearly decide what to do among themselves by talking, they seem to have problems putting it down in writing. While verbal communication offers them a much more flexible environment, everything gets sharper in written communication. For example, although one of the team members is responsible for the model-making process, this task can be divided into smaller parts and completed with the support of other team members. However, when students document the task, they identify it as a model making and mark either the person in charge or all the supporting team members. The detailing part of the task seems to be an extra burden for them. In addition, it can be difficult to make a sharp distinction between tasks, as the process of working together and supporting each other is very common in teams that prefer to work side by side. Students also have a hard time documenting it. But despite all these difficulties and shortcomings, the documentation of the process gives the team regular feedback on what needs to be done, and what has been done. This enables team members to follow the process better and increases their awareness. The visibility of the process also encourages students to make a more balanced division of labor.

Time management

Time management is one of the most significant stages contributing to process management in effective teamwork. The fact that each team member has a different schedule in a project where different individuals come together indicates the necessity of effective planning in terms of time. Different individual schedules keep

teams from working together whenever they want. For this reason, it is important to determine the common times that can be allocated for teamwork in a general framework by sharing individual calendars from the first day. Determining common times helps organize weekly meetings and working hours. In addition, it is important for the evaluation of the process that the frequency and duration of the meetings can be seen on a *common calendar*. Another important point regarding time is that there should be a deadline for individual tasks after the division of labor. Not all students have the same working method and pace and for this reason, in order to prevent possible disruptions, determining when each task should be completed in advance helps that student to construct his/her own study process in a more planned way.

The new generation of students prefers a more balanced life. The order of priority of the tasks in their life is changing. They do not prefer to put their social activities (communities, courses, events, etc.) in the background compared to the tasks involved in their courses. This change reveals the necessity of better construction of these activities in terms of time schedule in their lives. Time needs to be better structured and work plans should be better organized.

Team working methods

Individual differences also bring differences in the choice of the working styles. For this reason, it is important to discuss these differences before starting the project and to make a joint decision about what kind of working method they will follow, and what the expectations and rules will be during the process. While a predetermined method may make a difference for some of the team members, the fact that it is a joint decision shows that everyone agrees with it. A well-planned process based on a certain method both enables individual students to better organize the time they can spare for themselves, and contributes to the team's planning of the process. In a planned process, it enables students to spare more effective time for their own individual assignments different from this project.

One of the biggest problems with team meetings is where to meet and work. Although this situation is generally solved in the faculty environment, it brings

transportation problems, especially for students who do not stay on campus. Therefore, although face-to-face meetings can be more effective, using online tools to minimize such problems gives teams a great advantage. The best alternative to time and place constraints may be to organize an online meeting. Online tools allow students greater flexibility in terms of time management.

Conflict management

The weekly meetings provided the opportunity for both the teams and the educator, to evaluate the weekly performances of the teams in detail in terms of what they do and how much time they spend. One of the most critical points for evaluating the Google Sheets document and trying to find a solution by discussing abnormal situations is the attitude of the educator. Having a neutral attitude and even trying to find solutions for more effective processes for the teams, encouraged students to share possible problems more easily. The fact that this can be done together set an example for how leaders should behave in such a situation. Although there was a reaction to the work done at the beginning of the process, it turned into a positive state in during the process. Some students showed a negative attitude at the first meeting, and then, they started to become more enthusiastic because they realized that these activities improved their teamwork. When there was a problem, having someone to share them with comforted the students and saved them from the negative effects of the problem. They started to become more willing to take suggestions on how to fix them. In addition, in the weekly meetings, planning for the next week made their work easier in the process. They arranged how they could schedule the week and how they could make a division of labor easier. Explaining the processes easily and getting suggestions to improve them facilitated the process organization. It was seen that talking about the process they went through, giving ideas, and getting suggestions increased the motivation of the students.

Shared Leadership

The topic of rotational leadership is another experience that the students like. The fact that everyone who has experienced this process ensured equality within the team

and fostered a sense of attachment to the project and the team. That also ensured that each team member's contribution to the process was equally made which was an important part of the formation of balances within the team. Although teams use different strategies in leadership selection, they think that it is better to lead the processes in which they are successful and suitable considering their personality traits. Some of the team members who led the different stages of the project stated that they chose the stage in which they were the leader consciously, while others chose it completely randomly. Although there is no sharp distinction between the project stages, students can contribute more to their teams by choosing to lead when they are good. Leading, albeit for a short time, and taking more responsibility from others increased the students' sense of belonging and responsibility. Although the leader has different responsibilities in teams, each contributed positively to the team process such as *regular and timely submission of the assignments* and *reminding meetings and deadlines*.

The students identified very clearly that they would not prefer to take individual grades from this process. Individual grading of teamwork may be in contradiction with asking students to learn teamwork. Individual grading may also affect the relationships among the team members and may result in students not feeling as a complete team. But on the other hand, in different situations like an unsolved problem or unbalanced task division that cannot be overcome, the document can be used for evaluating the team members' performance or contribution as we experienced in this period. This gives educators and team members freedom to move. Evidence allows educators to better evaluate the process and ensure that team members are not under suspicion. It provides a fair trial process for both parties.

In a good teamwork process, students learn a lot from each other and from the process. For this reason, teamwork within the educational project is a great advantage for the students. This experience also contributes to their professional lives by learning and experiencing how to work in a team. This research phase shows that, when the team process phase is carried out well, the process can complete more effectively. Students can gain a lot of knowledge and skills through this process such

as; (i) practicing the skill of working in teams, (ii) making task and time management, (iii) managing a task division process and defining the tasks, (iv) improving communication skills, (v) being a leader and getting the responsibility of the team, (vi) supervising the decision making and conflict management processes. Therefore, this research can be an initial phase of an educational toolkit for design educators which includes how teamwork can be taught in design education in all the steps.

CHAPTER 6

STAGE III: DEVELOPING LEARNING STRATEGIES FOR EFFECTIVE TEAMWORK IN DESIGN EDUCATION (IN THE PANDEMIC SITUATION / DISTANCE EDUCATION)

After the second study as presented in the previous chapter, during the 2019-20 spring semester, with Covid 19, the pandemic situation made many changes in our lives. Due to that shift, all courses were carried out through distance education. The second half of that semester was experienced as a transition period. As all education was moved to online platforms, educational institutions and educators tried to adapt their courses to distance education and online platforms. The project carried out in the third-year studio during this transition period was a team project, and the students had to carry out teamwork online under these conditions. This transformation changed the teamwork processes of the students, their habits and their experiences of using online tools. Miro and Zoom became among the most used online platforms. Miro, which allows simultaneous work, provided great advantages to students, especially in terms of teamwork. During this period, students' interest in online platforms increased, and naturally, their usage expanded. Different platforms such as Blackboard Collaborate, Zoom and Google Meet were tried and new discoveries were made. While students who had a special interest in the past tended to use and search such programs, thus the knowledge, interest, and use of most of their students on this subject increased with distance education.

With the pandemic, mandatory changes in our daily routines, restrictions and lockdowns made everyday life very difficult for people and for students too, especially in a social sense. Having to follow the courses in front of the computer all day and then continue to work at the computer for teamwork was emotionally challenging for the students. At the same time, technical issues such as internet

connection and accessibility for online courses and related materials bothered the students the most. It was seen that following the courses, participation in each course session and communication within the team were affected to a greater extent due to the connection problems. All these constraints changed the learning strategies of the students.

With all these restrictions, expectations from the students changed. The lack of access to sufficient materials, especially due to the inability to benefit from the faculty's facilities and the stores that were closed due to restrictions, greatly reduced the expectations for 3D physical models. The usual jury environment, jury presentations have been moved completely to online platforms. It took time for both students and educators to adapt to all these changes. In this process, different methods were tried and the most effective one was tried out, so the process of internal meetings and information exchange increased among the educators.

All these changes naturally affected the process of how the students handled teamwork. The students' communication with each other, working methods, presentation methods, and task divisions were changed. After that transition, it was decided that in 2020-21 it will be completely distance education; in order to understand these changes, it was planned to get students' opinions on this subject during that year. In the third stage of the research, two different studies were carried out. In the first study, students' opinions were collected through a survey. In the second one, the students were given suggestions and there was a chance to examine in more detail how the teams worked through one-on-one meetings and observation.

6.1 Teamwork and Online Tools Survey

In this step, the study was conducted based on the seven-week studio project titled “Passing on Skills and Experiences through Learning and Sharing: Sustainability Scenarios for Encouraging Children’s Engagement in Online Courses” in the third-

year industrial design studio course, Fall 2020-21 semester (see Appendix O). At the end of the semester, a questionnaire was sent to the third-year students, focusing on teamwork and online tools to better understand students' thoughts, practices, attitudes, behaviors, and constraints within the context of distance education (see Appendix M).

Survey Questions

The survey questions consisted of three parts. The questions were all open-ended questions, and the students were asked to share their experiences and opinions on the relevant topics. In the first part, the students were asked questions specific to teamwork under the title of teamwork in distance education. At this stage, the students' opinions were taken about the following issues related to teamwork: *collaboration among the team members, leadership, communication, task and time management*. In addition, feedback was collected from the students about the design critiques and presentations, which are a part of the studio education. Lastly, information was obtained about which *online tools* they used and how they benefited from them. In the second part of the questionnaire, comparative questions were asked about their past teamwork experience and current experience in this period under the title of comparison of teamwork experiences. Finally, in the general comments and suggestions section, the students were asked to indicate what they would like to add to teamwork and distance studio education (see Table 6.1).

Table 6.1 Survey Questions of the Research Stage III

| Questions | |
|---|--|
| <i>Distance education and Teamwork Process</i> | 1-Could you please share your experiences on the teamwork project, considering the use of online tools and other tools if applicable? a-collaboration among the team members & leadership & interaction and communication with the teammates b-division of labor & time management & task description and workload for the assignments c-design critiques sessions & presentations and feedback such as preliminary and final juries d-suggestions for improving the design process for team projects via online platforms and tools |
| <i>Comparison of teamwork experiences</i> | 1-Please indicate your previous teamwork projects in terms of project title, term, and duration. 2-How would you evaluate your previous teamwork experiences compared to the teamwork process of this project? What were the pros and cons? 3-What did you learn about teamwork management during this project? How would you use it in your next teamwork? |
| <i>General comments and suggestions</i> | 1-Please provide your further comments and suggestions about the teamwork process. |

Participants

Seventy-one students and twenty-three teams have taken part in the project. Two teams involved four members, and the others were three-member teams. At the end of the semester, a questionnaire was sent to the students via email. Considering the intensity of the final period, two reminder emails were sent at an interval of a few weeks. In total, there were twenty responses. The responses were collected anonymously but if the students preferred, they had the option to provide their names. Two of the responses were anonymous, one of the students answered three times, and two of them were the same.

Analysis

All the answers have been combined into a file (see Appendix N). During the analysis phase, all the answers for each question title were reviewed and important conclusions were highlighted with the relevant answers. All answers were compiled separately for all questions and sheets were created. As a limitation of the questionnaire, it was seen that some questions were not fully understood. Some of the answers were irrelevant to the content of that question. Those responses were extracted for more refined information. According to the students' responses, these sheets were reviewed, and an analysis was made for each theme (Figure 6.1). Finally, a general evaluation was made on teamwork and online tools in distance education during the pandemic situation.

| | Theme I | Insights | Theme II | Insights | Theme III | Insights |
|---------------|--|--|--|---|---|--|
| | collaboration among the team members & leadership & interaction and communication with the teammates through considering the use of online tools | | division of labour & time management & task description and workload for the assignments through considering the use of online tools | | design critiques sessions & presentations and feedback such as preliminary and final juries through considering the use of online tools | |
| Participant 1 | Teammates are more understanding to each other. And it is easy to arrange meeting time proper for everyone because of the lock down. | Lock down provides teams to arrange meeting dates easily | Division of labour is sometimes depends on the tool of the Team members' have. Team members are free to arrange when they gonna do their part, because of the a lot of time at home. However, it can create a situation like underestimating the workload and stuck in the last minute. | | It is hard to express designs at juries, because of the limited time and screens. Disappointment can be emerged because of not being able to express all the thoughts and all the aspects of the design. Feedback quality is poor depending on that reasons. | they do not believe that they can get effective feedback due to time constraints. |
| Participant 2 | bu arki grubumuzda belirgin bir lider yok. birbirimiz aramızdaki iletişim gayet iyi. arandığımız ve birbirimizi dinliyoruz. projeye başladıktan birkaç hafta sonra ben covid oldum ve ekip arkadaşlarım hem bana moral verdi hem de iş paylaşım konusunda gerpeden çok yardımcı oldular bana. çok sıkar etememe rağmen ez iş verdim bana hasta olduğum için. Birbirimizin suçlarını kapatabildik ve güzel fikirler üretebildiğimizi düşünüyorum. aramızdaki iletişimi discord ve whatsappın konuşarak sağlıyoruz. bazen figma ve miroda da comment ekleyerek ya da arkadaşlarımızın olduğu yere yeni yeni post-it yaparak sorularımızı ve soruyoruz. | good team relations, a sharing and supportive team environment Discord and whatsapp | ben covid olmadan önce daha adil iş bölümü yaparız ama covidten sonrasında daha çok kişi arasında iş bölümünü yaptık. idea generationda ben de katıldım beraber yeni çözümler ürettik. time management diğer derslerde de çok grup ödevi olduğu için daha çok önem kazandı. atılım derslerinde kaynaklı benim pek grup projem yoktu ama ekip arkadaşlarımla zamanı ayırdım daha çok. | health problems like covid caused some disruptions in group work. | sunumlarında ve kritiklerde de biliyorduk ama yine covidden sonra ben süresiz okuduğum ve sevim kısıtlı için kişi anlamı daha çok. atılımın kritikler için grup ödevi daha mantıklı oldu bence hocam. hem kritik süresi uzadı hem de collaborative çalışmamızı getirdiği avantajlarla şifigözesi daha iyi olmaları oluyor ekiple ve yabancısı hocalarla anlaşmak daha kolay oluyor. | |
| Participant 3 | Buluşma saatlerimizi whatsapp üzerinden belirleyip discordda sesli arama eşliğinde çalışmaya başlıyoruz. Bir kişim genelde bu buluşmalar için öncelikle olmasını gerekiyor, herkes bu konuda epey elverişli oluyor. Grup içinde lider belirlemesi gibi bir durum söz konusu olmasa da bir kişi liderlikten bu rolu üstlenmek zorunda kalıyor. Senkron çalışmadığımız vakitlerde Miro/Figma gibi yerlerde birbirimize yorum bırakarak da beraber çalışıyoruz anlar oluyor. | lack of leaders - leads to shortcomings in organizing the meeting day. | Görev dağılımı genelde projenin aşısına göre değişiyor. Ayrıca görev dağılımı, çalışma saatleri ve bu çalışma saatlerine kimlerin katıldığına dair hocalara herhangi bir raporiform sunmadığımız için, kimin projeye ne kadar katkısı olduğu veya ne sorumluluklar aldığı belli olmuyor. | Since the process was not visible, how the division of labor was done and how much the team members contributed lost importance, which led to injustice. | Sunumları biligerek kolektif bir şekilde yapıyoruz. Kritik sırasında bir kişi daha çok söylenilenler not almaya odaklanırken diğerleri hocaların sorularını cevaplamaya odaklanıyor. | part of the work in the critiques, someone takes notes, someone answers questions, someone explains. |
| Participant 5 | I think we have been communicating with each other quite well. We can have fun while working on the project. Also, we all aware of our responsibilities so we did not have any problem till now. | responsible team members | First, we talk about the upcoming task on WhatsApp so that we can analyze the workload. Then we divide the labor for some parts and decide on a deadline. After, we come together and work on it until it is finished. I personally think that the workload is reasonable most of the time. | talking about what needs to be done, making a division of labor and giving a deadline, then getting together as a team and completing the work is a perfect work plan for teamwork. | I do not like getting feedback on personal team breakout room. I enjoy listening others critiques but I also multitask on these times so keep changing the breakout room just to listen other critiques becomes painful. If, as a team, we would like to work on those times we usually use Discord rather than breakout room. | distance education made it difficult for students to be aware of each other's criticisms. |

Figure 6.1 A screenshot from the Analysis Sheet of the Research Stage III

Findings

Theme 1: Distance Education and Teamwork Process

Collaboration among the team members & leadership & interaction and communication with the teammates

One of the most striking issues among the students' answers on this subject is *communication* in the team management and decision-making of the design process. The students highlight the *difficulties of communicating through online tools* and moving the whole process through those platforms. They state that they feel a great lack of being able to convey their ideas by drawing, especially at the meetings where design decisions are made (e.g., Participant 10). Those who do not have a drawing tablet or are not very accustomed to using these devices prefer the method of drawing what they want to express on paper and sharing its photo, but they state that this is also a waste of time (e.g., Participant 7). They cannot experience the practicality of being face-to-face in communication online. It seems that *communicating through online platforms* is much more time-consuming and difficult than face-to-face (e.g., Participant 14).

It is very difficult to communicate with people and to tell our problems through online platforms. We have difficulty in explaining our ideas to each other, because we try to explain our problems by just talking, and that is not enough. (Participant 10).

Our visual communication has decreased even more in the online period, while we can normally show what we have in our minds by drawing with our hands, this means that we now draw, take a photo and share it. (Participant 7)

Communication is not much different; it just takes more time. It was a tiring period. (Participant 14)

In addition to constantly trying to explain themselves verbally, technical problems are another factor that makes communication difficult in distance education. Internet outages or poor internet connections cause disconnections in communication, making the already difficult and lengthy communication process even more difficult

(e.g., Participant 15). Having connection problems causes discontinuation in communication, which negatively affects an ongoing design decision process. If someone in the team has a constant internet problem, it delays team decisions and makes the process longer. Another prominent problem related to communication is seen in the *division of labor* process. Due to communication-related problems, teams have more difficulty in the division of labor on online platforms (e.g., Participant 6). In addition, the students who had the chance to be together in a studio environment could be more aware of each other's processes, while the isolated life in distance education made this situation difficult. Teams gathered from meeting to meeting are lacking in giving feedback and exchanging ideas with each other during this period.

It was very difficult to meet someone online and explain things to each other constantly on zoom. Our internet troubles were sometimes huge, and we had a lot of trouble understanding and communicating with each other. (Participant 15)

It was very difficult to divide the tasks on the online platform. The biggest problem was communicating via text or call. Although the division of labor could be followed side by side, it progressed in a very tiring order. (Participant 6)

While students participate more actively in face-to-face meetings, online platforms make some students more passive. Online platforms reduce interaction and cause some team members to not contribute enough. They state that while students interact and exchange ideas with each other more in face-to-face meetings, some of their teammates stay silent for a long time on online platforms (e.g., Participant 7). The online opportunities to turn off the camera, mute yourself or do something else in the background make the concentration on the screen harder for some students. This lack of communication also negatively affects the teamwork process. The question of how to include such students more actively in the process is valid in the courses too. In the online courses where there is no obligation to open a camera, students can be at the computer all day without turning on their cameras. This makes it very difficult for instructors to have an idea about how much that student listens to the course and

how actively s/he takes part. However, it is much easier to observe the students in the classroom environment, to gain an impression, and to ensure their active participation in the lesson.

While it is obligatory to participate in the subject in our face-to-face meetings normally, since we have the chance to "mute" ourselves, a group friend may stay in the mute mode for 2 hours and not participate in the discussion, which affects us negatively. (Participant 7)

The pandemic brought with its necessity and dependence on the virtual environment caused fatigue in learning and communicating. Students who are in front of the computer all day because of the lessons state that they do not want to work at the computer in the evenings because of the tiring situation (e.g., Participant 17). This causes them to divide the tasks and prefer the method of working individually. Screen fatigue is distracting students from this, although they normally think they can work better with interaction. As presented in the previous chapters the importance of division of labor is significant for effective teamwork, it is also critical to follow and have an awareness of the process. While this tracking process in distance education can become available in meetings with each other over computers, this part of teamwork is missing for students who want to get away from the computer.

Since we took classes on online platforms during the day, we chose to divide the work and work individually due to boredom about not being able to get up from the computer after the lesson. However, an idea that emerged when we were together could lead to another good idea. (Participant 17)

On the other hand, they also say it's easier to set up team meetings than face-to-face training. Students, who normally have difficulty in arranging a time period suitable for everyone's personal schedule, have become more flexible about meetings thanks

to online tools. In addition, as the lockdowns due to the pandemic were added to this, the social activities of the students decreased and they had to stay at home in the evenings like everyone else (e.g., Participant 1). It is seen that the teams that turned this situation into an advantage brought their meetings to these closing hours.

it is easy to arrange proper meeting times for everyone because of the lockdown. (Participant 1)

One of the factors that facilitate teamwork is the project brief that is suitable for teamwork. Another criterion that has been added to this element in distance education is platforms that can enable them to work simultaneously; a project definition where they can do remote simultaneous teamwork. As the students stated, the UX/UI project allowed the teams to contribute to the project simultaneously (e.g., Participant 11). Using Figma for their designs, the teams were able to contribute to the project in a balanced way, thanks to the ability of more than one person to work at the same time. Currently, 2D or 3D drawing programs do not have such a feature, so students might have more difficulty in the division of labor in a project focused only on product design. Besides, it seems that the students prefer Discord for their meetings and Miro to bring their work together (e.g., Participants 2 & 3). The students who prefer WhatsApp as usual for written communication, seem to prefer Discord for their meetings, which they can use for free and unlimited, although they are used to Zoom in courses, there is no free version for the students. Miro, on the other hand, seems to have become an indispensable part of the design studio courses. Miro has become a platform where students share, combine, archive, and even share their ideas in teamwork, also allowing educators to access and follow teams closely.

I think the fact that our project is on UI/UX has made the working process easier. We preferred google drive to share our files and notes with each other, and Miro board and Figma for collaborative work. We could both work individually and follow each other in sync at the same time. (Participant 11)

We communicate between us by using Discord and WhatsApp. Sometimes we ask our questions by adding comments on Figma and Miro or by opening a new post-it where our friend is. (Participant 2)

We determine our meeting times via WhatsApp and start working on Discord with a voice call. When we are not working synchronously, we leave comments to each other in places like Miro/Figma and there are moments when we work together. (Participant 3)

Division of labor & time management & task description and workload for the assignments

Certain limitations of distance education and the pandemic situation necessitated certain changes in education. In order to increase student interaction and spend more time with students, some instructors have started to prefer teamwork assignments in their courses. The increase in the teamwork assignments causes students to engage in more than one teamwork at the same time (e.g., Participant 13). ***Managing multiple projects simultaneously*** has been challenging for students in this time of constraints. In addition, evening restrictions and the necessity of being in front of the screen all the time seem to tire students psychologically (e.g., Participant 14). This fatigue led to a lack of motivation and apathy. In addition, as with all teamwork, individual programs differ, making it difficult for students to find common time (e.g., Participant 12). While the necessity of meeting online in distance education makes this easier, it also does not recognize the flexibility of the physical environment. The students, who had the opportunity to exchange ideas with each other even between lessons, had to decide on a common meeting day for even the smallest subject in distance education. The first step is to find a common time and plan the process for time planning and process organization becomes challenging for teams, especially during the pandemic situation. Another issue brought about by the pandemic conditions was the situation of the students getting sick. Although not very often, the students who were covid during the teamwork process caused that team to complete

that process one person short (e.g., Participant 2). In this case, both the sick student and the team had to make an extra effort and correct this deficiency.

In distance education, since the educators prefer teamwork assignments more, carrying out more than one teamwork simultaneously during the semester is extra tiring and difficult for us. (Participant 13)

Evening restrictions and the fact that we had classes during the day made it difficult for us to get out and get some air, which made it extra difficult psychologically during the semester. (Participant 14)

Individual schedule differences make it difficult for us to find a common time for team meetings. (Participant 12)

During the time I was covid, we could not make a balanced division of labor. health problems like covid caused some disruptions in group work. (Participant 2)

Although the students make a good *division of labor* and *time planning* for effective process management during the teamwork process, sometimes non-responsible team members can put their other teammates in a difficult situation. Uncompleted responsibilities put an extra burden on other groupmates, which can cause imbalances and unrest within the team (e.g., Participant 10). The importance of regular written process follow-up in order to prevent this situation encountered during the whole teamwork process was emphasized in the previous chapters. When the so-called division of labor tables was not written and not made visible to everyone, it was observed that the effect was diminished. As one student stated, the absence of an official following this process can cause imbalances and injustice in the division of labor (e.g., Participant 3). Therefore, ***keeping a written record of the process*** allows possible problems to be prevented and educators to intervene in the process. On the other hand, following the written process is important for team members to follow each other and increase their awareness of the process. Otherwise, teams may encounter overlooked tasks or repetitive tasks (e.g., Participant 7). This

causes a loss of time for them and puts more strain on the teams in this process where the most important factor is time. It is very important that keep communication sustainable during distance education. In face-to-face education, students naturally work together and can be more informed about each other, since they are together in physical conditions. In online education, this required extra effort. Developing a written work plan process that all team members can check at any time for good time planning could be a better solution (e.g., Participant 17).

When there is a team member who does not fulfill his responsibilities in the team, it becomes difficult to divide the work and follow it. This puts us in a difficult situation and causes us to exert more effort than usual. (Participant 10)

Since the process was not visible, how the division of labor was done and how much the team members contributed lost importance, which led to injustice. (Participant 3)

Since the tasks could not be followed up within the team, the team members did unnecessary work unaware of each other and caused a waste of time. (Participant 7)

Creating a common calendar and making it visible to the whole team facilitated team planning, and in the same way, making the division of work visible to everyone helped us manage the process well. (Participant 17)

Determining the to-do list, dividing the determined tasks in a balanced way and deciding on a deadline, and then meeting with the team at the specified time to evaluate and bring together what has been done can be steps to be followed in a good teamwork process, as some teams do (e.g., Participant 5). One of the points to be considered in this setup is that the division of labor should be written and visible to everyone, as stated above to enable all team members to follow the process. Another point is that there could be a leader who manages this whole process and follows it closely (e.g., Participant 6). The team leader, following this process, which should

be written, informs and warns his teammates when necessary, making a great contribution to the progress of the process. In terms of monitoring the process, especially written accessible charts are even more important in distance education. Although some teams divided the work individually to facilitate this follow-up, they preferred to work online at the same time even while completing their individual tasks (e.g., Participant 11). Although it can be an effective method for teams that do not have difficulty in finding common time, it may not be the right choice for groups that have problems with time or do not adopt this working method. In the distance education process, where they are less aware of each other, it is seen that the creation and follow-up of the team process are more important. In this, written work charts gained more importance.

First, talking about what needs to be done, making a division of labor, and giving a deadline, then getting together as a team and completing the work was the flow of our team. (Participant 5)

it is necessary for someone on each team to lead and follow the process and motivate the others. (Participant 6)

Performing individual tasks simultaneously via online platforms provides us a great advantage in terms of monitoring the process. (Participant 11)

Design critiques sessions & presentations and feedback such as preliminary and final juries

Like everything else in distance education, design critiques and presentations had to be conducted through online platforms. For the team critiques, the students were expected to be ready in their breakout rooms at the time allotted for them. While explaining their works, the students used Miro boards and educators had the opportunity to follow what was told on Miro simultaneously. However, students stated that they had difficulties while explaining their projects on these platforms, they could not express themselves adequately and they had problems (e.g.,

Participant 17). These platforms, where one-on-one interaction decreased, caused deficiencies in communication (e.g., Participant 7). It was observed that the students had *difficulty in expressing themselves due to the lack of effective use of drawings and mockups on online tools*, the basis of the design critics, could not be done through the screen.

I felt inadequate because of the online tools as they reduced interaction in crits and presentations. (Participant 17)

Due to the lack of interaction, we had difficulty explaining our projects to the educators via the online platform. (Participant 7)

One of the issues that students complain about the most the critics is *time planning*. Stating that the time allocated to critiques is insufficient, students think that taking critiques from different educators for a longer time in design education will improve them more (e.g., Participant 1). The increase in the number of students gradually shortened the time allocated to students for crits. In distance education, when inexperience with online tools and technical problems are added to this, it is seen that some of the time allocated goes to such problems. But besides that, one of the advantages of the technology is that they were able to record their crit sessions and go over them again and again later (e.g., Participant 6). It can be said that the teams that can use the limited time efficiently turn this situation into an advantage. In addition, stating that there is not enough time to present the projects, the teams also state that being able to use different media in this process enriches their presentations and makes it easier for them to express themselves (e.g., Participant 15). Leaving aside the technical problems arising from distance education, it can be said that some features and opportunities of these platforms are used to enrich the educational process.

It is hard to express designs at juries and critique sessions, because of the limited time and screens. (Participant 1)

Although similar time was allocated for us compared to face-to-face education, for the critics, sharing a screen via the online platform and checking the connection cost our time a little bit. However, being able to record the critical process and listen to it again later allowed us to benefit more from this process. (Participant 6)

The time allocated to us in the critiques is not enough due to the fact that we are very crowded. It will be better for us to get longer and more crits. Similarly, the time given to present our project in the final jury was not enough. But being able to use different media such as video provided an advantage. (Participant 15)

In distance education, on days when students get crits throughout the day, they were sent to different breakout rooms so that they could work comfortably if they wanted. The students who preferred to listen to the critiques could also *visit the teams and listen to the critiques concurrently* together with the educators. However, it seems that these days, the students do not devote their remaining time to their own studies, and they state that instead of being sent to separate breakout rooms; in order to benefit more from the critics, it is better to stay in through which they can listen to each other's crits in a single room (e.g., Participant 5 & 10).

I do not like getting feedback on the personal team breakout room. I enjoy listening to others' critiques but changing the breakout room just to listen to other critiques becomes painful. As a team, we usually use Discord rather than breakout room. (Participant 5)

Instead of sending all teams to different breakout rooms during the crits, an order in which everyone can listen to each other in a single breakout room will be more effective. (Participant 10)

It is seen that students also develop strategies within themselves in order to make the best use of the limited time. Especially during the crits, it could be seen that one of the team members was the spokesperson and explained the project quickly, one of

them took note of what was said, and the other one clarified the questions (e.g., Participant 3). While this saved them time, *division of labor* helped them to make good use of the limited time. In addition, they stated that by exchanging ideas as a group, they determined the points they wanted to tell and the questions they wanted to ask and noted them down. Then, they say, in limited presentation or crits, the spokesperson of the group asked what was noted (e.g., Participant 11). It is advantageous to the teams to construct the limited time available and to make good use of the time.

We were doing the division of labor during the critiques. While one person tries to take notes of what was said, the other two try to present the project and answer the questions of the educators. (Participant 3)

In the project presentations, whoever had more control over which stage of the project, presented that part. In the critiques, we would write down the questions together before the critiques, and then we would declare the most talkative group spokesperson and leave it to him to ask the questions. (Participant 11)

Suggestions for improving the design process for team projects via online platforms and tools

While students are more active in expressing the difficulties they experience in distance education, it is seen that they remain more passive in the solution proposal part based on the answers in the survey. The first of the prominent suggestions is related to the definition of the project. They stated that the definition of the project should have phases that are suitable for teamwork and where they can divide the work easily (e.g., Participant 15). The other is that it is suitable for the use of online tools (e.g., Participants 5 & 8). At this stage, it is emphasized that the programs that can be used by all team members simultaneously facilitated the teamwork process. Miro and Figma stand out among these applications. The fact that modeling programs do not have such a feature, for now, makes it difficult for students to divide

the tasks in the teamwork process. In this project, which is a UX/UI project, students work simultaneously and participate in the project development process.

Projects suitable for online platform use and teamwork will be much better in this process. (Participant 15)

Online tools that can be used simultaneously have greatly contributed to teamwork such as Miro Boards and Figma. (Participant 5)

Tools that can be used simultaneously such as Miro and Figma provided an advantage. (Participant 8)

Another important stage, as the students stated while criticizing the design critiques is about the single break-out room for all the crits (e.g., Participant 10). They suggest that it would be more reasonable for the educators to have a fixed room and the students who had a time slot to move to that room, while at the same time it would be a more practical solution for students who want to listen to the critiques to stay in that room. Instead of walking around the rooms one by one, the idea of a fixed room may be a reasonable suggestion. Teams who want to work in this process can continue their work in their own breakout rooms.

In the critiques, if the educators have a certain room, the teams who get crits and those who want to listen to the critique can stay there. Those who want to work can also stay in their own breakout rooms. (Participant 10)

One of the prominent issues in teamwork is to make the unbalanced work distribution visible. While some students suggest asking for a project evaluation report at the end of the project (e.g., Participant 3), some say that it would be good to follow the process closely with weekly reports (e.g., Participant 6). They believe that these reports will increase the motivation of the team members throughout the process and all the members will have more responsibility. It is seen that knowing that they will

be evaluated by their teammates at the end of the process or during the process, or knowing that they are followed by the educators, positively affects the attitude of the students in the process. Therefore, such solutions in teamwork will ensure the healthier progress of the process.

Requesting a report evaluating the team process at the end of the project can ensure that team members are more active throughout the process. (Participant 3)

Giving a team grade in teamwork may cause some of the team members to take less responsibility. To prevent this, a weekly report system can be created, and it can be noted what kind of process was done and which tools were used. (Participant 6)

Theme 2: Comparison of Teamwork Experiences

It is seen that all the students have experienced teamwork at least once within the scope of studio or elective courses until they reach the third grade. Although the projects are usually around 4-5 weeks, each experience contributes to the students' approach to teamwork.

Comparison of the previous teamwork experiences with the ongoing one

One of the biggest problems encountered in teamwork is the *unbalanced division of labor*. It started to appear as a bigger problem in distance education even more. Because in the physical environment, it was seen that the students completed the process by working together without division of labor, while the lack of this opportunity in distance education forced the teams to divide the work. It is seen that students have difficulties in certain subjects while doing the division of labor. The above-mentioned, project definition suitable for teamwork has gained greater importance in distance education. The definition of a project where they can work simultaneously and divide the tasks makes the work of the teams easier, while the opposite makes the process more difficult. As one student (e.g., Participant 5)

pointed out, the modeling programs cannot be used simultaneously, which forces the students to put this task on one person. In projects where this takes a lot of time and importance due to the definition of the project, the burden of the project falls on that student. An unbalanced division of labor causes problems in teamwork. One has to take too much responsibility. The other does not want to spend time on a step that he cannot fully intervene in the process. Therefore, the programs that students can use simultaneously should be taken into account while preparing the briefs of projects that will be teamwork, especially in distance education (e.g., Participant 12). In addition, while determining the project expectations, if possible, educators could ask for items of similar difficulty suitable for division of labor such as three main expectations for three-member teams, students will be directed to make a division of labor and it will be easier for them to divide the tasks.

I was modeling and screen sharing most of the time. For the final, since my team members were not willing to do it I had to model everything and decide all the necessary details while they were sleeping. On the contrary, for this ongoing project, I never felt such a thing. We divide the tasks and work together on every design decision etc. I think one of the main reasons for that is the fact that this project is mainly an interface design. We have lots of tools that we can work together. (Participant 5)

Since the topic was UX design, it was compatible with an online environment. This made it easy to work and divide labor. (Participant 12)

While it is thought that distance education makes teamwork difficult in general, there are many situations where it can be said that the opposite is also true. Students' awareness and knowledge about the use of online tools have increased. This actually shortened the time spent in front of a single computer and provided them with practicality, especially, the tools that enable simultaneous work. While it is more difficult to find a physical environment for meetings, and especially students who do not live on campus can give a more limited time interval considering the process

when they will return to their homes, online meetings have provided flexibility to students. They had the opportunity to meet whenever they wanted. One of the other points is that students who are in a more social environment in the physical environment have difficulty concentrating on their work, while they can have a better command of the process because they are alone with the computer screen in virtual meetings (e.g., Participant 2). Although face-to-face meetings tend to last much longer, online meetings become more tiring so, short effective meetings will bring teamwork to a better level in distance education. In the physical environment, very long meetings are conducted, especially since the students mainly prefer to work in the studio environment. During this period, while it is seen that students chat with each other more and exchange ideas, this is much less happening in the online environment. Since the advantages of the online environment have not been discovered by students to a greater extent before the pandemic, online tools may not be considered an alternative to solve their time planning problems. However, since this process, this experience gives both students and instructors a different perspective, both the physical and virtual environment will be the two indispensable mediums of communication and interaction from now on. Students will not hesitate to hold meetings in the virtual environment and use new tools.

During the online meetings, team members can adapt to the meeting better than in the physical one. In the physical environment, more things could happen that would disrupt our concentration. Like friends who go for coffee and don't come for hours. (Participant 2)

Students' grades and success concerns reduce the tolerance of the non-working team member. Although they try to solve this themselves, problems continue in a scenario where educators do not interfere. Therefore, it will provide many advantages if the teamwork process is visible to all team members and the course instructors. It will motivate the students, provide the opportunity for the educators to intervene in a possible problem and encourage a balanced division of labor within the team. One

of the students stated that they prepared weekly reports on his past experiences, and this provided him with comfort (e.g., Participant 3). While the pressure on students in teamwork, knowing that they will still get the same grade even though they do not do the same work is very discouraging for students, so such follow-up reports and documentation would relax the students and enable them to concentrate better on the project.

In one of the previous teamwork, weekly reports were collected, and teamwork was followed by the educators gave us comfort in terms of teamwork. (Participant 3)

Teachings about teamwork management throughout the project and strategies for the next projects

Every teamwork experience provides students with new gains. The distance education criterion brought differences to teamwork, which allowed students to develop new methods and acquire new skills. When we asked the students what they learned about teamwork at this stage, one of the topics that came to the fore was *task and time management*. Especially not being together physically made it difficult for them to be aware of each other, and this pushed them to move forward in a much more planned way (e.g., Participant 19). Students who were accustomed to being side by side at all times perceived that they now had to meet privately for the whole process. In this, regular work and time planning gained importance (e.g., Participant 5). Similarly, the works that were completed together in the physical environment at the same time have now turned into more individual work with the *division of labor*. This encouraged the teams to divide the work. For an effective division of labor, the teams aimed to increase the quality of the resulting work by choosing to distribute the work among themselves according to their skills for a specific task (e.g., Participants 2 & 12). Thus, each team member was able to contribute more effectively to the process by doing the job they wanted to do. Students who perceived the importance of a good division of labor realized that division of labor was not enough, and they needed a mechanism that organized and controlled the process.

Some of them overcame this by choosing a leader within the group (e.g., Participant 3), others suggested that it should be guided by educators (e.g., Participant 10). The distance education process increased the awareness of the students on the basic elements of teamwork, *task and time management* and *division of labor*.

I learned to be in control and manage workload and time for my teammates.
(Participant 19)

We first talk and divide the task and decide the deadline for an online meeting. This was a great way of managing the time and tasks. (Participant 5)

Everybody highlight their strengths at the beginning of the project and the division of tasks was arranged according to that. (Participant 2)

It is important to divide labor and manage time according to the skills and availability of your teammates. (Participant 12)

I have experienced the benefits of being leadership, especially in terms of reminding meetings and division of labor. (Participant 3)

When the process cannot be followed, it may not be enough to divide the tasks. Students who do not fulfill their responsibilities put an extra workload on other teammates. (Participant 10)

The fact that students could not be aware of each other, which is one of the lack of physical environment, made communication within the team even more important. Even if they did not work privately in the studio environment under normal conditions, group members who had the opportunity to talk to each other during breaks or during lunch had the opportunity to be constantly informed of each other. However, students who closed their homes in the pandemic environment distanced themselves from each other. This caused communication problems in teamwork. Students perceived the importance of regular and continuous communication (e.g., Participant 9 & 11). A regular and continuous communication channel has gained

importance in teamwork in terms of being constantly aware of each other and informing each other about their situation or answering their questions. In addition, during this process, the students stated that their *communication skills* increased (e.g., Participant 15). Some students who have good communication skills in the physical environment may not be able to demonstrate the same skill online. It can be said that communication skills in the online environment have improved throughout the teamwork experience.

Communication is very important to maintain a good relationship and to make the project fun. (Participant 9)

It is important to be in constant communication and to assign tasks in terms of the strong and weak properties of the team members. (Participant 11).

Since it is more difficult to express online, I think that I have also improved my expression skills. (Participant 15)

The students, who considered it normal to work until the morning in the physical environment, could not perform the same in the online environment. It was very tiring for students to hold meetings at the computer for long hours (e.g., Participant 1). That's why more individual work turned into divisions of work that were then brought together as a teamwork process. The *division of labor* and *time planning* were the stages that the teams gave more importance under these conditions.

Long online meetings can lead to loss of concentration, so setting deadlines for meetings can be an advantage. (Participant 1)

During the distance education period, the concepts of *division of labor* and *leadership*, together with the *task* and *time management* in teamwork, began to attract more attention from students. Thus, the steps that should be taken in effective teamwork began to take on the necessary importance.

Theme 3: General comments and suggestions

As in physical education, one of the most common complaints is the random creation of teams. In this survey, students expressed their complaints about this issue whenever they had the opportunity and stated that it would be better to be in a group with their friends. I didn't want to mention it again because this issue was discussed before, but it seems that in-team communication becomes even more important in distance education. In such a situation, it is seen that students push themselves more and make more progress in communication and describing skills in online environments. In teams made with a group of friends, the process will not be so structured, and students will not be able to care about certain steps so much, such as task and time management, division of labor, and the process of follow-up.

Another topic coming from students is team evaluation. As it is frequently seen in other topics, the expectation is that the process will be followed closely by the educators in order to prevent possible problems, increase motivation, and get a fairer grading. Some suggest that this should be in the form of reports that are collected regularly every week (e.g., Participant 13), while others state that it may be in the form of in which team members evaluate each other at regular intervals (e.g., Participant 15 & 16). The most common problem in forms where students evaluate each other is the inability of all students to be fair and sincere. While some do not want to write anything bad about their friend and ignore it, others can be cruel. Some students may not want to be an evaluation authority in this regard. Therefore, although some students suggest this, it may not be a generally accepted solution. Although the process follow-up is more difficult and time-consuming, it will present a more objective picture. Therefore, this can be followed in the form of weekly reports, weekly meetings, or reports received at regular intervals, and feedback can be provided when necessary.

I think the weekly follow-up of group assessments can really change things. While non-problematic groups see this as a workload, it is essential for those who have problems. (Participant 13)

I think that groupmate evaluation forms will also work in order for the grading to be fair. In fact, I think that if it is done twice during the project, it will give much more accurate results. (Participant 15)

If there is a form (separate for each member) that the group members can fill in at some intervals of the project about each other, it may be more possible to control the teamwork process. (Participant 16)

Another subject emphasized by the students is the subject of the project. They emphasize that the UX / UI project is very suitable for both teamwork and distance learning. They say that if the conditions continue like this, it would be good to focus on such projects (e.g., Participants 5 & 19). The increasing popularity of this field and the increase in job opportunities ensure that the motivation of the students is high. Having tools such as Figma, where they can design online simultaneously in such projects, provides an advantage for students both while developing, testing and presenting. These advantages, which also support the teamwork process, provide convenience to the students. In addition, it is suggested that while defining the project, it would be good to determine certain tasks and items to have tips guiding the work distribution among the teams (e.g., Participant 3). It is seen that the decision of distance or physical education has become an important issue that affects the project subjects, content and final expectations. In addition, in the decision of teamwork, the possible project topics and related expectations are narrowed depending on this choice. However, with the development of online tools every day, these criteria will also be stretched.

If online education continues, I would suggest that the teamwork projects can be focused on UI design since they are lots of tools that can be used online. When 3D modeling and rendering becomes a topic, it is hard to arrange the workload among team members. (Participant 5)

I really want to continue working on UX during distance education, because it was a very comprehensive process to analyze user behavior and design a system for them. It was much easier to conduct the designing phase as a team. (Participant 19)

For assignment briefs there could be a defined workload for each member such as one person should develop this while another person works on this part of the project. (Participant 3)

Despite the suitability of the subject for teamwork, some of the students are reactive about teamwork and argue that it should not be done, especially in the distance education process. Teamwork in physical education offered students the opportunity to socialize as well as develop something together. However, as this situation turned into the necessity of working together only in distance education, the motivation of the students for teamwork decreased even more. In fact, it seems that the necessity of being in front of the screen for a long time makes them even more tired psychologically (e.g., Participant 17). In this case, it increases the tendency to do individual projects. However, although the opportunity to socialize in distance education is not as much as in the physical environment, the students are aware of each other and experience limited socialization, while in the individual project, it is seen that a part of the class is much more isolated from each other. In this process, where we have completely left the distance education period behind, we will not encounter such problems. Students generally do not think much about what will happen in the opposite scenario while proposing something.

After spending the whole day in front of the computer because of the lessons, it can be psychologically tiring to continue the evening in the same place for teamwork this time. While you can socialize with your teammates at the same time in physical education, in online education it has turned into the process of just doing its job. (Participant 17)

With the distance education process, although the restrictions on going out negatively affect the students' psychology, as they get used to this process, they started to discover features that can have positive effects on the education process. In particular, the use of online tools and the increase in awareness will create a new perspective for students in the future. Moving from a group of students who might have hesitations about learning a new program, to a process where new programs are mandatory has contributed to breaking the assumptions of the students. In addition, while trying to solve one of the biggest problems of team meetings, finding time, with online meeting advice, this option has now become the primary choice of students. It is strongly emphasized that the projects should be shaped according to the conditions of the period (physical or online) and whether they are individual or teamwork oriented. Regardless of all these, it is seen that making the team process visible in teamwork projects and its controllability by all the team members and the instructors will provide great comfort to the students with the help of the online tools.

6.2 Observation throughout the project

The second study of the third research stage was conducted based on the five-week studio project titled "Sustainable Design Solutions for Rethinking and Reusing Waste Materials to Extend Product Life Span in Collaboration with Asliteks" in the third-year industrial design studio course, Spring 2020-21 semester (see Appendix O). There were seventy-three students, and eighteen teams took part in the project. One team had five members, and the others were four-member teams. Throughout the project, weekly meetings were conducted with all the teams to explore and understand students' thoughts, practices, attitudes, behaviors, and constraints within the context of distance education. Four weekly meetings were conducted, and these meetings and observation notes were recorded in the form of reports. Throughout the project, as the researcher and educator, I suggested the student teams to adapt the

shared leadership process and *task management* tables to support their teamwork experiences. They constantly used the Miro boards which is an online whiteboard that helps students to visualize their ideas and work on both individually and as a team, for their design process concurrently. The fact that the educational version of the program is free and allows for simultaneous work has provided students with the opportunity to work both within their own team and with educators, especially during the distance education process (Spring 2020-21). Therefore, I also showed the potential features of this online platform for *task and time management*. Some teams made tables on the Miro boards and personalized their online working space, and used different strategies to follow and plan the related tasks for enabling the teamwork process. The screenshots of the tables created by the teams that followed the suggestions and used Miro for task management were recorded.

Table 6.2 Student teams list in terms of sections

| Section 1 : Bathroom / Bedroom | Section 2: Children’s room | Section 3: Living room / Home office |
|--|--|---|
| Team 1 - 6 (Team 1, five-member, others are four-member) | Team 7 - 12 (All of them four-member) | Team 13 - 18 (All of them four-member) |

Review of the Week 1 / On 18 March 2021

In the first week of the five-week project, the students were divided into 18 teams in total. The studio teams and student teams were divided into three sections, and each section included six teams, one lecturer, and one research assistant. Teams and sections were created entirely randomly. I was assigned to follow and consult the teamwork, and to be responsible for tracking the teamwork process of all teams independent from the sections. On Monday, the first day of the semester (15 March 2021), the project brief was announced to the students, and a research assignment was given. On the Thursday of the first week, while the teams received their first critiques about the research assignment from the instructors in their own sections, I did 10–15-minute meetings with all teams.

Because of the pandemic situation, distance education has been continuing, and course sessions were conducted on Zoom. While all the teams were working in their break-out rooms, I visited all the teams' rooms and talked about their teamwork experiences. The first meeting topic was related to how the teamwork process could be more beneficial and effective for them. I first got their first impressions and thoughts, and made suggestions about the issues to be discussed and decided at the beginning of the teamwork process.

It seemed that all teams had set up a WhatsApp group for *communication* and their meetings among themselves, except one team, which preferred to use Telegram which is similar to WhatsApp for voice/video calls and texting. The teams used platforms such as Discord, Zoom, and Google Meet to conduct their team meetings. Although they are used to using Zoom, it was observed that the students were looking for a different platform because the accessible version of the Zoom only allowed 40 minutes, and the meetings are closed automatically after that. However, it seems that there are teams that continue to use Zoom despite that time limitation.

As in the previous semester, the students were encouraged to use the Miro board this term as well by the studio team. Separate boards were opened for each phase of the project, and the teams were assigned their own Miro boards. This platform, which enables students to work together simultaneously, also supports the studio team to follow this process one-to-one, and criticize it interactively on that platform.

At the meeting, four main themes: *communication*, *shared calendar* (meeting), *leadership*, and *task division* were discussed, and suggestions were made to the teams. For communication, as mentioned before, teams were using WhatsApp groups, but I warned them to avoid dual talking and making decisions, and make sure that everyone in their team is aware of everything. Also, one of the difficulties of working remotely is that people can reach any team members at any time due to online tools, even when they take this time for themselves. Therefore, informing all team members about their special situations and requests from the first week is very critical. It is important to have a common understanding of this from the first week

because such requests that arise afterward can be misunderstood and cause problems. The students were supported to create a team discipline that each team member can approve.

Another topic that we talked about was the *team meetings* and *time management*, arranging a common time, for the meeting. The students were asked to stay away from the meetings involving two or three members as much as possible and to find a common time that all team members could be involved. Thus, it was stated that any of the team members could be prevented from missing something and would not cause a loss of motivation. It has been observed that some students who did not participate in a few meetings or did not participate in decision-making are partially isolated from teamwork. It was suggested to use a *shared calendar* to prevent all this and facilitate the process. Commonly available times, and important dates for the meeting and project (juries, submissions, etc.) could be added to the shared calendar. They were asked to make the project process more visible to all team members. Thus, the processes of organizing the tasks and setting the meeting dates could be easier for the teams. Also, it was suggested that Miro boards could be used for this time management process too. They can add a calendar or create their own timetable easily.

Miro board was suggested because it is used regularly and frequently among all the team members. It is important that such platforms are used regularly by all team members to make sure that all team members are aware of the process in order to provide interaction. A single program in which they carry out the whole process, rather than an extra different program specific to teamwork management such as Trello, provides convenience and practicality for the team members. In the previous study, a separate Google Sheets file was used, and it was observed that only the person who was the leader that week, used it in that process and thus the interaction among the members was reduced. That has been observed to be impractical. It is also important to set up time management through a less time-consuming and practical program that is already used by all members of the team.

Another point discussed with the teams was about *leadership*. The teams were asked whether they chose a leader or not and in general, it was observed that the teams did not choose a leader, but some students in a few teams voluntarily took on such a task without labeling themselves. Since there are things that need to be organized and followed in teamwork, someone has to manage this process. Therefore, the leadership or responsible person will contribute positively to the teamwork process. For this reason, I suggested the teams, selecting a leader and organizing this process rotationally if possible. When someone from the team takes on this task constantly without a common agreement within the team; this may create conflicts for that team in the future. The leader may not want to continue this task after a while or other team members may not be satisfied with this process, where there is no consensus. In the case of being a leader by the team decision, this process is prevented from being experienced by other team members. Considering that this is an educational project, it should be a goal of these projects to enable students to take responsibility for different tasks and discover their own potentials such as being a leader and managing and monitoring assigned tasks. For this reason, *shared leadership* process could reduce potential problems and ensure equality between students. This rotational responsibility could increase the motivation and sense of belonging of the team members both for the team and the project. In the previous research, it was stated that this shared leadership process increased the sense of responsibility of the students and made them realize their abilities. So, it was suggested that each team member could lead each week of the four-week project. Thus, each student could have experience in this process and get the opportunity to get awareness about their abilities.

The duties of the leader could be to organize the meetings, decide the platform to be used for the meeting, inform the teammates about the meeting details, and remind the meetings. Apart from the meeting organizations, to follow up on the assignments that need to be uploaded to ODTÜClass and organize the division of task processes. Although these are very simple things, these steps make the process of teamwork very practical and systematic. In improvised and unplanned teamwork processes,

missing tasks and time ineffectiveness can be encountered to a greater extent, which can reduce the motivation and participation of students, and also it can cause them to spend too much time than necessary.

All teams started working by dividing tasks from Monday to Thursday. They had made the necessary preparations for the critiques sessions that they would receive that day, so they had their first experience as a team until our first meeting. A few important points to be aware of while dividing the task were repeatedly reminded. The most important of these is that the *division of tasks* should not remain in the notebook of one of the team members. Once the division of tasks was done, they were told they had to write it down somewhere accessible to all members. The so-called task division can cause misunderstanding and/or incomplete understanding, and this may be a problem for the teams in the next meetings. For this reason, making it written and visible to everyone will eliminate those problems. It has also been observed that this adopted behavior increases the sense of responsibility in students. It has been suggested that they can use any platform including Miro boards, as well as make a very simple table that includes the tasks to do, who will do and the project deadlines. At the end of the course, it was seen that some teams started to implement these suggestions and added a shared calendar and a table for task management to their Miro boards.

It was stated that while dividing the tasks, it is necessary to manage a process where all team members agree, and it is normal for everyone to choose the areas they are good at or the tasks they want to do. In this process, the expectation from the leader is not to say to the team members that you should do this. Rather than this, they were recommended to carry out this process and to manage this table if they will use it. In addition, the problems that students fear most in their previous teamwork experiences are the unbalanced division of tasks, and some team members not doing the given task. In order to prevent and better manage this, they were suggested to make the division of tasks as visible as possible. A visible task division plan increases students' awareness of their responsibilities as well as reduces problems to some extent. In addition, another method is not the individual division of tasks, but

the division of tasks can be done in two and accordingly so that the team members support each other, and the students who have difficulty in keeping their own motivation and self-discipline are supported.

It was stated to the students that in general, they should discuss these issues from the first week and decide what kind of working style they want to establish. Solutions co-developed with all members at the beginning of the process would support the teamwork experience and minimize the problems that can arise in the following weeks. In addition, it was stated to the teams that we will continue to conduct such short meetings every Thursday and if they have any questions or problems, they can contact me whenever they want. It was said in the meetings that we would discuss how they spent that week and how we could make the process more effective.

Review of the Week 2 / On 25 March 2021

Second week meetings were shorter compared to the first week. How the teams spent the first week process, whether they had a problem and what they did about the topics suggested in the previous week were discussed.

For the moment, there was no team that was experiencing an important problem or trouble. As the process intensifies, problems may arise. Although I aimed to talk to the teams that I could not talk to, on Monday, we could not speak due to the schedule of the course. While some teams started the leadership process, others were seen preparing tables on Miro boards for division of labor and time planning. Of course, there were also groups that do not apply any of these items.

Review of the Week 3 / On 1 April 2021

Meeting was held with all the teams. How they spent the one-week process, whether they had a problem or not, and what they did about the topics discussed in the previous week were discussed again. While some teams were fine, some of them had

some problems, their meetings were held longer than the others. For this week, the teams completed their individual assignments until Monday and brought together their individual works as a team from Monday to Thursday, completing the assignments requested from the teams.

They said that while they were completing this assignment from Monday to Thursday during the week, due to their other courses, they had elective classes on weekdays, especially Tuesday and Wednesday, so they had difficulty finding time to work together. When the programs of the students were examined, it was observed that they were more intense due to the compulsory and elective courses on Tuesdays and Wednesdays. On the other hand, it was seen that Fridays were more convenient for team meetings. For this reason, the due date of the assignments on weekdays put pressure on teamwork.

It was observed that this intensity caused some tension in the teams. With tight schedules, not all students could adapt to this process to the same degree. Therefore, this may cause imbalance and problems within the team. While some students coped better with this intensity, others were demotivated and had trouble making equal contributions to teamwork. For this reason, giving tasks for as long as possible at least one week in teamwork projects can prevent problems from occurring and create an environment where students can understand and work more comfortably in equal positions. In the last two weeks of the project, it was suggested that the teams will not have such a tight schedule as they do not have any extra submissions and will be preparing for the final during these two weeks, so this process should not negatively affect their motivation. It was stated that they could plan their time better as they could use the weekend more comfortably.

Review of the Week 4 / On 8 April 2021

Meeting was held with all the teams. Before entering the final week, we talked to the students about how the previous week was and discussed when they met, how long

they worked and what kind of division of labor they made. Then we talked about the plans for the final week, and I advised all teams to make their one-week plans for the final jury from today. In particular, we discussed that they would need to organize the weekend well, which would prevent possible problems from leaving their workload to the weekdays. Therefore, I asked them to decide on which days of the week they would be available, on which day(s) they could work together and whether they should do their individual work.

Besides, I stated that they should make the final decisions about the project by Saturday at the latest to spare enough time to be prepared. I suggested that since the decision-making process is a never-ending process, they should know to stop at some point, make the final decisions and start preparing for the presentation. I said it would be good for them to make a to-do list and determine which ones should be prioritized. I asked them to decide which ones could be done on weekdays and make their weekly plans. For all this, I suggested that they make tables that can be seen by everyone in Miro. Finally, I stated that it would be good for all teams to prepare and rehearse for the presentation before the jury. In order to best explain their project in 10 minutes, I suggested that they pre-determine who would tell which part and rehearse beforehand.

All the team talks went well overall, and they didn't mention any of their problems. However, during the conversation with Team 10, one of the group members said that she wanted to talk privately by sending a private message. A private meeting was held with her during the lunch break. She talked about the problems in the team during the short meeting because of the time problem, she said how inefficient this week was and that she wanted to talk about it privately because she did not want to hurt her friends and offend anyone. I stated that she could indicate her discomfort with general comments without naming them. It reminded me that the reason I met with them every week was to be able to talk about these kinds of issues. We left, saying that we could talk again as a team at the end of the day if she wanted. At the end of the day, when I went to their break-out room, they said that everything was fine, they talked and solved the problem together.

Since Thursday was the last crit day before the final week, two crit sessions were held, both in the morning and in the afternoon, to make students more critical. Considering that the first criticism would be more extensive, half an hour was allocated, and the teams were expected to make improvements on the criticism they received in about 3 hours between the two critical points and prepare for the afternoon session. 20 minutes were allocated to each team for this session. It was stated that on Monday, we could only answer critical problems that would not be planned. Table 6.3 contains the important notes that came to the fore in the meeting with the teams throughout the project.

During the final jury, one team presented their design solutions, one member missing, and her team members did not know what happened. They stated that even though they were rehearsing for the jury altogether, she did not attend the presentation without any notice in the morning. She sent an e-mail the next day stating that she could not attend the presentation due to the electricity cut in the dormitory where she was staying. In the weekly meetings, it was realized that even though the teams seemed good in general, they did not talk about the minor problems they had as in this team. These minor problems could have great effects on the final week sometimes. It is very important that team members always feel responsible toward each other and that communication within the team should be strong. A small glitch can cause big problems. Therefore, it is critical to always be prudent and maintain communication within the team.

After the jury, the class representative thanked me for these meetings and stated that despite all this process, there were problems experienced and these were not reflected on me. Although they knew that I was trying to make their process more efficient and visible, they chose not to explain certain things. I think this process provides self-control for students and gives them the opportunity to explain and talk about their problems related to teamwork as the problem grows.

It is clear that teamwork became more difficult in online education. In other lessons, students focused more on teamwork, and they needed to work in more than one team

at the same time. This situation wore them out more. During this period when they could not allocate enough time for themselves socially, lockdown rules, and evening and weekend restrictions limited their socialization. In addition, the lessons during the week showed that they had little time to go out. It seems that all of these students devoted the majority of their time to the lessons and the work that needed to be done for the lessons. This may have caused students to become more intolerant of the teamwork process and have more difficulties while managing it.

Table 6.3 Meeting evaluation of the teams

| | Week 2 | Week 3 | Week 4 |
|---------------|--|---|---|
| Team 1 | The <i>leader</i> has not been selected. They made the <i>division of tasks</i> among themselves in the classical method | The team generally gets along well and does not have any problems. They met on Tuesday and decided what to do, and they divided the tasks and left. On Wednesday, the last day, they came together and made a <i>division of tasks</i> . | They met for one day this week, on Tuesday, they <i>divided the tasks</i> and prepared for today. |
| Team 2 | A <i>shared calendar</i> has been created on the Miro board. <i>Division of task</i> was done on the Miro board too but was deleted as the tasks was completed. They didn't choose a <i>leader</i> , but they organize the process on the Miro board. | Since their schedules were busy from Monday to Thursday, they had a hard time adjusting the time for <i>team meetings</i> . One of the team members could not attend one meeting due to the assignment of another lecture. The next day, they reported what had been done to him. They get along well and manage each other. | Although they met every day at the weekend, they could not advance the idea development process successfully, that's why they had to improve on the last day. It was suggested that for the final week, they should be more planned and organized. |
| Team 3 | No meeting. | Although they had <i>time problems</i> and complained about it, they did not pay much attention to the suggestions. Making a <i>shared calendar</i> could help solve time problems, they thought that being in daily communication via WhatsApp would be more effective. | They organized three meetings and tried to clarify their ideas together. They stated that they were busy due to the other courses as well. They said that <i>dividing tasks</i> significantly reduced the workload. |
| Team 4 | One of the team members was experienced in teamwork, as she participated the research I did last year. That's why she became <i>the first leader</i> . But they said the leader didn't have much to follow, as they held frequent meetings at short intervals. They created a <i>common calendar</i> on the Miro board. Generally, they met, <i>divided the tasks</i> and left. They held a long meeting on the last day and combined their works. | This week one of the team members was not very supportive due to his responsibilities in other courses. His friends understood this situation and made up for his deficiency. In the next period, it was suggested that he should take more responsibility from his friends for this nice attitude. In the process, <i>the division of tasks</i> has been made, and after everyone completes what they have to do individually, they bring them together. | One of the team members had internet problems this week due to the weather conditions where he lived and was not able to participate much this week. He also had frequent connection problems during our meeting. He stated he tries to make up for the deficiency via written communication. |

Table 6.3 (continued) Meeting evaluation of the teams

| | Week 2 | Week 3 | Week 4 |
|---------------|--|--|---|
| Team 5 | <p>The team selected their first <i>leader</i>.</p> <p>In the team, they started using <i>Trello for task management</i> and they seemed happy with this experience. One of the team members said that she liked it even though she had never used it before.</p> <p>Since it looks like Trello, I added Kanban to their Miro boards and suggested that they can do this on the Miro board too.</p> <p>Often they <i>divided the tasks</i> and left. They put it back together for the presentation.</p> | <p>They continue the <i>leadership</i> process.</p> <p>Trello has not been used this week. Since they did first an individual assignment and then teamwork, they devoted less time to teamwork.</p> <p>After this week, I said they might need a division of labor like Trello again.</p> | <p>They had worksheets in Miro for task management. The leader seems to have organized the process well. They haven't used Trello again.</p> <p>This week, they have improved their processes by holding frequent short meetings.</p> |
| Team 6 | <p>They held two meetings together. They both met and worked together, and they <i>divided the tasks</i> and left. While dividing the tasks, they wrote their names on post-its on their poster on the Miro board and made the <i>task division visible</i>.</p> | <p>Although it is a group of students from different periods and different cultures, it seems to be one of the teams that get along best. They <i>divided into tasks</i> and united after doing their part.</p> | <p>There is a <i>detailed work division table in Miro</i>.</p> <p>As the task was completed, they ticked the recognition. The division of tasks seems balanced.</p> |
| Team 7 | <p>They did not choose a <i>leader</i>.</p> <p>A <i>shared calendar</i> was created on the Miro board. They usually <i>divide up the tasks</i> at the meetings and left, then bring them together.</p> <p>Due to one of the team members' personal intense processes, there may be disruptions in her contribution to teamwork.</p> <p>It is recommended that instead of having long meetings, short meetings that everyone can attend and divide the tasks and leave process could be more effective.</p> | <p>This week, everyone who had a <i>division of task</i> and took the responsibility of one scenario and then joined it.</p> <p>During <i>this division of tasks</i>, they worried that the scenarios would not speak the same language. We talked about the fact that it is a process, and it is the most effective way to divide the work. On the issue of speaking the same language, the fact that this can be reduced by the basic rules taken.</p> | <p>The <i>division of tasks</i> among themselves looks quite smooth. They have already made their plans for the final week.</p> |
| Team 8 | <p>No meeting could be made with this team.</p> | <p>They met early on Wednesday and <i>divided the tasks</i>, and everyone completed their part by the evening, meet again and brought them together.</p> <p>It was stated that they needed better time and work distribution planning, and their method could be a problem in the future.</p> | <p>They had got the first critique of the day before the meeting. Their mode was a little low. It was suggested that they have 2-3 hours, and they can take crits again and make good use of the time in between.</p> |
| Team 9 | <p>No meeting could be made with this team. Shared task and time management tables appear on the Miro board.</p> | <p>They said that they could not find a common working discipline. From Monday to Thursday because of their other courses, they had difficulties organizing the process.</p> <p><i>Leadership</i> in the team continues. Despite the <i>division of tasks</i>, nobody could finish the work until the determined time.</p> | <p>They worked asynchronously and brought them together on the last day.</p> <p>There are worksheets on Miro for <i>task and time management</i>. They thought it up to plans A and B for the jury week.</p> |

Table 6.3 (continued) Meeting evaluation of the teams

| | Week 2 | Week 3 | Week 4 |
|----------------|--|--|--|
| Team 10 | No meeting could be made with this team. | Since one of the team members was <i>covid</i> , she could not contribute to this week's process. Three of them completed this week's process. | We talked about the need to make an urgent plan for the final week. One of the team members wanted to speak privately by sending a private message. We talked, I listened to the problems she told, and I gave my suggestions. When I came for the second time in the day, their moods were higher, their crits were good, and they said that they talked and solved their problems. |
| Team 11 | <i>No shared calendar</i> has been created. Nothing was used for <i>task distribution</i> and <i>no leader</i> was selected. Task distribution was made over WhatsApp and Zoom, and it was said that the process went smoothly. The previous week, one of the team members had mentioned that sometimes it was very difficult to support the motivation of team members, and I told them that they could work in two, so that they could support each other. This suggestion was considered. | It was decided what to do on Monday, they thought about Tuesday and then divided the scenarios. It was stated that it would be good for them to use their class hours in order not to <i>have time problems</i> . | They gathered within the week, <i>divided the work</i> , then brought together what was done. We talked about them making good use of today's process and making a <i>weekly plan</i> for the final week. |
| Team 12 | No meeting could be made with this team. A <i>shared calendar</i> was made on the Miro board. | The <i>leadership</i> process continues. They used <i>calendar and division of tasks tables</i> . They <i>divided the tasks</i> and separated, then held a meeting and brought them together. | One of the team members could not contribute much this week due to his other assignments. His teammates seem very insightful about this. I advised him to take more responsibility and effort compared to his friends this week. It was suggested to make a good weekly plan. |
| Team 13 | They met three times during this week. They did <i>nothing about the division of tasks, calendar, and leadership</i> . The <i>division of tasks</i> was made verbally in the meetings. | They continued in their own working style from the first day. They met and finished on Tuesday, and Wednesday evenings. | They did not work at the weekend, but they met and worked together on weekdays, Monday, Tuesday, and Wednesday, after 9 pm. They talked about who can do which stage for the final. |
| Team 14 | They usually held meetings and worked together. Therefore, <i>the division of tasks</i> was not made. They said they didn't have <i>time management</i> problems. They do not prefer to use a <i>shared calendar and leadership</i> . | There is no problem. Although some team members could not attend some of the meetings, they said they made up for it. It was suggested that, if possible, it would be good for them to get everyone to attend the meetings with better time planning. | They met on weekdays, distributed tasks, and worked separately. |

Table 6.3 (continued) Meeting evaluation of the teams

| | Week 2 | Week 3 | Week 4 |
|----------------|--|--|---|
| Team 15 | <p>They described the one-week process intensely. They said it was difficult to organize this whole process, as they also worked in teams in other lessons. However, they did not make a <i>shared calendar</i> or <i>division of task schedule</i> that could facilitate this process.</p> <p>But the <i>shared leadership</i> has begun. To ease the process a little, It was suggested that it might be better for them to have short meetings and detailed division of tasks rather than long and frequent meetings.</p> | <p><i>Leadership</i> continues in the team. The leader said she did ODTÜClass submissions.</p> | <p>Team members worked for one day on the weekend. They held a meeting again on Monday night and made a division of tasks. The next process progressed through WhatsApp.</p> |
| Team 16 | <p>The <i>shared leadership</i> has begun while meeting on Zoom, they worked on Miro separately so that they were informed about each other and speeded up the process with the <i>individual division of task</i>.</p> <p>They stated that they were satisfied with this method. Although it could be a good method, it can be difficult to set up such a long common time as the process intensifies; that is why they were advised not to insist on this method of work.</p> | <p>They could not plan well due to the busy weekdays. They worked individually, not as a team. It was stated that they can organize this process better. There might be a need for a leader in the team.</p> | <p>They said that they met on Saturday, and they did not take crit on Monday, they worked together, <i>divided the work</i>, worked separately, and then brought them together.</p> |
| Team 17 | <p>Nothing has been done on the proposed <i>shared calendar</i>, <i>division of tasks</i> and <i>leadership</i>. The process progressed through WhatsApp and task tracking was made. They held meetings in total two times a week.</p> | <p>This is the only team that said it was a very comfortable week. Their decision-making process was rapid, and they <i>divided the tasks</i> and worked and then brought them together.</p> | <p>Three of the team members were in the same house, they had the luxury of working side by side that the teams could not do these days.</p> |
| Team 18 | <p>The <i>first leader</i> organized the meetings in general. They said that they met four times, and they generally preferred to hold meetings after 9 pm due to the lockdowns. <i>The division of tasks</i> was made on Miro.</p> | <p>They decided and worked together in the process. They gave up the <i>leadership</i>. <i>The division of labor</i> was made through Miro.</p> | <p>Decisions and plans have begun to be made with today's critics. They meet and work every day and they are satisfied with this situation. Nevertheless, it was suggested that it would be better for them to plan the final week already.</p> |

Review

All meetings with the teams were based entirely on advice. It can be defined as short conversations that are suitable for the topic of the week, or how they can minimize potential problems and create a more effective teamwork environment. Some of these recommendations, which were offered to them were implemented from the first

week, some of them were adopted in the process, and some groups did not prefer to apply any of these methods. While the process progressed better with teams that were open to conversation and development, everything remained at the level of fulfilling the formality for the groups that were completely closed to communication. Six of the 18 groups did not lead or set up for teamwork in Miro or any other platform. While some of the other 12 groups used Miro, some continued the leadership process, and some tried to apply both methods (see Table 6.4). This rate is very satisfactory for this process, which is based on volunteerism, and some groups managed this process very well.

Table 6.4 Teamwork perspectives of the teams.

| | Miro (task – time management) | Leadership |
|----------------|--------------------------------------|-------------------|
| <i>Team 1</i> | | |
| <i>Team 2</i> | X | |
| <i>Team 3</i> | | |
| <i>Team 4</i> | X | X |
| <i>Team 5</i> | X | X |
| <i>Team 6</i> | X | |
| <i>Team 7</i> | X | |
| <i>Team 8</i> | | |
| <i>Team 9</i> | X | X |
| <i>Team 10</i> | | |
| <i>Team 11</i> | | |
| <i>Team 12</i> | X | X |
| <i>Team 13</i> | | |
| <i>Team 14</i> | X | |
| <i>Team 15</i> | X | X |
| <i>Team 16</i> | | X |
| <i>Team 17</i> | X | |
| <i>Team 18</i> | X | X |

The purpose of these meetings was to raise awareness among the students on issues such as task and time management, division of labor, leadership, and to give tips on how to adapt them in their processes. Some of the teams created their own workspaces on a very flexible platform and managed the process follow-up and time planning very well such as teams 2 and 9. The use of Miro was particularly encouraged because shared Miro Boards became the working area of the students in distance education. It was a place frequently used by all group members, as all assignments, presentations and critics proceeded through this platform. It was thought that having an area where they can follow the teamwork process would provide practicality in this work area where everyone can work simultaneously and can reach at any time. Although one of the teams chose to use a specialized program such as Trello, this did not become a continuous choice. However, in Miro, since it was not possible to forget or overlook an area that is always in front of them, the follow-up of the process would progress much better. This was also the case with most of the teams that preferred it.

Considering that the project was not a very long project, which covered the first five weeks of the 14-week semester, some of this process was reserved for individual assignments. It can be considered very normal for students to go through the process without getting overwhelmed and experiencing many problems. However, despite this, they had difficult and fast-paced periods, especially due to the fact that they were busy with other classes for some weeks. However, in this short-term process, the teams perceive the importance and need for time planning and process follow-up. Especially in the final week, all the teams started with *a more structured weekly plan*, in which the calendars were prepared, the meetings were decided in advance and the possible division of labor was made. This ensured a smooth preparation for the final.

A brief suggestion was presented to the students on what they could do on the Miro board. It was stated that for a better time planning process, all team members can share their course plans and notify their common spare time, so those weekly meetings can be organized more easily. In this process, it was seen that the teams

adopted the idea of a *shared calendar* more and indicated their own schedules, and made their weekly schedules for this purpose such as Team 2 & 9 (Figure 6.2 & 6.3). Another important element is the *to-do list* and the *division of labor*, and it was suggested that they could create simple tables to follow this process. At this stage, each team made its own table such as Team 9 (Figure 6.3). It was stated that there are three important stages in this process, who will do what and when. This three-section table is indispensable for process tracking.

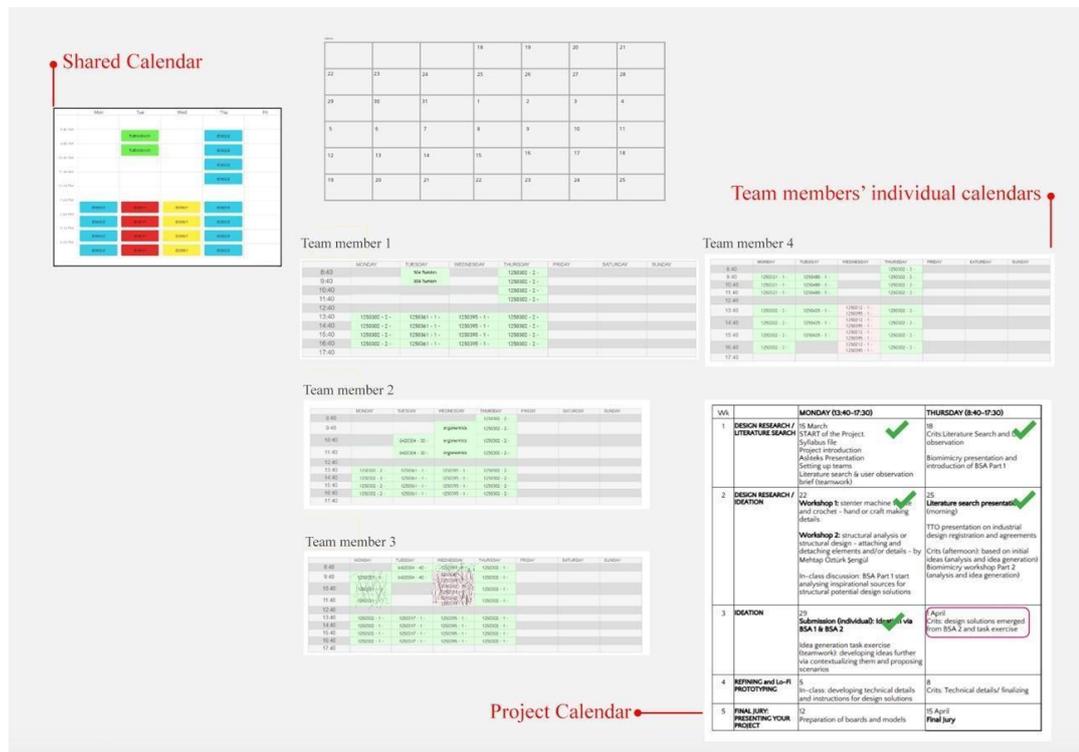


Figure 6.2 A screenshot from Team 2's teamwork area on Miro board

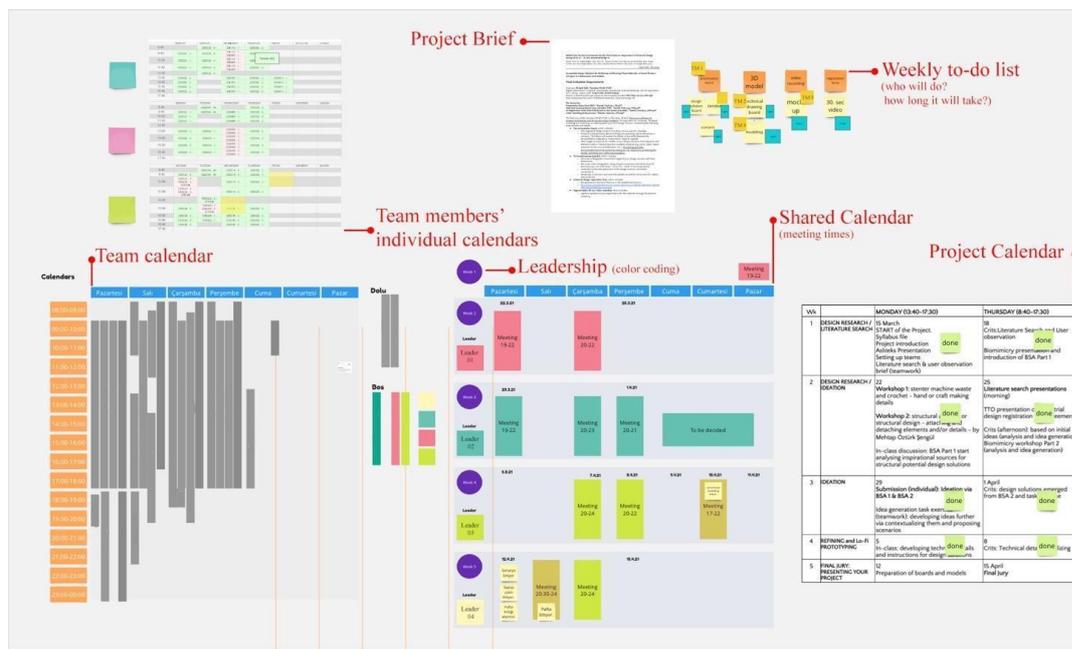


Figure 6.3 A screenshot from Team 9's teamwork area on the Miro board

In addition to these, it is seen that the teams have added the *project calendar* to this teamwork area such as Team 2, 9 & 12 (Figure 6.2, 6.3, 6.4). Being prepared to foresee what they will do next week will be an advantage in terms of team planning. If the teams that prepare a 4-week calendar are doing the leadership process, it is seen that the names of the leaders are written next to the weeks and noted what was done each week such as Team 9 & 12 (Figure 6.3 & 6.4). It is seen that these Miro boards are used more interactively compared to the Google Sheet and as the process progresses, ticks are made next to the works done, notes are taken with post-its or color codes are used to define team members or done tasks. However, since it is a recorded process to follow up, it is important to keep all the entries there, and it was seen that some teams deleted the tasks and the relevant part as the task after it was completed. In case of a possible problem in the future, it is important that these accumulate there without being deleted, and it is an element that should be reminded to the students. These tables should be made knowing that not only for them but also for the instructors, they can be checked at any time.



Figure 6.4 A screenshot from Team 12’s teamwork area on the Miro board

While the Miro boards of some teams were very structured for teamwork such as Team 2, 9 & 12, some of them just noted what to do on the posts quickly and added who would do it next to it and threw big ticks on them as they did it. Some prepared it especially for the meeting that day such as Team 5 (Figure 6.5), and some like the weekly jury plan like Team 14 (Figure 6.6). This process showed that it is possible to encourage the teams at the beginning of projects to plan or put these plans in writing. Maybe it can be submitted to a *simple template* so that they are more organized and registered, or it is necessary to accept that it is a part of this process without making it seem like an assignment. Miro Board, which has become an indispensable part of studio education together with distance education, is seen as an ideal place to be used in this process thanks to the accessibility of everyone and the program's features and flexibility.

Frame 2 Meeting Notes (to-do list, time management, division of tasks)

SUNDAY 10.00 AM MEETING

SKETCH EXERCISE AND IDEA CREATION

SALIYA BUNLAR OTURMUŞ OLMALI

| | | | |
|-------------------|-------------------|---------------------------|----------------------------------|
| ASILABİLİR | Yerden yükseltme | Kolay taşımak için handle | Kolay ayırmak ve temizlemek için |
| Sketch | Sketch | Sketch | Sketch |
| WHICH BIOMIMICRY? | WHICH BIOMIMICRY? | WHICH BIOMIMICRY? | WHICH BIOMIMICRY? |

PERŞEMBEYE BİTMİŞ OLMALI

| | |
|--|-----------|
| Standart parçalarımız nasıl olabilir (sonraya bırakılabilir) | Structure |
| | |

Figure 6.5 A screenshot from Team 5's teamwork area on the Miro board

Team Weekly Calendar (to-do list, time management)

| Cuma | Cumartesi | Pazar |
|--|---|---|
| <ul style="list-style-type: none"> mengene dene ahşapta birleşmeyi dene kapıya takmayı çöz bu aşamalarda video foto çek detaylara karar ver | <ul style="list-style-type: none"> örgü kısmını bitir Patrona çıkar modellere bu aşamalarda video foto çek örgü tekniğe nasıl gösteriliyor? Industrial design registration senaryo ürün paftası teknik paftası Industrial design registration | <ul style="list-style-type: none"> pafta senaryo ne yapıldığına karar verelim bu aşamalarda video foto çek |

Final Brief

final brief

personal space

paravan oluşturun

Middle East Technical University Faculty of Architecture Department of Industrial Design Spring 2020-21 - ©2020 Industrial Design 40

Assoc. Prof. Dr. Çiğdem Çelenk, Prof. Dr. Seren Turker, İsmet Armutcuoğlu, Ayşe Baş, Seray Çelenk, Ayşe Armut, Ayşegül Çelenk, Ayşe Baş, Seray Çelenk, Seray Çelenk, Ayşe Armut, Ayşegül Çelenk

1 April 2023, Thursday

Sustainable Design Solutions for Rebuilding and Reusing Waste Materials to Extend Product Life Spans in Collaboration with Students

Final Evaluation Requirements

Final Jury: 16 April 2023, Thursday 09:30-17:00
 Digital Submission of Conceptual presentation boards and technical drawings, and E3 registration form, 30 sec. video upload: 16 April 2023, 09:00 (Sharp)
 Booth in E3001 (Landscape based on the template provided) (PDF files and size 200 A4)
 Booth information materials in ©2020 AI3 Sections, Industrial Design 40

File Names for Presentation Board (PDF): "Name_Final Jury_01.pdf"
Technical Drawing Boards (PDF): "Name_Final Jury_02.pdf"
Industrial Design Boards (PDF): "Name_Final Jury_03.pdf"
30 sec. video recording of the process: "Name_Final Jury_04.mp4"

The final jury will be between 09:30-17:00 on Thursday, 16 April. <https://bit.ly/38z50>

Qualification criteria and the evaluation process (Detailed): Through interviews, drawings, 3D digital modeling and rendering, etc. with priority your final design solution considering the following requirements and details:

- The presentation board** which includes:
 - Full strength of design solution including concept specific drawings
 - Conceptual thinking, formal, dimensional and topological specific information in context. The solution will explain the details of assembly/production
 - Justification of proportions, materials, design & graphics
 - Clear images of physical 3D models of your design solution involving structural elements and/or modules based on available materials (e.g. paper, paper-based materials for the structural elements, etc.) <https://bit.ly/38z50>
 - Descriptions to the assembly setting and tool required for producing the blocks and their exact sizes/coordinates.
- Technical drawing boards**, which includes:
 - Full scale orthographic views (front right) of your design solution with basic dimensions
 - Full scale with orthographic views of each component with dimensions if necessary you can include drawing 3D for 2D - view of the components
 - Sections to show the placement of the design solution and related components
 - Scale 1:10, dimensions and assembly details, as well as instructions for makers and producers
- Industrial Design registration form**, which includes:
 - The questions in the form filled out in full, detailed and correct
 - <https://bit.ly/38z50>
 - <https://bit.ly/38z50>
- Approximately 30 sec. video recording** which includes:
 - significant details of your exploration with the materials through 3D physical modeling

Figure 6.6 A screenshot from Team 14's teamwork area on the Miro board

The changing student perspective on distance education had a positive impact on the integration and facilitation of teamwork into design studio education and planning. Especially students' awareness about the use of online tools has increased, their prejudices have been destroyed and their use has increased. Online tools enabling simultaneous collaboration and work have gained much more importance in the teamwork process, especially in distance education, as well as its use in diverse project phases (e.g., *collaborative work for brainstorming and evaluation, presentation*). It was seen that they were more interactive on a platform they prepared and used constantly. Thanks to these positive signs, students' awareness and desire to be more positive in the teamwork process and to carry out their own processes.

6.3 Summary and Discussion

The fact that I had the chance to observe the effects of the sudden change with the pandemic in education on the teamwork process of the students as a responsible research assistant of the third year studio course helped me to understand this general change. This perception was enriched by the survey conducted with the students at the end of the semester. Having open-ended questions allowed students to describe their experiences in detail. In the following semester, in light of this information, the teams were followed up with weekly meetings and suggestions were given for effective teamwork. In the first week's meeting, the teams were asked to talk about certain issues and take decisions. One of these issues was about the communication; which platform they will use for communication, specifying special requests, not wanting to be disturbed after a certain time should be talked from the first week. Taking these decisions from the first day prevents misunderstandings that may occur in the future. Another point is to create a common calendar, noting important dates related to the project in this calendar helps the teams while planning the process, and sharing individual calendars can facilitate the organization of team meetings. In

addition, it was suggested to make a weekly table for the division of labor, and having a written version of who takes which task prevents possible misunderstandings and eases the process follow-up. For these purposes, it was stated that it would be a good choice for all team members to use Miro, which they used constantly during the design project. It was suggested that they may prefer the leadership process within the team to organize the whole process. For this reason, it would be fairer to organize this work in turns, rather than having only one leader. These suggestions, which were made to increase the awareness of the students on this issue and to encourage them, were implemented by the majority of the teams, although there was no obligation. The changes in teamwork with distance education and the methods of students on the subject are collected in table 6.5.

Table 6.5 Changes in the teamwork process with distance education

| | Research II (face-to-face education) | Research III (online education) |
|--|--|--|
| <i>Team Meetings</i> | <ul style="list-style-type: none"> * Preferring to conduct meetings face-to-face * Long meeting hours * Opportunity to make an online meeting when there is a time problem * Difficult to set up a meeting | <ul style="list-style-type: none"> * Mandatory online meetings * Shorter meetings (due to the screen fatigue) * Easier to set up a meeting (time and location flexibility) * Being more flexible about meetings thanks to online tools |
| <i>Teamwork process</i> | <ul style="list-style-type: none"> * Being aware of each other in face-to-face * Opportunity to talk about team process in all matches (breaks and lunch times) | <ul style="list-style-type: none"> * Much more disconnected and less aware of each other * Obligation to conduct a meeting for every detail of teamwork process |
| <i>Task and Time management</i> | <ul style="list-style-type: none"> * Mandatory use of Google Sheets * Having prejudices to use online tools * Only used by responsible leader * No interaction via document * Only leader track the process * Not linked to the design process * Could be seen unnecessary especially for the teams prefer to work side-by-side always * Importance for educators * More permanent tables | <ul style="list-style-type: none"> * Recommended Miro use * Increasing students' awareness and knowledge about the use of online tools * Leader is responsible but all team members use it * Providing interaction among team members over the tables * All the members check the process closely * Could be linked to the design process easily * Importance for students * Deleting the tasks after it was completed |

Table 6.5 (continued) Changes in the teamwork process with distance education

| | Research II (face-to-face education) | Research III (online education) |
|---------------------------------|---|--|
| <i>Division of labor</i> | <ul style="list-style-type: none"> * Tend to work side by side and together * Working side by side in a way that is aware of each other, even if individual work is done * Task division to show the educators | <ul style="list-style-type: none"> * More willing to divide the work * doing individual tasks and then putting it together in team meetings * Importance of good division of tasks * Obligation of the written form of the division of labor |
| <i>Communication</i> | <ul style="list-style-type: none"> * The need to be physically present * a more concentrated environment * Easier for students to encourage each other * Distraction from other people and place in the environment * More practical in terms of using gestures, drawings, models etc. | <ul style="list-style-type: none"> * Ability of students to turn off the camera and mute themselves * Less concentrated and more disinterested * Much more difficult to encourage each other * Technical problems such as internet interruption, slowness and equipment failures * Much more time-consuming |
| <i>Shared Leadership</i> | <ul style="list-style-type: none"> * Less responsible for process monitoring * Much more concrete responsibilities | <ul style="list-style-type: none"> * The significance of process follow-up due to the intensity of the individual tasks * More responsible for communicating and encouraging team members * Needed more to be leader |
| <i>Team Evaluation</i> | | <ul style="list-style-type: none"> * Significance of evaluating each other at the end of the process or evaluating the whole process in terms of individual contribution |

Team Meetings

The results showed that due to the pandemic conditions, it was an extremely tiring process for students to carry out all the work on the computer. For this reason, students' preferences on issues such as *team meetings and division of labor* have changed. The students, who normally prefer to conduct face-to-face meetings, were forced to advance all processes through online platforms. In addition, team meetings that normally lasted much longer, even into the morning, turned into shorter talks. The students, who had to spend the whole day in front of the computer, preferred to have shorter meetings and work individually due to screen fatigue. In addition, while it was more difficult to arrange a meeting in the physical environment, think about

the transportation, and arrange a venue and time; it was sufficient to find a common time to arrange a meeting online. It also allowed flexible working hours. While it is difficult to meet in the evening under normal conditions, it has been observed that students from the distance education process generally prefer to hold their meetings in the evenings.

Teamwork Process

During face-to-face education, it was very common for team members to interact with each other during extracurricular times such as common lessons, class breaks, lunches and social activities, so their social lives could support the teamwork process too. However, considering that the social encounters were completely over in the pandemic conditions, the teams had to make a special speech or arrange a meeting for every detail in their working process. In addition, sharing the same physical environments made it easier for team members to be aware of each other and to track their signs of progress, but this disappeared in distance education. The students had to carry out a much more individual and disconnected process. In this case, division of labor, process follow-up and leadership has become much more important.

Task and Time management

While students were required to use Google Sheets online tool to monitor teamwork in the face-to-face education process, they were advised to use Miro in distance education. In addition, Google Sheet provided students with more structured tables, in Miro, students designed and used their own tables according to their own needs, which provides flexibility. Although Google Sheets is a program that students are very familiar with, students generally had prejudices and reservations about using an online tool and learning a new tool. But distance education has completely changed this situation. The compulsory use of online tools broke students' presumptions and increased their knowledge and awareness about such tools. Therefore, the students voluntarily used Miro for task and time management. Although the follow-up and filling process of the document was the task of the leader, Miro also provided the interaction of the students with the advantage of being the platform that the students

used very often and carried out all their work. The teamwork process and follow-up became much easier and more practical for students. Simultaneously, it created the opportunity to match the work done in Miro with the tasks. It gained great importance in terms of following the process for team members who are far and disconnected from each other. Since they were more aware of each other and the process during the face-to-face working process, it seemed unnecessary to put it in writing and follow it from there. For this reason, while the task and time management process in Miro was a process that students mostly tried to do for themselves, Google Sheet was like to show the instructors the process. But as a disadvantage, some teams prefer to delete these tables in Miro as they are made, while the tables in Google Sheets are more permanent to show the educators.

Division of Labor

Students, who normally find it effective to work together face to face, started to divide the tasks and prefer to work individually in order not to spend more time in front of the screen or to not depend on someone. This situation actually created the awareness of a good division of labor for effective teamwork among students. Since the remote working order necessitates individual work, a more effective division of labor has become critical for students. In fact, it became very important that this division of labor was written and visible to all team members. Being in constant verbal communication while working side by side caused the students to carry out the division of labor verbally. It could be seen as unnecessary to record this process in writing.

Communication

While communicating in a physical environment is a much more practical action, communicating on an online platform is seen as much more difficult and time-consuming. Especially in the design process, while it was much easier for students to explain something to each other through their models and drawings, not being able to do this on the online platform was seen as a major shortcoming for students. In addition, the ability of students to turn off the camera and mute themselves in online

meetings has caused some students to be much less active in communication. While it was easier for students to encourage each other in the physical environment, it was much more difficult to do this online. In addition, technical problems, internet interruption, slowness and equipment failures were other factors that negatively affected team communication in distance education.

Shared Leadership

With the increasing awareness and need for the follow-up and planning of the teamwork process, the role of the leader who organized the whole process gained importance. During the face-to-face education, the leader was generally in charge of filling in the tables, making the necessary reminders and organizing the process. However, as the importance of each of these responsibilities in online education has increased, the role of leadership has become more critical. Leaders have more responsibility especially in communication, informing and encouraging team members and monitoring the process.

Team Evaluation

In this process, where the division of labor and time planning gained more importance, the students emphasized more on evaluating each other at the end of the process or evaluating the whole process in terms of individual contribution. They also stated that the project topic and calendar should be suitable for teamwork. It seems that having at least one week between submissions will make it easier for the team to organize tasks and time. In addition, online tools such as Figma, where they can work together remotely, seem to ease the team's business plan. In this process, where the whole process proceeds remotely, project planning can be organized in a way that supports the planning of the teams.

Knowing that the students are constantly monitored at weekly meetings keeps their motivation of the students high and encourages them to fulfill their responsibilities. Assessment and grading of this process in a more structured project will affect the students' view of this process more positively. Along with some difficulties, online

education provided convenience in terms of teamwork and created awareness. When these positive aspects continue to be used in the face-to-face transition of education, the whole study process will be able to proceed much more effectively for students. Breaking the prejudgments of students about online tools and increasing their awareness also supports this process. Since students focus directly on the specific project details in the design project, such as what the assignment is and when the deadline is, they overlook how to manage this process. The simultaneous balanced execution of these two mediums for education will also positively affect the project output. For this reason, to encourage students to plan the process, especially in teamwork and make suggestions about how they can make better organization support students' whole process.

CHAPTER 7

CONCLUSION

7.1 Revisiting Research Questions

Teamwork is seen as an increasing need in the professional sector today. It turns into an inevitable skill and experience for a professional group that has the opportunity to work in different sectors and works together involving different disciplines such as the design discipline. In order to respond to this transformation, the teamwork process must be transformed into a part of design education. Since doing team projects alone is not a sufficient step for students to teach teamwork skills, it was thought that this could be a part of studio courses, such as the design process in a more structured and informative way. It provides a good opportunity for the design students to experience the teamwork process, considering that the projects done in design studio classes take longer. Considering that the duration of teamwork in the first year is a maximum of one week, there is not enough time for design students to fully acquire teamwork skills, so it will be effective to start this process especially in the second grade at the latest. However, in the first grade, students can be informed about the basic communication, collaboration skills and team management skills.

In the light of all this, the main purpose of this doctoral study is to explore and understand how to carry out this process in a studio project in order to provide students with teamwork skills, how online tools can be contributed to at this stage, and what the roles of students and educators should be in this process. In this direction, two main research questions of the study emerged which are:

Q1: How can the design students' experiences and practices of teamwork be enhanced in design studio education?

Q2: How can the learning and teaching strategies and skills for effective teamwork be integrated into design studio education?

These two main research questions, together with their sub-questions, will be explained in detail in the following sections.

7.1.1 Q1: How can the design students' experiences and practices of teamwork be enhanced in design studio education?

Under the first main research question, four sub-questions stand out. Each of these questions will be discussed in detail in line with the literature research and research process carried out within the scope of this doctoral study.

Q1.1 What are the current approaches and strategies for integrating teamwork experience skills into design education?

The new generation of Gen Z, involving university students currently enrolled in higher education, grows up in a world where the internet and technology are indispensable in their lives (Leslie et al., 2021). This results in that they can resist traditional education methods and prefer a more interactive environment (Souleles, 2012). This generation, which has entered every aspect of their lives with technology and the internet, has high business skills simultaneously and can use this technology very effectively in terms of obtaining the information they want and communication skills (Lapolla, 2014). All these require higher education to develop and experience different learning methods for its new students.

On the other hand, the discipline of design, like generations, is changing very rapidly as an area that is directly affected by these changes and developments. With the change in the definition of design (see section 2.2 Design Education), designers have started to work in many different sectors (Hidayah, 2020). In addition, for the

solution to today's complex design problems, the integration of different disciplines such as technology, business and social sciences into design education and learning to work together with people from these disciplines should be an important and indispensable skill of design graduates. In this rapidly changing world, designers need to adopt the lifelong learning method and develop their communication and teamwork skills to keep up with this change (Meyer & Norman, 2020). All these changes make teaching teamwork skills which are the essential qualification of the design graduates, critical in design education (Tucker & Abbasi, 2016 & Casper, 2017).

Although teamwork becomes an invaluable part of design education, especially in studio courses, it does not progress within a structured teaching framework. For this reason, design students are not able to gain the expected teamwork skills and many problems can be encountered throughout the process. For this reason, there should be certain steps that the students should be asked to do about teamwork in an educational teamwork project. In this controlled process, both the quality of the design outputs, the project process and the teamwork process can progress much more effectively. These steps can be summarized in six steps in proportion to the teamwork skills which are (1) coordination of tasks and responsibilities; (2) communication via speaking, writing, drawing and modeling; (3) idea generation, evaluation & selection; (4) decision making; (5) leadership; and (6) conflict management (Tucker & Abbasi, 2013) expected from design graduates in general.

Before starting the teamwork process, there are different methods suggested for *team forming*. These methods can be summarized in three steps in general, which are (i) self-selection, (ii) random allocation, and (iii) deliberate allocation (Hains-Wesso, 2013). In addition to the advantages and disadvantages of each of these methods (see Table 2.2), it is emphasized that leaving this choice to the students can cause problems so, in order to build a fair and balanced teamwork process, it should be organized and facilitated by educators (Levin, 2005). In addition, diversity within the team and students' learning to work with people they do not know both improve

teamwork skills and contribute to students' awareness of cultural and personal diversity in this changing global world (Volkov & Volkov, 2015).

After creating the teams, the first thing that should be asked from the students is the *team contract*, which the team members must come together to form. Tucker and Abbasi (2013) propose three main parts for the content of the team contract which are team process, ground rules/team expectations and consequences. This document, which is approved by all team members and turned into a written document, also determines what kind of process the teams will follow (Hains-Wesso, 2013). Another step is to make a team plan in relation to the project topic and calendar. At this stage, they are expected to answer the questions of division of labor, that is, which team member does what and how long, and who monitors this process and how. During all these processes, it is recommended to offer guidance and methods to students regarding communication, decision-making processes, and conflict management processes. (See Section 2.3.3 Guidelines for Design Educators and Students).

Another prominent teamwork skill at this stage is *leadership*. In order to organize and coordinate this multifaceted process, it is essential to have a leader in the team. However, it is recommended that an effective solution is to divide this leadership process among all team members on a *rotational basis*, not to a single team member, especially in order to create a more democratic, equal and non-competitive environment for students in educational projects (Levin, 2005). In particular, it is important that all students gain *leadership experience*, and that the leadership process is carried out rotationally. This process should be determined from the beginning as a part of the team contract and team plan, and the team members should determine at what stage they will lead from the beginning.

Hains-Wesso (2013) stated that it is necessary for an effective process management that educators follow and encourage teams closely and provide feedback on their processes throughout the entire process. In addition, it seems significant to *record all the tasks* done during the process to distinguish the individual contributions of the team members. In addition, at the end of the process, *reflective reports* could be

requested from the team members in which they evaluate themselves, other team members, and the team process separately. All these written documents help educators better understand how teams work and make evaluation fairly in grading.

In teamwork projects in design education, there are stages that design educators could follow, and students could be guided in this direction. When this whole process is well-coordinated, the teamwork process could progress in a much more structured way and the students' awareness of the teamwork process and skills would increase. This will reduce the prejudices about teamwork in general and minimize potential problems.

Q1.2 What are the roles of *task and time management* and *shared leadership* skills for teamwork experience in design studio education?

One of the skills that a design student should acquire in terms of teamwork skills is the *coordination of tasks and responsibilities* (Tucker & Abbasi, 2013). For this skill, students should learn to make a team plan and determine the purpose of the team and what kind of process they will follow. The division of labor should be done as part of this process. Tasks should be determined and allocated, deadline should be decided on, and the whole process should be controlled and followed. In a teamwork process where all these stages progress systematically, in connection with this, the design processes of the teams progress more structured. In terms of educators, this process should be made visible, written down, and students should be encouraged when necessary (Hains-Wesso, 2013).

Considering the significance of the *coordination of tasks and responsibilities*, a Google Sheets document was offered to the students in the second stage of the research, where they could organize the task management process. The document allowed the teams to define tasks and determine the responsibilities including which team member would complete that task and by when. In addition, a system has been created where the person responsible for that task can specify what stage s/he is at in

the task, and a system where they can follow the process. In addition to the use of this tool, the process was closely followed through weekly meetings and regular feedback was provided to the students. In this way, while students' awareness of task management increased, they were able to organize this process better week by week. As the students stated, learning to organize the process made the teamwork processes more effective. Also, this process allowed the students to evaluate themselves among team members and realize their shortcomings in terms of task performance, and improve themselves accordingly.

To coordinate task management effectively, good time planning is needed. In particular, the fact that students have different courses, social lives and different teamwork-oriented projects in different courses that they have to carry out simultaneously reveals the importance of time planning in terms of the advanced progress of the process. In terms of time planning, there are two stages that teams should pay attention to. The first is when the tasks shared in the division of labor should be completed, and the other is to find a common time for team meetings. Considering that the problems in finding common time will increase as the number of team members increases, it is important for students to determine their common time with each other before starting the project. For this reason, students were asked to determine their common time from the first week in the time planning part, which is an important part of the Google Sheets document prepared for Task management. This shared calendar is significant in terms of time planning and following the whole process. In the weekly calendar, the teams recorded the meetings and how long they held the meeting. This clearly demonstrated the collaborative working processes of the team. The fact that the process was visible in such detail facilitated the quest to do better.

Finally, it becomes clear that there should be a person who organizes this whole process. Having a leader who is especially interested in the task and time management part and coordinating the process will ensure the effective progress of all processes. Otherwise, the absence of a responsible person may cause disruptions in this process. For this reason, as part of the research, the teams were asked to use

the *shared leadership* order, and for this, to determine who can be the leader at which stage of the project and to determine the tasks of the leader in the team, apart from task and time management. This process showed very clearly that the biggest reason for the trouble-free use of the Google Sheets file is that the leaders took this responsibility. Otherwise, it has been understood that this document may not be filled in cases where there is only one leader or there is no leader. In addition, the leadership task helped students evaluate teamwork from a different perspective, improving their empathy and communication aspects. Shared leadership also gives all students a chance to help them discover their potential. Especially in the final stage of the design projects, managing both the design project and teamwork processes simultaneously is very critical for a successful and smooth process.

With the situation of Covid-19 pandemic, it was observed that the importance of these management processes for students became even more important (as discussed in Chapter 6). The students who would have prejudgment about the use of online tools increased their knowledge and motivation about the use of such tools, together with the obligations and limitations of distance education. The fact that they could not exist physically side by side, especially in terms of communication and process follow-up, made it necessary for the students to make the whole process visible to everyone in writing. For this reason, Miro as an engaging and collaborative online tool was used by students in terms of division of labor and time planning. The use of a single platform as team communication, organization and working platform provided practicality. Although leaders have similar duties in teamwork projects examined in both face-to-face and online education (as discussed in Chapter 5 & 6), in pandemic conditions where all processes are carried out remotely, the leaders have more duties in terms of providing communication and encouraging team members. During the face-to-face education (see Chapter 5), the awareness that the document needs to be filled because an instructor will be checked regularly was more common, while in the online education (see Chapter 6), the students were aware that they were doing this process for themselves. However, in both researches, it is seen that when

these stages are done properly, it supports both the students to acquire the necessary teamwork skills and the progress of their processes more effectively.

Q1.3 How can the *online tools enable task and time management and shared leadership skills for teamwork?*

For the new generation, which has made the internet and smart products an indispensable part of their lives, it is inevitable that online tools will become a part of education. Although students prefer online tools to access information, it is seen that they unconsciously do this for their academic success (Smith et al., 2009). Online tools that can be used in design education have been examined under three main headings (see section 2.3.4 Teamwork and Online Tools in Design Education) which are: design stages-oriented, design management-oriented, and social media tools. Although design stages oriented and design management-oriented tools are not widely known by students, it can be seen that social media tools are used more frequently, and the results of the first stage of the research support this (as discussed in Chapter 4). Although these tools do not focus on the design discipline, it seems that they can be used for more general actions such as communication, sharing, archiving and teamwork. As supported by An et al. (2009), online tools provide the students with new ways of communication, collaboration and sharing with their classmates and instructors.

In the first part of the research, a three-stage process including, two surveys and interview sessions was carried out to understand which online tools the students used at different stages of the design process and how. The results showed that the tools specific to the design process are not known by the students and the well-known social media tools are used for different purposes. Tools such as Google, WhatsApp, Google Drive and Instagram can appear at different stages of the design process for different purposes such as communication, task management, research, archiving and etc. For example, for task management, the students state that they use WhatsApp, a communication tool among themselves to note down task division. A

group that tries to use Slack for task management, a program specialized for this purpose, cannot ensure its continuity. Similarly, only meetings are decided on WhatsApp, with which they are in constant communication for time planning. Students simply carry the platform they use in their daily lives for communication and sharing, not for a specific design purpose such as brainstorming or idea generation, into the education process. It's not the steps taken to improve the quality of education processes.

In the second stage of the research, an online tool, Google Sheets file, was developed and incorporated into the design studio project to make the teamwork process more effective and the students were suggested to use it. The online tool, which was prepared especially for task and time management, has been made in a way that can help them organize all teamwork processes. Apart from the Google Sheets, Google Drive is suggested for archiving and sharing, Hangout for online meetings, and WhatsApp for communication during the whole project process to structure their processes. In order to encourage the students to use an online platform for task management and to ensure the continuity of the process, a familiar program was preferred. The results showed that using this type of tool motivated the students for the organization of the teamwork process. An online tool encouraged students to define and divide the tasks, organize the scheduling process, and track the progress. In addition, the *increased visibility of the process* and the ability to be controlled and adapted by everyone at any time increased the awareness of the students on their task responsibilities. It also facilitated the process management for the leaders. Especially in terms of time planning, it became easier to decide on the *meeting time over the common calendar*, and they had the opportunity to evaluate their processes objectively by noting their meetings. In addition, the table also guided the leaders on what to do including the steps of the division of labor, the duration of the meetings, and what they should do step by step in the follow-up of the process.

In the distance education process, it seems that the importance of online tools has increased and the hesitations toward using them have completely changed. In this period, when the entire education process was based on online tools, the importance

of these tools for teamwork began to come to the fore even more. All meetings, decision-making processes, research phases and user testing or evaluation that could not be held side by side were tried to be done and facilitated with the help of online tools. Besides the design process, task management played a more critical role for the teams. In design studio classes, design critiques, presentations and studies progressed through the Miro boards during the distance education period. For this reason, it is suggested that they can use the tables they edited on Miro for task and time management. In this process, which proceeds on suggestions and recommendations, the level of voluntary use of the teams shows that they are aware that these tools will contribute to their processes. They created tables on Miro according to the needs of the teams, and in this process, the examples were given about what could be achieved through the use of those tables for task and time management. It provided a much more flexible platform compared to Google Sheets file. In addition, the fact that team members are constantly working on this platform made everyone more aware of the task and time management process, and this frequent use increased the interaction among team members. Task and time management processes have evolved from a process used and organized only by the leader to a process involving the whole team thanks to the Miro.

In a team project, it is critical that all team members are aware of team decisions and the process. The most advantageous tool to achieve this is the online tool that all team members have access to. However, one of the important points at this stage is that it should be visible to all team members throughout the whole process. A work division list shared via WhatsApp disappears among new messages after a while. The fact that the tables specialized for task and time management are on a common platform frequently used by all team members provides convenience and practicality for the team members for the awareness and organization of these stages. What is requested in the tables helps leaders identify their tasks and follow the process. Organization in teamwork becomes easier thanks to the incorporation of online tools.

Q1.4 What are the current strategies and practices for integrating *task and time management and shared leadership skills for teamwork*?

One of the most important steps in the task management process is to define the tasks. For this reason, first of all, the work to be done in the definition of homework should be planned in such a way that it can be done both individually and as a team (Tucker & Abbasi, 2013). It is significant that the tasks are clearly defined, their duration and the responsible person, and tasks' connection with each other are determined, and all these are clearly approved by all team members. Communication is a critical aspect of the team organization, Tucker and Abbasi (2013) suggest that students should prefer face-to-face communication for complex design discussions, and also state that the rules and expectations for the use of online communication tools should be determined from the beginning.

For coordination, which is another important stage for teamwork organization, it is critical that students should make a project plan and manage the tasks and responsibilities through this plan. Tucker and Abbasi (2013) recommend that these plans should be submitted on a regular basis throughout the project, and educators should evaluate these plans regularly. With interim submissions, students can get feedback on these plans, and considering the feedback student could improve their management process. Not only making a team plan, but also regular monitoring and evaluation of these plans and giving feedback enable students to develop the team management skills and improve themselves accordingly. Online tools and sample tables can be recommended to students for these team plans as well.

Two other issues that students should be careful about in this management process are decision making and conflict management. Stating that students should inform about these two issues before they start the project process, Tucker and Abbasi (2013) emphasize that in such cases, the steps to be followed by students should be explained and these should be practiced with students in a workshop. It should be stated that in case students cannot solve their problems despite all that has been

taught, they can always get help from the instructors. In such a situation, educators should act as mediators and try to solve these problems in a neutral environment.

One of the most important roles in the organization and progress of all these processes belongs to the leaders within the team. At this stage, the kind of leadership process in the team and the role and responsibilities of the leaders should be decided by discussing that process with the students (Tucker & Abbasi, 2013). They also suggested that the leadership process could be evaluated by meetings with the teams at different stages of the design process, necessary guidance should be given, and students should be encouraged in this regard. In general, as the suggested responsibilities of the educators, providing the necessary information from the first day including methods of decision making and conflict management process and experiencing them with role-playing if necessary, following the students with interim meetings and/or reports, making necessary feedback and suggestions, and suggesting templates for certain stages such as task and time management would contribute to the development of teamwork skills of the students in this process.

7.1.2 Q2: How can the learning and teaching strategies and skills for effective teamwork be integrated into design studio education?

Under the second main research question, there are three sub-questions. Each of these questions will be discussed in detail with the suggested examples.

Q2.1 What are the key strategies and practices for enabling an effective teamwork experience for design students?

Considering the literature review and findings of the research conducted within the scope of this dissertation, the stages of a teamwork project in design education were determined step by step. In this context, eight stages come to the fore, which are:

- 1-Introduction to Teamwork** (*hand-out and presentation*),
- 2-Team formation** (*deciding and explaining forming method*),
- 3-Team contract** (*Communication, leadership, conflict management, working method*),
- 4-Time management** (*Shared calendar*),
- 5-Task management** (*Division of tasks, task definition, visibility and tracking*),
- 6- Shared-Leadership** (*how to choose, the role and responsibilities of the leaders*),
- 7-Teaching Teamwork and Process Feedback** (*Interim meetings, report at regular intervals, end-of-process evaluation*),
- 8-Project definition and collaborative online tools** integrated into the project.

In Figure 7.1, considering a six-week design project calendar, the responsibilities of the instructors and students are determined week by week. Color codes are used to distinguish the responsibilities of the instructors and the students. The teamwork process starts with a presentation made by educators to inform the students about the stages of the teamwork process and significant reminders before forming the teams. After the presentation, the reasoning behind the chosen method to form the teams is explained and the teams are formed. While students are coming together for new teams, they are informed about the *team contract* and asked to examine the sample document, requested to come together as a team and create their own team contracts. Since it is thought that students will not have enough time to discuss all the stages of the team contract during the course, the submission of this document can be postponed to the next course day. Simultaneously, it can be explained how task and time management processes should be in an effective teamwork process, and how they can set up an order through sample templates. In connection with the management process, a brief explanation can be given to the students about how the leadership process should be and their roles and responsibilities could be exemplified. After an intensive explanation and exemplification process on the first day, students are expected to choose their first leader and adapt and start using the sample templates of task and time management according to their team decisions.

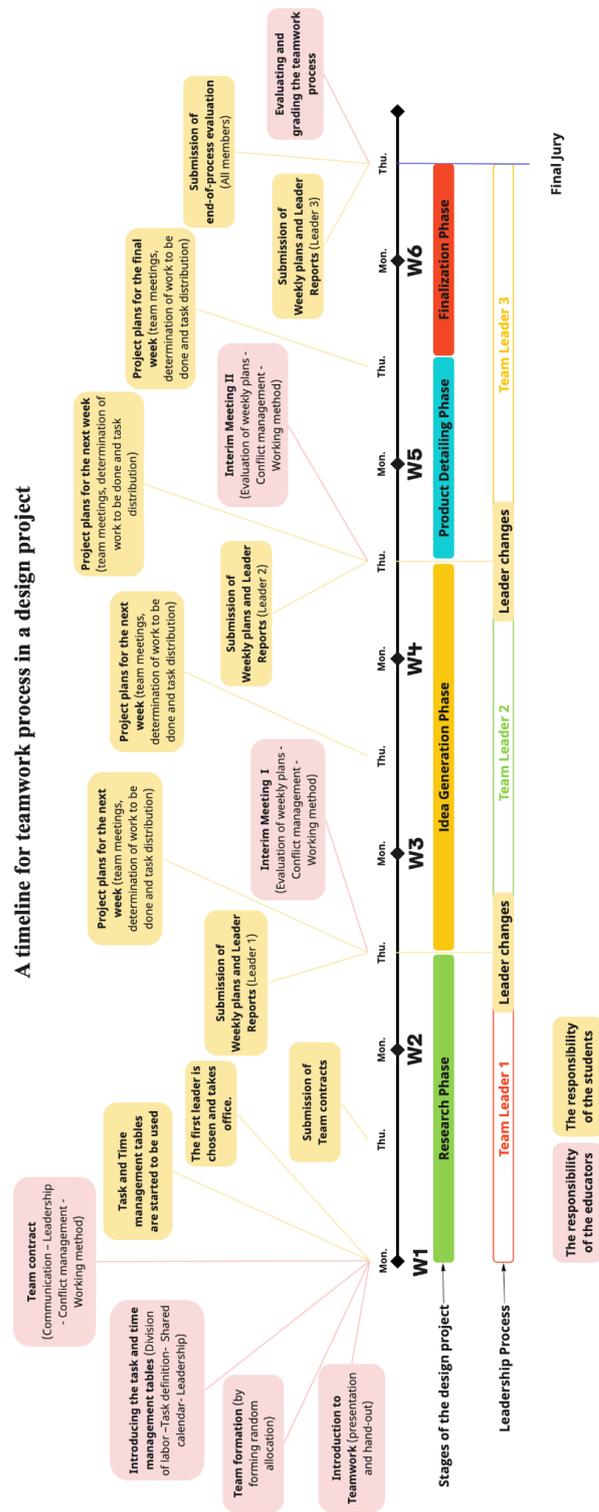


Figure 7.1 Phases of the teamwork process in a design project

The responsibility to manage the tables used throughout the project process belongs to the leaders. For a three-person team in a six-week project, each leader has a two-week responsibility period. For this reason, as seen in the example, an evaluation report can be received from the leaders at the end of their responsible time frames and an evaluation meeting can be held approximately every two weeks with the educators. Those time periods could be adjusted according to the project phases and related requirements and deliverables. In these meetings, it is possible to evaluate how the teamwork process is progressing based on the reports and task-time management tables and give feedback to the students. In a six-week project, two interim meetings can be sufficient for the evaluation of the students' progress in terms of teamwork. Throughout the whole process, students should be encouraged to use the necessary tables for task and time management and prepare weekly plans. At the end of the project, besides the final leader's evaluation report, a report may be requested from all team members in which they evaluate the whole process. Teamwork processes of students can be evaluated and graded in line with team contracts, interim meetings, and these final reports. The details of these stages will be explained in more detail below with examples.

Introduction to Teamwork

After the project topic and details are explained, the expected stages of the teamwork process should be explained to the students in detail. In an educational design project, if the goal is to teach students teamwork skills, the stages of the teamwork process, the roles and responsibilities and the tools which contribute to the teamwork process should be presented starting from the first day and the process should be followed, and feedback should be given throughout the project. Considering the expectations from the students, the examples especially for the task and time management should be explained in detail.

The titles that should be in a sample presentation were discussed in seven categories (Figure 7.2) (also see Figure 5.4: Teamwork Hand-out used in the Research Stage II). These categories are: (1) what is teamwork? (2) teamwork skills, (3) task and

time management, (4) communication, (5) leadership, (6) decision making and conflict management, and (7) weekly reports and process evaluation.

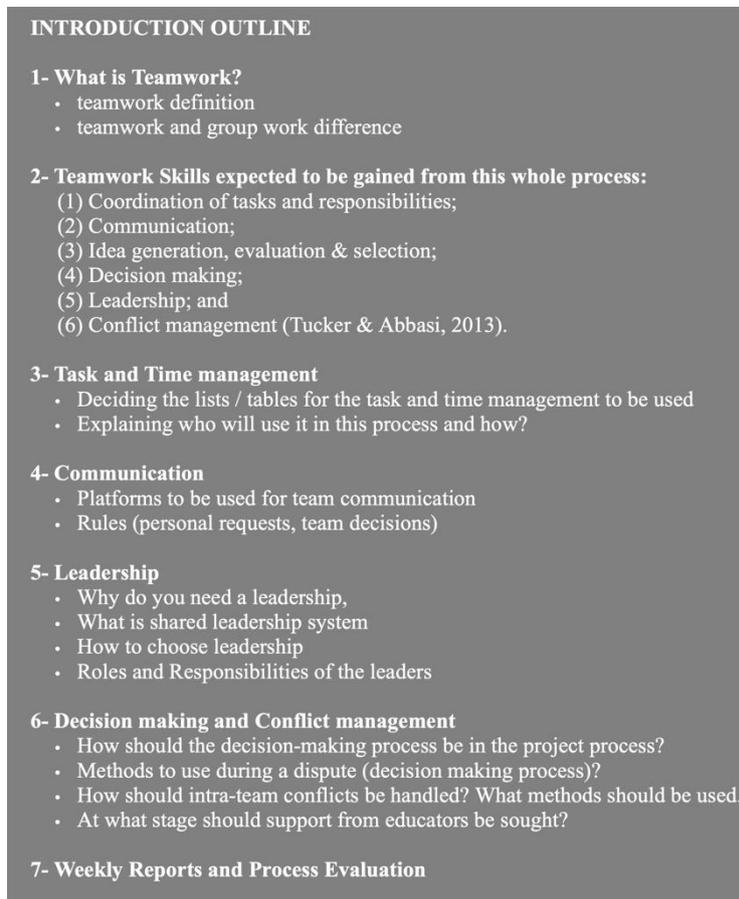


Figure 7.2 An example outline of the introductory presentation and handout

A very similar presentation was made in the second phase of the research and handed out to the students (see Figure 5.4). During the introduction to teamwork, first, the students can be clearly explained what teamwork is and its differences from the group work. The teamwork skills that students are expected to acquire can be listed and explained in detail. While explaining the expectations from the students in order to gain these skills, four main headings which are task and time management, communication, leadership and decision making, and conflict management come to

the fore. While describing the steps that a team should take in terms of task and time management, it could be better to explain with examples through the tables they are expected to use. It can be shown that they can customize the tables according to their needs and wishes. Examples of synchronous and asynchronous tools for communication that can be used within the team can be given while warnings are made about the issues to be careful about communication. While explaining how the leadership process should be, the responsibilities that the leaders should take can be sampled, but it should be stated that they can make this decision within the team. While explaining how to take steps for decision making and conflict management processes, it should be emphasized that it is important to consult educators when there is an unsolvable problem. And finally, expectations and necessary information should be given about the leader reports and interim meetings that they have to submit throughout the process. This comprehensive presentation will form students' first impressions of the teamwork process. While drawing the framework of what kind of teamwork process should be, the expectations of the students are clearly explained.

Team Formation

Considering to literature review findings, there are three main team formation methods which are (i) self-selection, (ii) random allocation, and (iii) deliberate allocation (Hains-Wesso, 2013) could be used during an educational project. Which method chosen in team forming methods should be explained to the students in a justified way. In particular, some sources in the literature state very clearly that the formation of teams by educators is essential for a fair and equal education project (Levin, 2005). Considering the similar problems encountered, the increase in the number of students and the participation of foreign or exchange students every year, determining the teams randomly or according to a rule by the educators will prevent possible problems such as excluding some groups of students and uneven distribution that may arise from the first day. If the educators do not want to use the random allocation method, some criteria can be taken as a basis by the educators when creating teams. These criteria could be:

- **academic success:** grade point average
- **physical proximity:** if the physical working situation is very necessary, according to the accommodation,
- **time alignment:** the common lessons they have learned and etc.

Despite these criteria, being as sensitive as possible about diversity (gender, nationality, interests, etc.) within the team is one of the issues that educators should consider when forming a team. When forming teams in an educational project, teams should be formed in such a way that it can be ensured that all students start the project under fair and equal conditions. At this stage, paying attention to diversity within the team is important for the development of teamwork skills.

Team Contract

In the light of what has been explained and suggested methods and stages, teams should be expected to meet on the first day and decide on their own working order. Clarifying their own rules and methods in writing under certain headings determined at this stage would facilitate their processes more effectively. This written document is defined as a team contract. This initial conversation also helps team members get to know each other better, and learn other team members' expectations from each other and the team. An example of a team contract document can be seen in Figure 7.3. An example team contract document could include:

- General rules of teamwork (expectations and personal requests),
- Platforms and rules for communication,
- Sharing and archiving strategies,
- Leadership selection methods and responsibilities of the leaders,
- Team calendar and team meetings (physical and online),
- Task and time management tables,
- Strategies for conflict management.

These are the possible titles for an example team contract. Teams can expand or narrow these topics as they create their own documents. The course time may not be enough for the teams to both meet and discuss and decide on all these issues. For this reason, it is possible to go over the titles and ask the teams to come together and make a joint decision on these issues, fill out and sign the document before the next course. A copy of this document can be received by educators, and the teams' teamwork decisions can be reviewed and used for evaluation throughout the process.

| TEAM CONTRACT | | |
|---|---|--|
| Team Number: | Date: | |
| Rules and Responsibilities | Tools and Usage Process | |
| <div style="border: 1px solid black; padding: 5px;"> <p><u>general rules</u></p> <p>-----</p> <p>-----</p> <p><u>team meetings</u></p> <p>-----</p> <p>-----</p> <p><u>responsibilities of the leaders</u></p> <p>-----</p> <p>-----</p> <p><u>strategies for decision making</u></p> <p>-----</p> <p>-----</p> <p><u>strategies for conflict management</u></p> <p>-----</p> <p>-----</p> </div> | <div style="border: 1px solid black; padding: 5px;"> <p><u>communication</u></p> <p>-----</p> <p>-----</p> <p><u>team meetings</u></p> <p>-----</p> <p>-----</p> <p><u>sharing and archiving</u></p> <p>-----</p> <p>-----</p> <p><u>task management</u></p> <p>-----</p> <p>-----</p> <p><u>time management</u></p> <p>-----</p> <p>-----</p> </div> | |
| Team member 1 Name, Surname signature | Team member 2 Name, Surname signature | Team member 3 Name, Surname signature |

Figure 7.3 An example of the team contract

Encouraging students to discuss within the framework of a formal document and making joint decisions from the first day helps team members to get to know each other better and to understand their expectations from the process. Such a start prevents situations that may be misunderstood in the later stages of the process. At the same time, the fact that they have experienced a joint decision-making process on a different subject apart from design decisions provides a good experience for the teams. A document they sign may seem too official for teams. It can be emphasized that this is to see that all team members agree. In addition, the decisions taken under the determined headings can be explained in a most comfortable way, a few sentences or a few keywords can be used. Leaving the teams flexible in this regard can enable them to make more comfortable decisions.

**The task management, time management and leadership process are detailed in Question 2.2.*

Process Feedback

The process of giving feedback to students can be organized in many different ways and at very different intervals. There are different factors that can affect this: the project topic and the intensity of the project schedule, the number of instructors and students, and the expectations in this process. One of the possible scenarios will be described here. If we have teams of three in a six-week project and each leader is responsible for two weeks, an evaluation report can be received from the leaders at the end of these two weeks, and accordingly, an evaluation meeting can be held to evaluate the process and make suggestions for the new leader. Receiving evaluation reports from the leaders at the end of their task also increases their responsibilities for and awareness of the process. This evaluation report could be in a format very similar to the task management table they already use (Figure 7.4). The table includes a division of labor, weekly team meetings, and a brief assessment of the leader. In this process, weekly reports can be reviewed by the educators and as an alternative to the meetings, written feedback can be given.

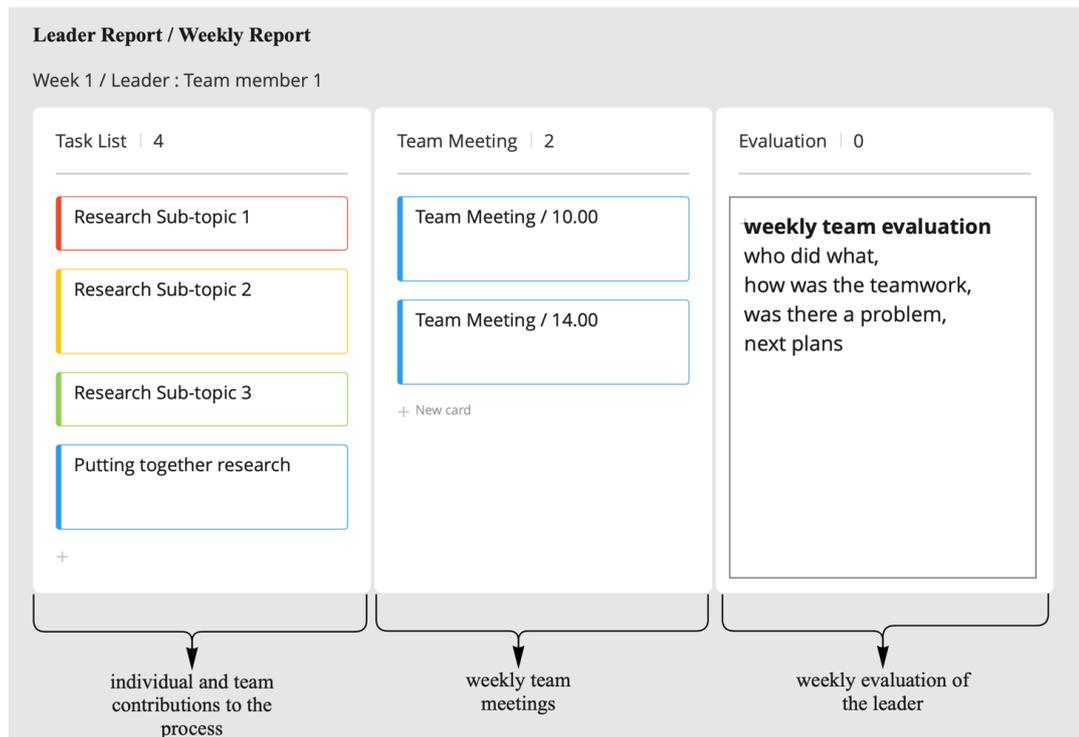


Figure 7.4 An example of the Leader Report

In addition, at the end of the process, a written report may be requested from all team members in which they can evaluate both their own and team performances. In addition to the evaluation, suggestions can be gathered about what can be done better and how could be asked to enable them to think in more detail and generate ideas. In this report, while the students are expected to evaluate themselves individually on the determined topics, a more general assessment can be taken in terms of the team (Figure 7.5). For the self-evaluation part, students' contributions to the process including their roles and responsibilities in the team, and their leadership process could be asked, and also their thoughts about the task division, time planning, and conflict management processes could be taken.

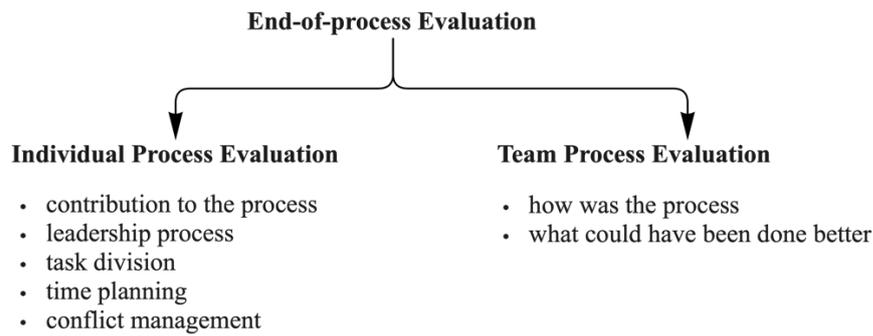


Figure 7.5 Phases of the final evaluation report

All these evaluation reports, evaluation meetings and team contracts enable educators to learn about the team project processes of the teams and make the teams' processes visible. Thus, when there is a problem, educators can intervene more fairly and decisively, and they can be fairer in grading. In addition, in terms of gaining teamwork skills, following this process closely allows educators to give feedback throughout the process. Knowing that their processes are followed by the educators, increases their motivation and awareness about teamwork. As a design project, it is accepted that the teamwork process is a part of the education that needs to be learned and improved.

Q2.2 How can task and time management and shared leadership skills be incorporated into design education in particular for design studio projects?

These three important stages which are task management, time management and leadership will be explained in line with the above-mentioned example scenario. The examples of these three stages were prepared assuming a six-week design project and teams of three people.

Task Management

For task and time management processes, sample tables were prepared in Miro, where students are currently managing all design processes. Miro entered the life of

design students, especially with the pandemic and offered them different opportunities. Teams can create a workspace where they can share and compile what they have done through this platform where they can work simultaneously. At the same time, these platforms are used to interact with instructors and are used for design critiques and presentations. Miro, which is used so frequently and allows simultaneous access to everyone, also offers a good alternative for the organization of the teamwork process. It also offers many different templates for its users. Since these templates also offer the possibility of customization, they also offer many different alternatives to the users.

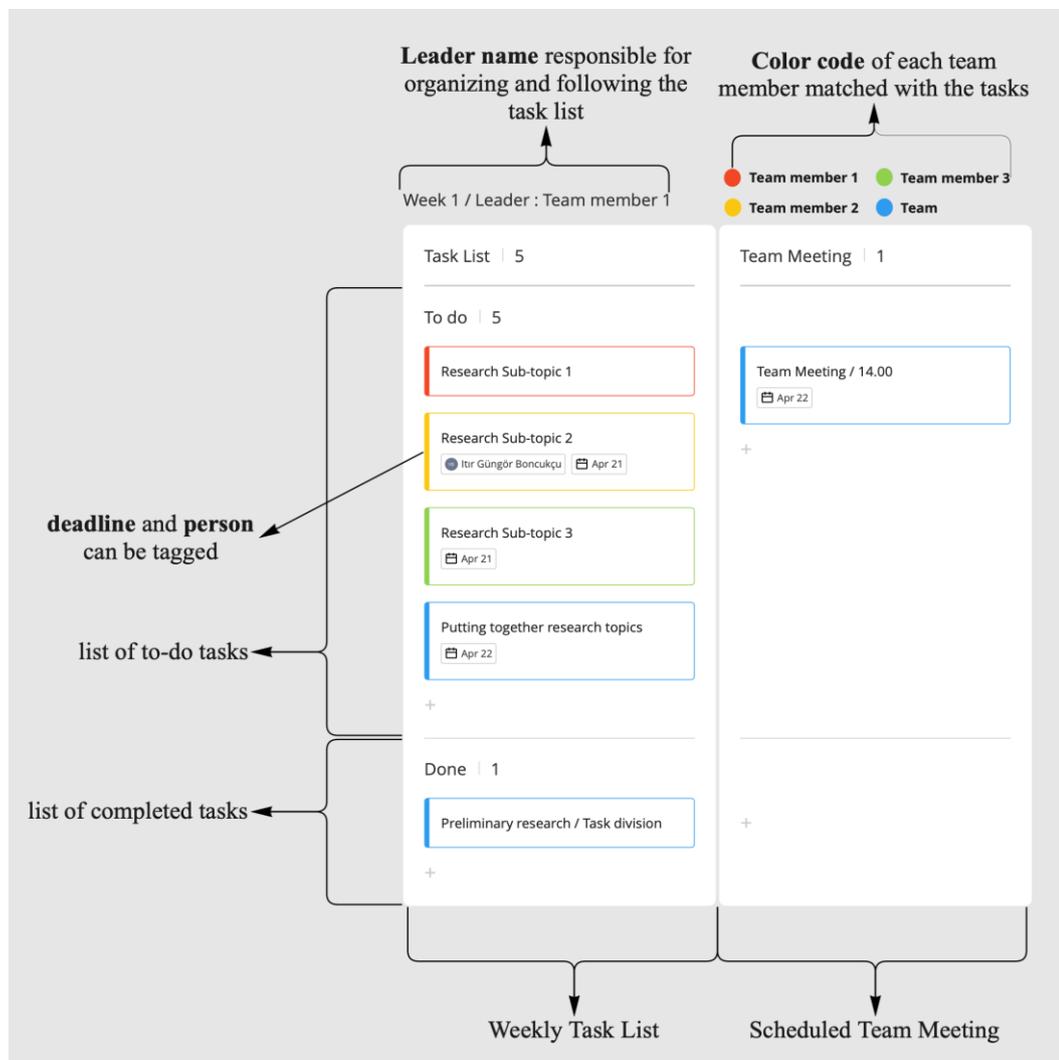


Figure 7.6 An example of the task management table on a Miro board

One of the templates for task management was customized in line with the findings of the research conducted within the scope of this dissertation (Figure 7.6). In the upper left part of the table, there are the week's name and the name of the responsible leader. The table has two main columns. One is for listing tasks and the other for noting down the team meetings. In the column where tasks are listed, there are two basic lines, to do and done. Completed tasks can be transferred to the done line by the drag and drop method. In the to-do list, it was suggested that a color code could be used for each student, and the tasks were marked with this color code. In the box added for each task, a more detailed explanation of that task can be made, people can be assigned, and deadlines can be determined on the calendar. In the section where the meetings are noted, planned meetings can be noted in a similar way and the completed meetings can be dragged to the done line by the drag and drop method. In short, it is a simple system where they can prepare a to-do list and note them on the table with the task distribution. There is a column where they can also add the meeting dates to help them determine the next meeting after they have distributed the tasks.

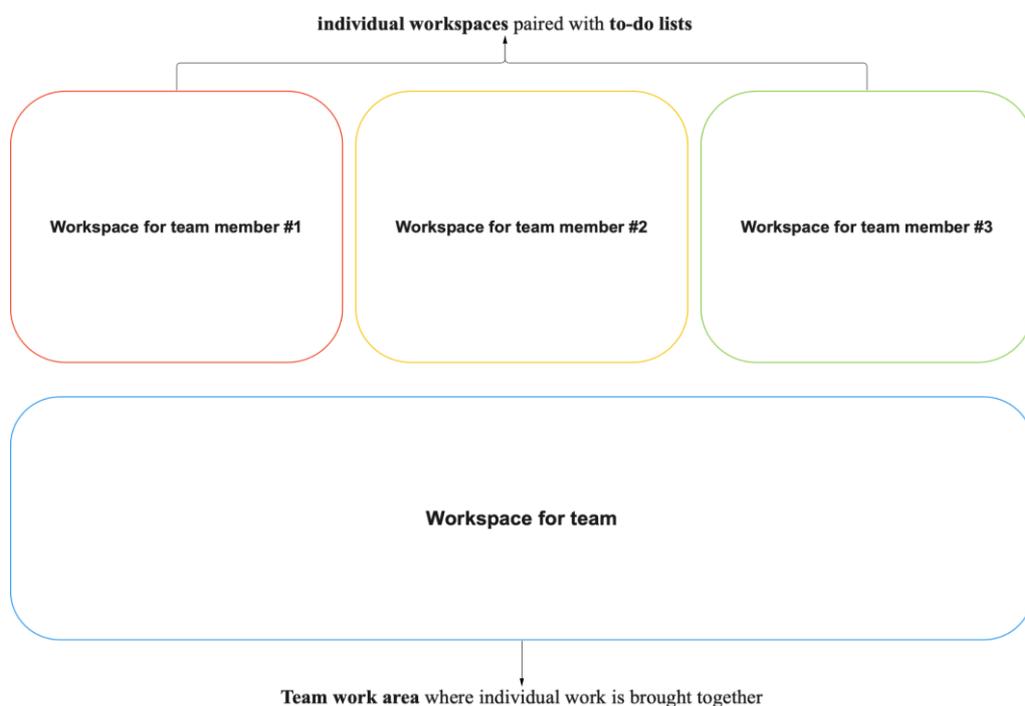


Figure 7.7 An example of the working space linked to task management

For weekly plans, teams are expected to come together on a certain day of the week and prepare their weekly plans. In this process, the tasks to be done are determined and distributed within the team. The duration of the tasks is determined, and the next meeting is decided. Thus, individually completed tasks are brought together. Weekly task plans are made under the responsibility of the leaders and put into writing. Tasks are expected to be determined and distributed by consensus within the team. At this stage, the responsible leader transfers the decisions to this relevant table. The team member who has completed his/her responsibility states that he/she has completed the task by taking that task under the done category. In this way, the leaders can check the table and see the status of the tasks, and otherwise give necessary reminders to their friends.

In order to increase the visibility of the task, individual workspaces can be created on the Miro, where they are already working, compatible with the color codes of the team members (Figure 7.7). Thus, a connection is established between the teamwork process and the design processes. As a result of the completed task, the level of work can be seen, so the contribution of the students to the process becomes more visible and recorded. Then these things can be brought together in a teamwork area.

The task management table encourages students to make a to-do list, distribute them, track the process, and determine their meetings. Making this regular and putting it under the responsibility of the leader enables them to make much more planned teamwork. Thus, teams experience the coordination of tasks and responsibilities, which is the first of the teamwork skills, and learn how to do it.

Time Management

Two different alternatives were created in Miro for time planning. There are two basic things that teams need in terms of time planning. One is the sharing of their individual programs and deciding on their common time, and the other is the project calendar where they can see what they need to do within the scope of the design project. They can follow their meetings, submissions and presentations in the project

calendar. These tables, which are prepared as an example, can be customized within the team according to their working styles.

In the first example, these two calendars mentioned above were combined. As seen in Figure 7.8, an integrated table including an area where team members can share their individual schedules at the top of the calendar and the project calendar at the bottom has been prepared. In the section where they can share their individual schedules, each team member adds their courses to the relevant day and time with their own color code, and free spaces that can be used for team meetings are revealed. In the bottom part, it is possible to mark which days of submissions, presentations, and juries in a six-week design project can be marked, and team meetings can be planned in line with the empty spaces in the individual calendar above. In each added box, the meeting can be written in detail and the time and place can be specified. They can also mark unusual plans on the project calendar, which are not in their individual schedule, on this calendar with their own color code. Thus, these situations can be taken into account when making a weekly plan. Also, which team member takes the lead role in which weeks are in the left part of the project calendar.

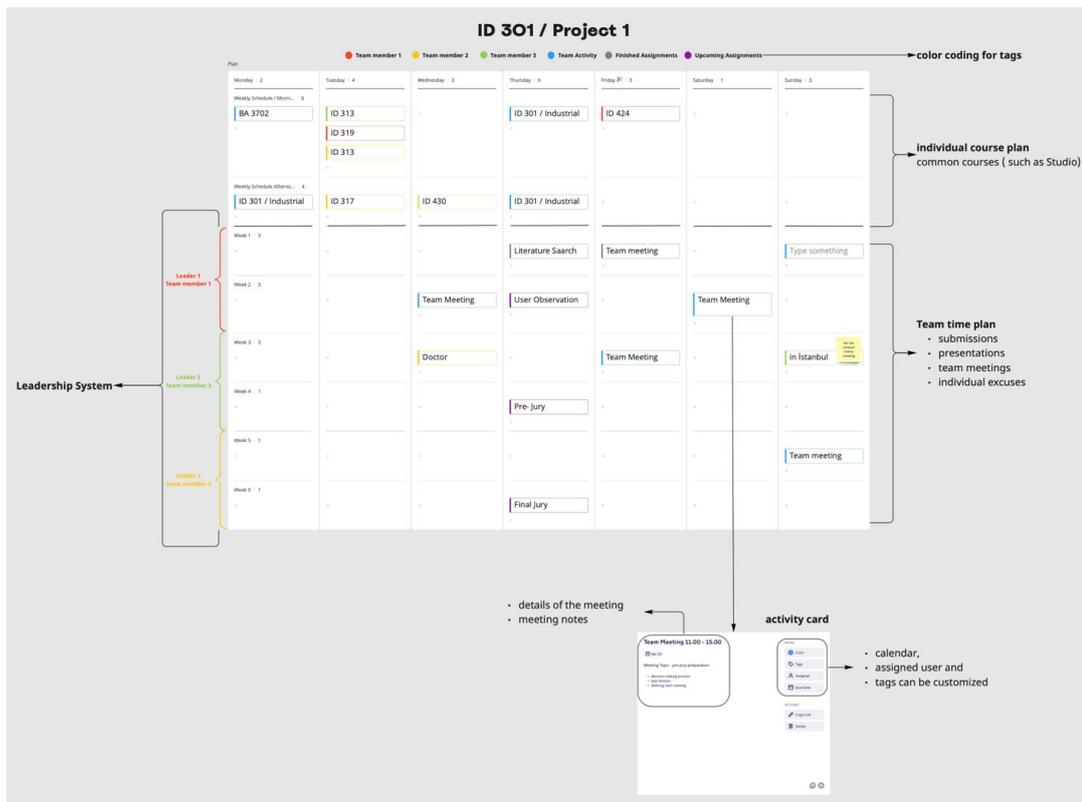


Figure 7.8 First alternative of the time management table

For the second alternative, individual and project calendars are handled separately. Individual calendars can be shared separately, and team times can be marked in a separate team weekly calendar (Figure 7.9). This may be more practical for students. Because, in general, students can see the excel format of their programs in the university's own system or they prepare it themselves. When they share and combine their ready calendars with each other, busy and empty common time intervals emerge. These tables assist in the joint time setting phase, which is critical for planning team meetings and collaborative working hours.

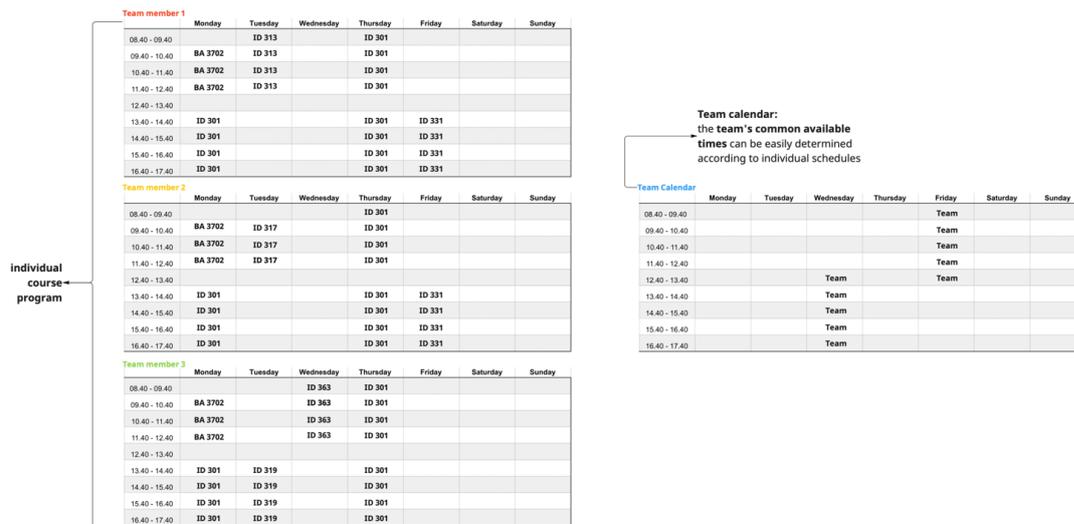


Figure 7.9 First part of the second alternative of the time management table (individual programs)

In the other part of the second example, teams can create a project calendar similar to the first example (Figure 7.10). In this calendar, important details in the project process can be marked, team meetings can be added, and individual exceptions can be noted. In addition, project and assignment briefs for deadlines and other documents related to the project could also be linked with the common calendar. It is stated which leader is responsible for which week, and seeing the process holistically makes planning easier while teams make weekly planning.

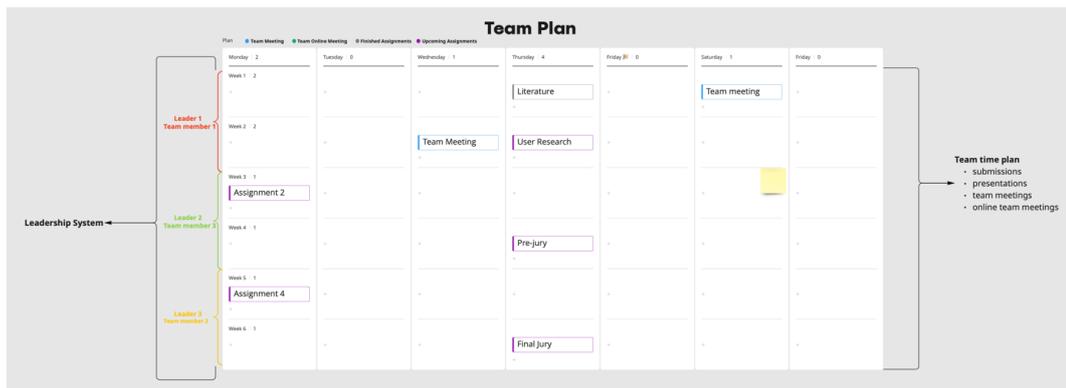


Figure 7.10 Project Calendar of the second example of time management

The teams' notes on their meetings and how long these meetings last give the educators clues about the working methods of the teams. Abnormalities in meetings such as meetings that are too long or meetings that are too frequent can be questioned by the educators and any problems or deficiencies can be improved by talking to the teams. All phases documented in writing provide an opportunity for educators to review teamwork processes and give feedback. On the other hand, timetables encourage students to document all these processes and help them better track and plan the process in line with project requirements, expectations, and related deliverables.

Shared Leadership

In the shared leadership system, the number of days each leader should be responsible for can be calculated by dividing the project week by the number of team members. Thus, the project schedule is divided into those intervals, so that the team members can choose which stage to lead. As an example, when a team member is three in a six-week project, each leader is expected to fulfill this responsibility for two weeks (Figure 7.11). The stages in a design project generally proceed similarly. The project mainly starts with the research phase, then continues with idea generation, idea development and finalization. Although the intermediate stages

differ, the basic structure is similar. For this reason, students could be encouraged to lead at the stages where they think they are good at considering their skills and motivation toward leading that stage.

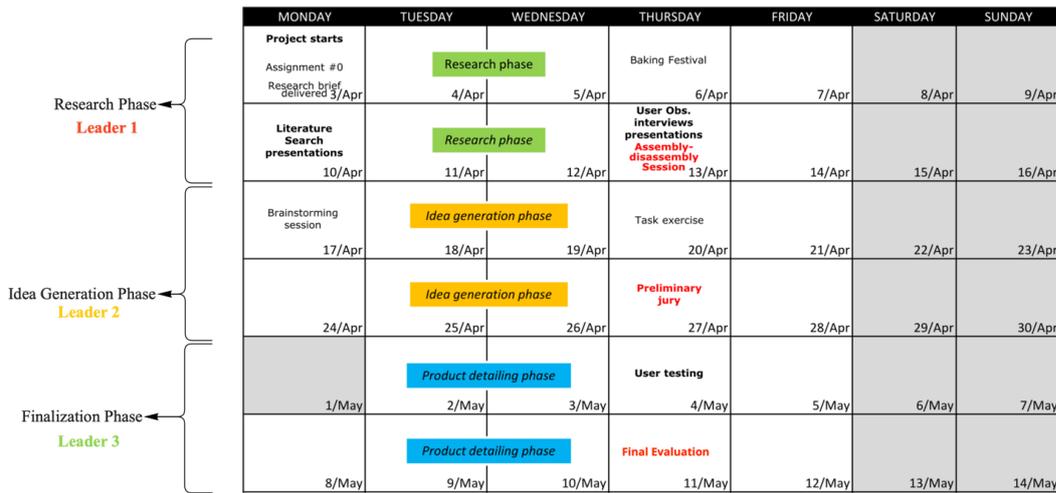


Figure 7.11 An example of the Leadership Calendar

There are two main responsibilities that leaders undertake throughout the process. The first of these is to fill in the task and time management tables, make team plans in line with them, follow the process, and inform teammates about these issues. Another is the evaluation reports that they must submit at the end of their leadership responsibility. Next to the regularly filled task management tables, they should write down their opinions on the process or the situations that need to be known about the team and prepare a two-week report.

In addition to these responsibilities, different responsibilities can be given to the leaders in the team contract prepared by the teams in the first week. These can include making assignment submissions, reminding meetings, taking responsibility for decision-making processes, etc. It is expected that the teams have taken these by making a joint decision from the first day and all the responsibilities of the leaders are clearly defined. The division of leadership responsibility ensures equality among

team members, allowing students to evaluate and compare themselves. In all this process, they both experience the leadership process to get this skill as one of the teamwork skills that students must acquire and learn how to do it.

Q2.3 How can teamwork experiences be improved by using online tools in industrial design education in terms of design studio projects?

Online tools can be used in different ways at different stages of the teamwork process. They make great contributions to communication, which is one of the most basic needs of teamwork. Synchronous and asynchronous communication tools are used to advance the whole process between team members. Considering that students do not have the opportunity to meet face-to-face, especially during the distance education period, communication proceeds entirely through online tools. The most preferred platform for fast communication by students is WhatsApp. It is an advantage for them to prefer this platform, which is used by everyone in terms of being fast and practical. Such platforms, such as WhatsApp, which allow reaching someone at any time, can be disturbing in some situations, such as being disturbed late in the evening or on the weekend. In order to prevent such inconveniences, students should discuss and decide on such requests on the team contract from the first day.

Another prominent issue in communication is team meetings that it is not always possible to arrange them face-to-face because of time and place issues. In such cases, online meetings should be preferred in order to be more practical, and platforms such as Zoom, Discord or Hangout. As the awareness of such platforms increased with the pandemic situation, the students' view of this alternative changed in a positive way. Before this, students had a presumption that online meetings would not be enough and helpful for planning and facilitating team management. While face-to-face meetings could be preferred for important design or team decisions, the discussion topics such as division of labor could be held online.

Sharing and archiving is another action for teams where online tools are most needed. WhatsApp is the most preferred platform for this purpose, but different sharing platforms are also preferred, such as Google Drive and Email, because the quality of the shared files decreases, in particular, the visual ones that might be an issue for preparing their boards or presentations in design process, and they are lost among the messages in the WhatsApp. Asking students to archive their work in a common folder during the teamwork process is important for the accessibility of all team members and their availability after the project. The most widely used tool for this right now is Google Drive.

Teams need online platforms for collaborative working areas whether they work remotely or side by side. Nowadays, where most of the processes are carried out by computers, platforms where everyone can contribute simultaneously provide a great advantage to the teams. Miro, which is currently the most used, gives students a great advantage in this regard. The opportunity to share all the responsibility within the team, rather than a single person taking it, provides equality within the team in terms of time and workload. Since Miro is the online platform that students use most frequently and they manage the design processes nowadays, the templates recommended for teamwork processes are also prepared in Miro. However, the main purpose of those templates is to show the features and the related content for task management and shared leadership that could be given in the templates. These features are available in many online tools and these templates can be adapted to those tools. Google Sheet, one of the most well-known tools, is one of them. Apart from Miro, a platform like Figma where they can do UX/UI work accelerates the progress of the project process via engaging the students to work together simultaneously and collaboratively. Although tools such as Google Docs and Google Slides are not preferred very often, they can be advantageous for design students in some cases such as preparing the presentation or description texts.

Although there are specialized programs within the teamwork organization, such as Trello and Asana, the fact that students can create a very similar structure on Miro, which they use most, adds time and practicality to them. Therefore, instead of such

specialized programs, it will be a more practical solution for them to advance this process through the platforms they already use frequently. It will also be easier for them to learn the process.

With the development of the internet and technology, online tools are also changing rapidly, and new ones are being added. For this reason, educators and students can follow the new developments and choose and recommend the most practical, free and useful tools. It is inevitable that online tools that enable simultaneous working and communication are an indispensable part of teamwork.

7.2 Contribution of the Dissertation

The literature research and the findings obtained in line with the results of the three-stage research conducted within the scope of this doctoral study have contributed to design research and design education fields in different ways. These contributions are explained in the following three headings.

A source of information on the teamwork skills that design students should acquire

Comprehensive literature research conducted within the scope of this doctoral study, shows that teamwork should become an indispensable part of design education. With the research process, a detailed information source has emerged about how the teamwork process can be handled within the context of a studio course in design education. Although teamwork is at the core of this information resource, it is also a resource for getting to know the new generation who are university students now. And it provides a detailed source of information on online tools, which is one of the main research topics of the research. Examples of what kind of tools are available and how these tools are used in design education are brought together. Since there is not much research on both teamwork and online tools in design education, the

coexistence and relationship of these resources have a significant value for design research.

Methods for investigating teamwork processes within the context of a studio course

Within the scope of the research, a comprehensive research process was carried out on understanding how design students carry out teamwork processes and how this process can be improved. When the studies in this field are examined, it is seen that these studies progressed through questionnaires. This comprehensive research process within the context of this doctoral study contributes to design researches because to gather students' experiences and insights, a generative design research approach including an online tool, Google Sheets, for task and time management, has been adapted in this field (see Chapter 5). The whole research process including a template that allows students to record their teamwork processes, and the evaluation of these processes with weekly meetings, the collection of students' opinions throughout the project and extensive team discussions at the end of the project created a very valuable source of information. This research process, which spread throughout the entire project process, provided a very detailed understanding and recording of the teamwork processes of the students. During this whole research process, being an educator and researcher helped me to set up research steps suitable for the stages of the design process, thanks to my familiarity with the studio education process. In addition, having a design education and design principles helped me to progress in line with these principles while creating the tools used in research methods.

On the other hand, the comprehensive survey and observation-meeting processes conducted to understand teamwork processes that changed with the change in educational conditions during the pandemic period can be accepted as the first data in this field. In the changing life and education conditions along with the pandemic conditions, the research provides an opportunity to both closely observe how the teamwork processes of the students' progress and to understand their views on this

subject. In addition, finding the opportunity to conduct research in both face-to-face education and distance education helped to compare these two processes. In the distance education period, the changing habits, awareness and perspectives of the students about the teamwork process and online tools could be perceived better.

A framework for students and educators as a guide to develop an effective teamwork process in a design studio course

As the last and most important contribution, the framework that emerged as a result of this doctoral research. This framework includes a detailed information resource on how teamwork projects should be handled within the scope of design studio courses in design education. This source of information explains step by step what both instructors and students should do in this process. In addition, it explains a very detailed process on how this process can be brought more effectively with sample documents, outlines and templates prepared for each step. In particular, a very detailed information resource has been created on how task management, time management and leadership processes can be handled in the educational project. Detailed templates have been created for these processes, which are enriched with the contributions of online tools. These templates can be used and adapted easily and directly by design students. The students' teamwork experiences gathered through these templates provide design educators with detailed information about how students go through a teamwork process, and help them evaluate their processes and give feedback. Considering that the design processes in studio projects are very similar to design education, this resource can be easily adapted to studio projects.

7.3 Limitations of the Study

All research processes within the scope of this doctoral study were conducted with the third year design students in the Department of Industrial Design at Middle East

Technical University. Although there is an opportunity to work with the third year students in three different periods, the situation of students at other grade levels on this subject has not been discussed. In addition, design departments in other universities did not participate in this research. Another constraint was the rate of participation in the first stage of the research. Especially since the level of participation of the students in the series of surveys carried out in the first phase of the research phase was very low, the data in the surveys were not sufficient and the research process was changed. On the other hand, the interviews held at the end of the process instead of the surveys gave more detailed information about the whole process.

In the second stage of the research, at the end of the project process, the team interviews with the teams could be completed in long intervals due to the difficulty of the students in finding a common time. Although team interviews have the advantage of reminding or recalling things while talking to each other, it has been observed that some students may not reveal different opinions about the team, thinking that their teammates may misunderstand. Individual interviews with 40 students could have provided more detailed and realistic information about the teamwork process. Although the meeting notes of the weekly meetings held within the scope of the same research were edited on the same evening, some details might have been forgotten, because weekly meetings were not recorded.

Before the final stage of the research, due to the pandemic, the planned research process could not be carried out and the research method was changed. There was a loss of time in this process. Within the scope of the changed method, first, a remote survey was conducted with the students, and in the following semester, weekly meetings were held throughout the project process and the students were observed. However, since all these processes had to be carried out remotely considering distance education conditions, there might be some deficiencies in the findings. For example, the participation of students in the process could not be fully encouraged. Student participation in the survey was about one-third of the class. In the observation stage, remote meetings created difficulties in establishing interactive

communication. It has been difficult to encourage students who do not prefer to speak. Although it was tried to give all students the time to speak in order to prevent this, there were even those who did not want to open their cameras. It was much easier to get students involved in face-to-face meetings. In addition, as the meetings were not recorded, as in the second study, some details may have been overlooked while editing the meeting notes.

Finally, considering that the whole research process was carried out with students who took the third-year studio course, the fact that the researcher worked as a research assistant in both the design department and the third-year studio for a long time may have affected the students' view of the research process. This situation may have caused some students to hesitate about sharing information. Considering that this could happen, in order to prevent this and in terms of the reliability of the data, the researcher did not participate in any grading process, especially during the project in which the research was conducted, and the students were also informed that the researcher would not participate these grading phases.

7.4 Opportunities for Further Research

In order to further develop the created framework, the research process can be experienced in other studios that carry out teamwork projects, especially with second and fourth-year students. The framework can be developed in line with the feedback received from different grade students. In addition, although it is seen that similar processes are followed in studio courses in design education, different methods and processes may be followed in different universities. By researching these, the existing framework for teamwork can be tried in the design studio courses of different universities, and the opinions of the students can be taken and improvements can be made in line with these experiences and insights. In addition, this research process, which is mainly reflecting the students' point of view, can be developed in a way that also examines educators' experiences while using or

adapting this framework, so that educators and students can be evaluated under separate headings and different manuals can be prepared.

Another step for the development of the created framework could be to test this process with graduate students, rather than undergraduate students. Having graduated and considering that some of them will be working in the sector, different experiences and viewpoints would enable this process to be handled from a different perspective. This group, which is closer to professional life as well as they are students, will be able to better understand the expectations of the sector from the students and make feedback and improvements to meet these expectations.

During the research process, it was noticed that exchange or international students do not have the desire to form teams with their friends. While students in schools abroad do not show any reaction to being a random team generation, it is seen that Turkish students have similar reactions against random formation every semester. For this reason, the question of how these cultural differences and their effects on teamwork can be explored in design education. By reconciling the psychological behaviors of Turkish people with their roles and reactions in teamwork, cultural differences can be researched, and suggestions can be worked on in this context. In addition, it can be examined whether this cultural difference emerges as a difference in business life.

While doing research on teamwork, a more detailed research and idea development process on teamwork skills, especially task management, time management and leadership were carried out. For further development, more detailed templates can be designed for subjects that are less emphasized such as conflict management and decision-making among teamwork skills. In addition, evaluation in team projects as another critical determinant of the teamwork process can be explored in detail as a research topic to develop and evaluate alternative methods to be integrated into design education. In the team project grading process, individual and team grading percentages, processes, and stages can be investigated in more detail.

While supporting teamwork in design studio education, online tools and platforms, one of the collaborative tools, were used. In this process, the most important criterion was that these tools would allow more than one person to work simultaneously. Although the purpose of this research is not to design an online tool, it gives clues about what to expect from the online tools used in a teamwork process for educational purposes. In this direction, a more detailed guide can be developed on how different tools can be integrated into teamwork processes. Considering that such tools and the programs used by design students change very frequently, it may be a much more effective inference to find out how to make use of existing ones rather than sticking to a certain program. The findings and insights presented within the context of this doctoral study would provide many potential areas for future research on enhancing and empowering teamwork experience and skills in design education.

REFERENCES

- Alruthaya, A., Nguyen, T., & Lokuge, S. (2021). *The Application of Digital Technology and the Learning Characteristics of Generation Z in Higher Education*.
<https://search.ebscohost.com/login.aspx?direct=true&AuthType=ip&db=edsarx&AN=edsarx.2111.05991&site=eds-live>.
- An, Y., Aworuwa, B., Ballard, G., & Williams, K. (2009). Teaching with Web 2 . 0 Technologies : Benefits , Barriers and Best Practices College of Liberal Arts and Education. *Writing*, (2008), 1–6.
- Anderson, P. (2007). What is Web 2.0? Ideas, technologies and implications for education. *JISC Technology and Standards Watch*, 60 (1). 1-64.
- Archer, L.B. (1965) *Systematic Method for Designers*. In: Cross, N. (Ed.), *Developments in Design Methodology*. Chichester: Wiley.
- Ayer, S., Messner, J., & Anumba, C. J. (2016). Augmented Reality Gaming in Sustainable Design Education. *Journal Of Architectural Engineering*, 22(1).
- Baldea, M., Maier, A., & Simionescu, O. (2015). Using Blogs as a Communication tool for Teaching Students in the Architecture Design Studio. *Procedia Social And Behavioral Sciences*, 191(1), 2758.
- Baruah, T. D. (2012). Effectiveness of Social Media as a tool of communication and its potential for technology enabled connections: A micro-level study. *International Journal of Scientific and Research Publications*, 2(5), 1-10.
- Bohemia, E., Harman, K., & Lauche, K. (2009). *The Global Studio: linking research and teaching*. Amsterdam: Delft University Press/IOS Press, 2009.

- Bosch, T. (2009) 'Using online social networking for teaching and learning: Facebook use at the University of Cape Town', *Communication*, 35(2), 185-200.
- Casper, C. (2017) Teaching beyond the Topic Teaching Teamwork Skills in Higher Education, *Journal of Higher Education Theory and Practice* Vol. 17(6), p. 53 – 63.
- Caspersz, D., J. Skene, et al. (2004). *An approach to managing diversity in student team projects. Seeking Educational Excellence*. Proceedings of the 13th Annual Teaching Learning Forum, Perth: Murdoch University.
- Charmaz, K. (2000). Qualitative Interviewing and Grounded Theory Analysis. In Denzin, Denzin. K., Lincoln, Y. S. (Ed.), *Handbook of Qualitative Research*. Thousand Oaks, California: Sage Publications.
- Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. Thousand Oaks, CA: Sage.
- Cheng, P. (2016). Development of a mobile app for generating creative ideas based on exploring designers' on-line resource searching and retrieval behavior. *Design Studies*, 44(40) 74-99.
- Churchill, D. (2009). Educational applications of Web 2.0: Using blogs to support teaching and learning. *British Journal of Educational Technology*, 40(1), 179–183.
- Cilliers, E.J. (2017). The challenge of teaching generation Z. *People: International Journal of Social Sciences*, 3(1), 188–198. DOI: 10.20319/pijss.2017.31.188198.
- Conole, G., & Alevizou, P. (2010). A literature review of the use of Web 2.0 tools in Higher Education. *The report Commissioned by the Higher Education Academy*. The Open University, UK. Retrieved from http://www.jisctechdis.ac.uk/assets/EvidenceNet/Conole_Alevizou_2010.pdf
<http://oro.open.ac.uk/23154/>

- Cornford, I. R. (2002). Learning-to-learn strategies as a basis for effective lifelong learning. *International Journal of Lifelong Education*, 21(4), 357–368.
- Cox, P. L., & Bobrowski, P. E. (2004). Power tools for teams: A model for improving the teamwork skills of first-year business students. *Journal of Behavioral and Applied Management*, 5(3), 204–227.
- Crebert, G., Patrick, C., Cragolini, V., Smith, C., Worsfold, K., & Webb, F., (2011). *Teamwork skills toolkit*. <http://www.griffith.edu.au/gihe/resources-support/graduateattributes>.
- Dabbagh, N., & Kitsantas, A. (2012). Personal Learning Environments, social media, and self-regulated learning: A natural formula for connecting formal and informal learning. *Internet And Higher Education*, 15(1), 3-8. doi:10.1016/j.iheduc.2011.06.002
- Danvers, J. (2003). Towards a radical pedagogy: Provisional notes on learning and teaching in art & design. *International Journal of Art and Design Education*, 22(1), 47-57.
- Definition of Industrial Design. (n.d.). Retrieved April 6, 2022, from <https://wdo.org/about/definition/>
- Design Council (2005). *The Business of Design: Design Industry Research in 2005*. The Design Council: London. Retrieved March 5, 2022, from www.designcouncil.org.uk
- Design Council (2012). *A Study of the Design Process*, 44(0), 144. Retrieved from http://www.designcouncil.org.uk/sites/default/files/asset/document/ElevenLessons_Design_Council%282%29.pdf
- Dorst, K., & Reymen, I. (2004). Levels of expertise in design education. In P. Lloyd, N. Roozenburg, C. McMahon & L. Brodhurst (Eds.), *2nd International*

Engineering and Product Design Education Conference. The Changing Face of Design Education (pp. 159-166). Delft, The Netherlands: NIVO.

Dreamson, N. (2017). Online Collaboration in Design Education: an Experiment in Real-Time Manipulation of Prototypes and Communication, 2. <https://doi.org/10.1111/jade.12079>

Eckler, D. (2016). The (Near) Future of Technology, The Startup, Medium. Retrieved October 22, 2017, from <https://medium.com/swlh/the-near-future-of-technology-1e7adc3b3bed>

Ehab M. Okba, Mona H. Soliman (2005) *Teamwork as a new pedagogy for Teaching Architectural Design Conference: The second conference of Architecture Department "Globalization and Beyond"*, Faculty of Engineering, Cairo University At: Cairo University – Egypt

Ellis, A.P.J., & Bell, B.S., (2005). An evaluation of generic teamwork skills training with action teams: effects on cognitive and skill-based outcomes, *Personnel Psychology*, 58(3), pp. 641-672.

Fleischmann, K. (2014). Collaboration through Flickr & Skype: Can Web 2.0 Technology Substitute the Traditional Design Studio in Higher Design Education? *Contemporary Educational Technology*, 5(1), 39-52.

Friedman, K. (2012). "Models of Design." *Visible Language*. Vol. 46, Nos. 1 & 2, pp. 132-153.

Friedman, K. (2019). *Chatterjee Global Lecture. Design Education Today: Challenges, Opportunities, Failures*. Cincinnati, Ohio: College of Design, Architecture, Art and Planning, the University of Cincinnati.

Gikas, J., & Grant, M. M. (2013). Internet and Higher Education Mobile computing devices in higher education: Student perspectives on learning with cellphones, smartphones & social media, *19*, 18-26.

- Given, L. M. (2008). *The Sage encyclopedia of qualitative research methods*. [electronic resource]. Thousand Oaks : Sage Online, 2008.
- Glaser, B. G. (1978). *Advances in the methodology of grounded theory: Theoretical sensitivity*. Mill Valley, CA: Sociology Press.
- Glaser, B. G., & Holton, J. (2007). Remodeling Grounded Theory. *Historical Social Research / Historische Sozialforschung Supplement*, (19), 47-68
- Glaser, B. G., & Strauss, A. L. (1967). *The Discovery of Grounded Theory; Strategies for Qualitative Research*. Chicago: Aldine Publishing Company.
- Glesne, C. (2011). *Becoming qualitative researchers: An introduction*. Boston: Pearson.
- Green, L. N. (2005). A Study of The Design Studio In Relation To The Teaching Of Industrial and Product Design. The Degree of Doctor Of Philosophy, The University Of Canberra.
- Green, L. N., & Bonollo, E. (2003). Studio-based teaching: History and advantages in the teaching of design. *World Transactions on Engineering and Technology Education*, 2(2), 269-272.
- Greenhalgh, S. (2016). The effects of 3D printing in design thinking and design education. *Journal Of Engineering, Design And Technology*, 14(4), 752-769. doi:10.1108/JEDT-02-2014-0005
- Grosbeck, G. (2009). To use or not to use web 2.0 in higher education? *Social and Behavioral Sciences*, 1 478-482.
- Gu, N., Gül, L. F. & Maher, M. L. (2007). Designing and learning within the design: A case study of principles for designing and teaching 3D virtual worlds. CAADRIA 2007: Proceedings of the 12th International Conference on Computer-Aided Architectural Design Research in Asia, Nanjing, China, 127-132.

- Gu, N., Gül, L. F., and Williams, A., (2010). Methods for evaluating 3D virtual worlds in design education. *International Design Conference, DESIGN 2010*, 1259-1266.
- Guzzo, R. A., Salas, E., and Associates. (1995). *Team Effectiveness and Decision Making in Organizations*. California: Jossey-Bass Inc.
- Hains-Wesso, R., (2013), *Teamwork Resources for Teachers*, Deakin Learning Futures Teacher Resources.
- Hanington, B. M. (2007). *Generative research in design education*. *International Association of Societies of Design Research 2007: Emerging Trends in Design Research*, 12-15.
- Harrasim, L. (2012). *Learning theory and online technologies*. New York: Taylor and Francis Group.
- Heskett, J. (1980). *Industrial Design*, Thames and Hudson Ltd., London.
- Heskett, J. (2005). *Design: A very short introduction*. Oxford: Oxford University Press
- Hidayah, N., (2020), *Developing a New Norm of Thinking in Design Education*, retrieved March 5, 2022 from <https://qs-gen.com/developing-a-new-norm-of-thinking-in-design-education/>
- Hong, J. C., Yu, K. C. & Chen, M.Y. (2011) Collaborative learning in technological project design, *International Journal of Technology & Design Education*, 21(3), 47-335
- Industrial Design (2016). Retrieved April 06, 2022, from <http://etmk.org.tr/endustriyel-tasarim.php?d=en>

- Johnson, D. W., Johnson, R. T., & Smith, K. A. (1998). *Cooperative learning returns to college*. *Change*, 30(4), 26-35
- Johnson, L., Adams Becker, S., Estrada, V., and Freeman, A. (2015). *Horizon Report: 2015 Higher Education Edition*. Reading. [https://doi.org/ISBN 978-0-9906415-8-2](https://doi.org/ISBN%20978-0-9906415-8-2)
- Jones, J. C. (1980). *Design Methods: Seeds of Human Futures*. London: John Wiley & Sons.
- Jung, Y., Lim, Y., & Kim, M. (2017). Possibilities and Limitations of Online Document Tools for Design Collaboration: The Case of Google Docs. *CSCW '17*, Portland, OR, USA DOI: <http://dx.doi.org/10.1145/2998181.2998297>
- Kaplan, A. M., & Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities of social media. *Business Horizons*, 53, 59-68
- Kingston, A. (2017). Get ready for Generation Z. Retrieved October 06, 2017, from <http://www.macleans.ca/society/life/get-ready-for-generation-z/>
- Kitsantas, A., & Dabbagh, N. (2011). The role of Web 2.0 technologies in self-regulated learning. *New Directions For Teaching And Learning*, 99-106. doi:10.1002/tl.448
- Korski, D. (2017). Britain's universities must change to survive. Higher education reform is the way forward. Retrieved October 02, 2017, from <http://www.telegraph.co.uk/education/2017/01/23/britains-universities-must-change-survive-higher-education-reform/>
- Ku, H., Tseng, H., & Akarasriworn, C. (2013). Collaboration factors, teamwork satisfaction, and student attitudes toward online collaborative learning. *Computers in Human Behavior*, 29(3), 922-929. doi:10.1016/j.chb.2012.12.019

- Lapolla, K. (2014). The pinterest project: Using social media in an undergraduate second year fashion design course at a United States University. *Art, Design & Communication in Higher Education*, 13(2), 175-187.
- Leslie, B., Anderson, C., Bickham, C., Horman, J., Overly, A., Gentry, C., Callahan, C., & King, J. (2021). Generation Z Perceptions of a Positive Workplace Environment. *Employee Responsibilities & Rights Journal*, 33(3), 171–187. <https://doi.org/10.1007/s10672-021-09366-2>
- Levin, P. (2005) *Successful teamwork! for undergraduates and taught postgraduates working on group projects*, Open University Press in Maidenhead.
- Livingston, B. (2010). *Using web 2.0 technologies. [electronic resource]*. Alexandria, VA: ASTD Press, c2010.
- Martin, B., & Hanington, B. M. (2012). *Universal methods of design: 100 ways to research complex problems, develop innovative ideas, and design effective solutions*. Beverly, MA: Rockport Publishers, 2012.
- Mason, R., & Rennie, F. (2006). *Elearning: the key concepts*. London; New York: Routledge, 2006.
- Mauricio, N., (2018) Innovating Industrial Design Curriculum in a Knowledge-Based, Participatory and Digital Era, *Design and Technology Education*, 23(3), 154-204.
- McGourty, J. And De Meuse, K.P.(2001). *The Team Developer : an assessment and skill building program-Instructor's Manual*. New York: Wiley.
- Meyer, M., and Norman, D., (2020) Changing Design Education for the 21st Century, *The Journal of Design, Economics, and Innovation*, 6(1).
- Morkel, J. (2011) ‘Facebook-enhanced face to face learning: the architecture studio’, *Proceedings of the 5th International Computer & Instructional Technologies Symposium*, Firat University, Turkey, pp. 1-7

- National Association of Colleges and Employers NACE (2015). *The skills/qualities employers want in new college graduate hires*. Retrieved March 10, 2022, from <http://www.naceweb.org/aboutus/press/class-2015-skills-qualities-employers-want>
- Neustadt, A., Robinson, J.P., & Kestnbaum, M. (2002). Doing social science research online. In Wellman, B., & Haythornthwaite, C., (Eds.), *The Internet in everyday life*, USA: Blackwell publishing 186-187.
- Niederhelman, M. (2001) Education through design. Review of the ‘Re-inventing design education in the university’ conference, *Design Issues*, 17(3), 7-83.
- Nieradka, P., (2016). *The use of mobile applications in the group of Generation Y*, MakeLearn & TIIM Joint International Conference 2016: Managing Innovation and Diversity in Knowledge Society through Turbulent Time, Timishoara.
- Norman, D., (2014), *State of Design: How Design Education Must Change* retrieved March 5, 2022 from <https://www.linkedin.com/pulse/20140325102438-12181762-state-of-design-how-design-education-must-change/>.
- Norman, D., & Klemmer, S. (2015) *State of Design: How Design Education Must Change*. Retrieved October 11, 2017, from <https://www.linkedin.com/pulse/20140325102438-12181762-state-of-design-how-design-education-must-change?trk=mp-reader-card>
- Oakley, B., R. M. Felder, et al. (2004). Turning Student Groups into Effective Teams. *Journal of Student Centered Learning* 2(1): 9-34.
- Okba, E., M., & Soliman, M. H. *Teamwork as a New Sustainable Pedagogy for Teaching Architectural Design*. In Environment, Health and Sustainable Development (IAPS 19 Conference Proceedings on CD-Rom). IAPS. Alexandria, Egypt, 2006.

- O'Neil, H.F. Jr., Lee, C., Wang, S., & Mulkey, J. (1999). *Final report for analysis of teamwork skills questionnaire*. Advanced Design Information.
- Özenen, G., & Şener, S. M. (2015). Evaluating the impact of augmented reality of augmented reality systems for model-making in architectural education and design studios. *Sakarya University Journal of Science*, 19(2), 197-201.
- Page, T., & Thorsteinsson, G. (2017). Using virtual tools to support collaborative learning in design education. *Journal of Educational Technology*, 14(2), 6-19.
- Park, J. (2011) Design education online: learning delivery and evaluation, *International Journal of Art and Design Education*, 30(2), 176-87
- PayScale (2017). Industrial Designer Salary. *PayScale Human Capital*. Retrieved March 5, 2022 from http://www.payscale.com/research/US/Job=Industrial_Designer/Salary
- Perkel, D. (2014) Digital Tools for Design Research. Retrieved October 22, 2017, from <https://labs.ideo.com/2014/09/19/digital-tools-for-design-research/>
- Powers, M. N. (2016). *Self-regulated design learning : a foundation and framework for teaching and learning design*. New York : Routledge, 2017.
- Reeder, K. J. (2001). An Overview of the Industrial Design Curriculum. *The Technology Teacher*, 60(8), 21.
- Revkin, A. C. (2011) On Birds, Twitter and Teaching. Retrieved November 02, 2017, from <https://dotearth.blogs.nytimes.com/2011/05/05/on-birds-twitter-and-teaching/>
- Rivera-Chang, J. (2015). Case study: Use of online tools in the classroom and their impact on industrial design pedagogy. *Procedia Manufacturing* 3. 2275 – 2280

- Rosen, D., & Nelson, C. (2008). Web 2.0: A new generation of learners and education. *Computers in the Schools*, 25, 211–225
- Sara, R. (2006). Sharing and developing studio practice: A cross-disciplinary study comparing teaching and learning approaches in the art and design disciplines. Paper presented at the CLTAD Conference. London.
- Savery, J. R., & Duffy, T. M. (1995). Problem Based Learning: An Instructional Model and Its Constructivist Framework. *Educational Technology*, 35(5), 31-38.
- Semaj, L. (2016) Generation xyz. Retrieved October 5, 2017 from <https://www.slideshare.net/leahcimsemaj2013/generation-xyz-nov016hrmaj>
- Shim, S. (2017). *What Is ID?* Retrieved October 11, 2017, from <http://www.idsa.org/events/what-id>
- Simsarian, K.T. (2019), Design education can change the world, *Interactions*, 26(2), 36-43, <https://doi.org/10.1145/3305362>
- Souleles, N. (2012). Perceptions of undergraduate Graphic Design students on the educational potential of Facebook, 20(1063519), 241-253.
- Summers, J., et al. (2005). Evaluating collaborative learning and community. *The Journal of Experimental Education*, 73(3), 165-188.
- The Generation Guide - Millennials, Gen X, Y, Z and Baby Boomers. (2015). Retrieved October 06, 2017, from <http://fourhooks.com/marketing/the-generation-guide-millennials-gen-x-y-z-and-baby-boomers-art5910718593/>
- Top Tools For Learning 2021, (2021), retrieved April 6, 2022 from <https://www.toptools4learning.com>

- Tucker, R., & Abbasi, N. (2016). Bad attitudes: Why design students dislike teamwork. *Journal of Learning Design*, 9(1).
- Tucker, R., & Abbasi, N. (2012). Conceptualizing teamwork and group-work in architecture and related design disciplines, in *ASA 2012: Building on knowledge, theory and practice : Proceedings of the 46th Annual Conference of the Architectural Science Association, Architectural Science Association*, Gold Coast, Qld., pp. 1-8
- Tucker,R, Abbasi,N, Thorpe,G, Ostwald,M, Williams,A and Wallis,L (2014), *Enhancing and assessing group and team learning in architecture and related design contexts*, Office for Learning and Teaching, Department of Education, Sydney.
- Volkov, A., & Volkov, M. (2015). Teamwork benefits in tertiary education: Student perceptions that lead to best practice assessment design. *Education and Training*, 57(3), 262–278. <https://doi.org/10.1108/ET-02-2013-0025>
- Wang, Q. (2009). Design and evaluation of a collaborative learning environment. *Computers and Education*, 53(4), 1138-1146. doi:10.1016/j.compedu.2009.05.023
- Xi, S. (2010). Virtual reality for arts and design education. *2010 IEEE 11Th International Conference On Computer-Aided Industrial Design and Conceptual Design, CAID and CD'2010*, 679-682. doi:10.1109/CAIDCD.2010.5681258
- Xia, F., Yang, L. T., Wang, L., & Vinel, A. (2012). Internet of Things. *International Journal of Communication Systems*. 25, 1101-1102. DOI: 10.1002/dac.2417

APPENDICES

A. Online Tools for the Design Process

This table includes popular online tools especially focusing on the research stages of the design process. Online tools for brainstorming or mind mapping methods are very popular and offer users different features such as collaboration, sharing, and storing. Moreover, there are online tools for research stages including focus groups, surveys, user research, and for defining design objectives such as persona and storyboarding.

| <i>Design Methods</i> | Name | Aim / Method | Link |
|---|---------------------|--|---|
| Brainstorming (Mind Mapping) (Stage 1,2,3) | Mindmeister | An web-based online mind mapping tool that lets you capture, develop and share ideas visually. | https://www.mindmeister.com/ |
| | Bubbl | A mind map tool to graphically represent ideas and concepts. | https://bubbl.us/ |
| | Coggle | An web-based collaborative online mind mapping tool. The clear way to share complex information. | https://coggle.it/?lang=en-US |
| | Lucidchart | An online flowchart maker that lets users for sharing, communication and collaboration. | https://www.lucidchart.com/ |
| | Popplet | An application used on the iPad and web to capture and organize your ideas. Used as a mind-map helps to think and learn visually. | http://popplet.com/ |
| | Mindmap | A Google Chrome extension that has Cloud, Google Drive and Dropbox support all built-in. Store in the cloud or print and export finished mind maps as an image. | A google Chrome Extension |
| | Xmind | A mind mapping tool enables to discover clues by evaluating, organizing and connecting thoughts. | http://www.xmind.net |
| | Mapul | A web application to create organic and classic styles of mind maps. | http://www.mapul.com/ |
| | Spiderscribe | An online mind mapping and brainstorming tool that lets to organize ideas by connecting notes, files, calendar events, etc. in free-form maps, and lets users collaborate and share maps online. | https://www.spiderscribe.net/ |

| | | | |
|--------------------------------|----------------------|---|---|
| <i>Focus Group (Stage 1,5)</i> | Mindomo | A tool for collaborative mind mapping, concept mapping and outlining. | https://www.mindomo.com/ |
| | Stormboard | An online sticky-note whiteboard for making meetings, brainstorming, and creative projects more productive and effective. | https://stormboard.com/ |
| | Pinterest | A visual social media tool provides to collect ideas and articles around a particular topic. The boards can be shared with others. | https://tr.pinterest.com/ |
| | FocusGroupIt | An online, easy, fast and low cost (free) way to gather qualitative feedback online. Participants can respond to questions and each other. | https://www.focusgroupit.com/ |
| | Theclickroom | A 3D interactive environment that not only engages but provides a level of enjoyment for participants. Participants from different areas of the country can get together in one place. | http://www.theclickroom.com/ |
| <i>User Research</i> | UserZoom | A flexible and mature remote usability testing and UX research platform that includes a multitude of advanced user testing and research features and tools, including remote unmoderated testing on PCs and mobile devices. | https://www.userzoom.com/gb/ |
| | UserTesting | An user experience research platform to get real customer insights and thoughts | https://www.usertesting.com/ |
| | Validately | A user research and usability testing platform that offers both self-moderated and moderated tests | https://validately.com/ |
| | Loop11 | An online user testing and survey tool that lets usability studies without the need for a usability lab, specialized equipment or moderator. | https://www.loop11.com/ |
| <i>Persona Creator</i> | Xtension | User Persona Creator | https://xtension.io.com/user-persona/ |
| | MakeMyPersona | a free step-by-step wizard to take through the process of creating buyer personas | http://www.makemypersona.com/ |
| | UserForge | A simple tool for designers, agencies and in-house teams to create effective user personas, together | http://userforge.com/ |
| <i>Storyboarding</i> | PersonApp | A free web-based app for creating informal personas and sharing with colleagues | http://personapp.io/ |
| | Boords | Collaborative online storyboarding which save time and stay organised. | https://boords.com/ |

| | | | |
|--------------------------------------|----------------------|--|---|
| <i>(Stage 2,3)</i> | StoryboardTha | Storyboard creator: Posable Characters and Scenes, customizable Smart Scenes Creative Commons Photos or Upload Your Own | http://www.storyboardthat.com/ |
| | Plot | An online storyboard creator lets write, draw & collaborate | https://theplot.io/ |
| <i>User Testing (Stage 3,4,5)</i> | Voice | Getting inspiration from future customers: collecting opinions and growing engagement easy | http://voicepolls.com/ |
| | Qualtrics | Experience management Platform: Track consumer behavior, benchmark company versus competitors, conduct complex academic research and product testing | https://www.qualtrics.com/ |
| <i>Expert Feedback (Stage 3,4,5)</i> | Clarity | Getting advice and feedback from experts | https://clarity.fm/ |
| | Pivotplanet | Connect people and getting advice | https://www.pivotplanet.com/ |
| <i>Diary and Survey (Stage 2)</i> | 24tru | Qualitative research platform: provides an app for remote diary studies that let participants upload videos, photos, or text | https://www.24tru.com/ |
| | Sawtooth | Qualitative research platform: collect deep insights from users (surveys, focus groups, usability testing, ethnography and analysis) | https://www.focusvision.com/ |
| | Dscout | Mobil diary study | https://dscout.com/ |

B. ID 542, 2016-17 Fall, Course Syllabus

ID542 DESIGN MANAGEMENT Collaboration in Design

2016-17 Fall Semester, Fridays 9.40-12.30, R35
Asst. Prof. Dr. Pinar Kaygan, R55, pkaygan@metu.edu.tr

Course Description

Collaboration is working collectively to produce something that a single person could not have produced on her own. Despite the individual (male) artist myth borrowed from the field of fine arts in the early years of professionalisation, which has shaped the image of the "genius designer hero", recently design is defined as a team-based activity that requires interdisciplinary collaboration. In this course we will explore various forms of collaboration, highlighting critical issues appear in collaborative processes, in design education, research and practice.

Course Requirements

1. You are expected to attend all sessions. Attendance, however, does not only correspond to being in the class physically, but also requires to do the readings assigned weekly before classes.

2. Course assessment will be based on the following five tasks:

Task 1. Presentation of your research topic, including presentation *and* outline submission (10% of the final mark)

Task 2. Annotated bibliography submission (15% of the final mark)

Task 3. Book and attend *three* scheduled individual critiques in to discuss the pilot study (15% of the final mark, 5% each critique session)

Task 4. Presentation of your research proposal (20% of the final mark)

Task 5. Research proposal submission (40% of the final mark)

Further information regarding the content and the format for each task will be provided throughout the semester.

Course Outline

Session 1 (7 October 2016): Overview of the course

Session 2 (14 October 2016): Introducing the concept of organizational culture

Readings:

Alvesson, M. 2005. *Understanding Organizational Culture*. Chapter 1 (The Concept of Organizational Culture), 1-8. London: Sage

Alvesson, M. and Sveningsson, S. 2008. *Changing Organizational Culture*. Chapter 3 (Organizational Culture and Change), 35-50. London: Routledge.

Alvesson, M. 2005. *Understanding Organizational Culture*. Chapter 6 (Culture as Constraint: An Emancipatory Approach), 118-144. London: Sage.

Suggested readings:

Acker, J. 2006. Inequality Regimes: Gender, Class, and Race in Organizations. *Gender and Society* 20 (4): 441-464.

Session 3 (21 October 2016): Working conditions and culture in creative industries

Readings:

Hesmondhalgh, D. and Baker, S. 2010. 'A very complicated version of freedom': Conditions and experiences of creative labour in three cultural industries. *Poetics* 38: 4-20.

Michlewski, K. 2008. Uncovering design attitude: Inside the culture of designers. *Organization Studies* 29 (3): 373-392.

Suggested readings:

Julier, G. 2009. Playing the system: Design consultancies, professionalization and value. In *Managing Creativity*, edited by B. Townley and N. Beech, 237-259. Cambridge: Cambridge University Press.

Smith, G., and Whitfield, T.W.A. 2005. The professional status of designers: A national survey of how designers are perceived. *The Design Journal* 8 (1): 52-60.

Session 4 (28 October 2016): Collaboration and teamwork

Readings:

Dykes, T. H., Rodgers, P. A. and Smyth, M. 2009. Towards a new disciplinary framework for contemporary creative design practice, *CoDesign*, 5 (2): 99-116.

Persson, S. and Warell, A. 2003. Relational modes between industrial design and engineering design: A conceptual model for interdisciplinary design work. *Proceedings of the 6th Asian Design*, 1-10.

Session 5 (4 November 2016): Qualitative research methods in organization research

Readings:

Glesne, Corrine. 2011. 4th ed. *Becoming Qualitative Researchers: An Introduction*, Chapter 3 (Being there: Developing understanding through participant observation), 63-100. Boston: Pearson.

Glesne, Corrine. 2011. 4th ed. *Becoming Qualitative Researchers: An Introduction*, Chapter 4 (Making words fly: Developing understanding through interviewing), 101-138. Boston: Pearson.

Symon, G. and Cassell, C. 2012. Chapters 15, 16, 17, 18 and 19 in *Qualitative Organizational Research: Core Methods and Current Challenges*. London: Sage.

Session 6 (11 November 2016): Presentation of your research topic
Presentation *and* outline submission (10% of the final mark)

Session 7 (18 November 2016): Scheduled critiques on your research proposal
Annotated bibliography submission (15% of the final mark)

In the following five weeks (**25 November, 2, 9, 16, 23 December 2016**) there are no class sessions. We will meet at *three* scheduled individual critiques each of which constitute the 5% of your overall mark. During these four weeks you will be carrying out the pilot study. Therefore the aim of these critiques is to discuss the design of your pilot study (the research method, issues regarding sampling, selection of participants, fieldwork questions etc.) You can use the week beginning with 30th December to prepare for your research proposal presentation.

Session 8 (6 January 2017): Presentation of your research proposal
Presentation (20% of the final mark)

Considering the class discussion you will revise your research proposal and submit its final version at the end of the semester (submission date tba). (40% of the final mark)

C. ID 730, 2016-17 Spring, Course Syllabus

MIDDLE EAST TECHNICAL UNIVERSITY
FACULTY OF ARCHITECTURE - DEPARTMENT OF INDUSTRIAL DESIGN
ID 730 Modelling User Experiences
2016 – 2017 Spring Semester

Assist. Prof. Dr. Gülşen TÖRE YARGIN
Res. Assist. Sedef SÜNER
Res. Assist. Aslı GÜNAY

| | |
|----------------------------|---|
| Catalog Description | Exploration of contemporary concepts and models of user experience. Review of the state-of-the-art methods, tools and techniques for user research data collection and analysis. Hands on practice in modelling user experience. Comparison of different methods for empirical research on user experience. |
| Course Objectives: | By the end of the course, the students will <ul style="list-style-type: none"> • Comprehend the state-of-the-art user experience research methods, tools and techniques and understand current concepts in user experience • Obtain the skills for exploring, evaluating and modelling user experience • Learn the practicalities of conducting user research in laboratory and contextual settings |
| Learning outcomes | During the course, students will <ul style="list-style-type: none"> • Review state-of-the-art methods, tools and techniques • Acquire hands on experience in conducting different user experience research methods and compare them considering the outcomes they provide and the way of application • Experience research in different settings |
| Format: | Weekly three hours classes. Weekly group assignments to be presented in the class. For the semester 50% of marks allocated for the student performance in weekly assignments and 50% for the final poster presentation. |
| References: | No unique text book is available for the course. The following sources can be consulted as a reference list for the course. Courage, C. & Baxter, K. (2005). <i>Understanding Your Users: A Practical Guide to User Requirements Methods, Tools, and Techniques</i> . San Francisco: Morgan Kaufmann. Hanington, B., & Martin, B. (2012). <i>Universal methods of design: 100 ways to research complex problems, develop innovative ideas, and design effective solutions</i> . Rockport Publishers. Hassenzahl, M., and Tractinsky, N. (2006). User experience – a research agenda. <i>Behaviour and Information Technology</i> , 25(2). Hassenzahl, M. (2010). Experience design: Technology for all the right reasons. <i>Synthesis Lectures on Human-Centered Informatics</i> , 3(1), 1-95. Karapanos, E. (2013). <i>Modeling Users' Experiences with Interactive Systems</i> (Vol. 436). Berlin, Heidelberg: Springer Berlin Heidelberg Kuniawsky, M. (2003). <i>Observing the user experience: a practitioners guide to user research</i> . San Francisco CA: Morgan Kaufmann. Laurel, B. (2003). <i>Design Research: Methods and Perspectives</i> (Eds.) Massachusetts: The MIT Press. McCarthy, J. & Wright, P. (2004) <i>Technology as Experience</i> . USA: MIT Press. Schiffenstein, H.J. & Hekkert, P. (2008) <i>Product Experience</i> . (Eds.) USA: Elsevier. An extensive list of references will be provided within the method matrix that will be presented in the class. |

D. Research Stage I Survey I

Middle East Technical University (METU)

Faculty of Architecture Department of Industrial Design

The Role of Online Tools in Design Process and Teamwork within the context of Design Education

March 2019

This research is carried out within the scope of the doctoral thesis of Itır Güngör Boncukçu, who is a PhD student of METU Department of Industrial Design. **The research aims to discover the practices and opinions of industrial design students related to the use of online tools. The term online tools covers all the tools, including websites, applications, and technologies that require internet connection. To develop an in-depth understanding of this research theme, I would like to focus on each design phases separately.**

You have completed the main research phase of the design process of your project. I would like to learn more about the online tools that you use in this process. The list of items below summarizes the main tasks that you have done in this phase individually and/or as a team. Please write down the tools you used and give specific examples in relation to how you utilize them.

Your responses will only be used in the design process, thesis study, scientific publications and presentations for scientific purposes, and your name will not be mentioned for any purpose in the final study. **During the design project, one more survey will be conducted and at the end of the design project, interviews will be taken place with the participants, which will last approximately an hour.** To be able to recall and review the process later, interviews will be recorded and voice recorder will be used during the interviews. All the data received will be anonymous.

By signing this form, you will be agreed that, you understand the information provided to you about the research, and that you accept your participation in the interviews. Signing this form does not waive your legal rights; in addition, the researcher, the students, related persons and institutions remain legally and professionally liable. Participation in the study is on a volunteer basis. You may request explanation or information at the beginning or at any stage of the research process. You are free to withdraw from the study at any time, without giving any excuse. Thank you for your contribution to the study.

| Participant's Name | Signature | Date |
|--------------------|-----------|-------|
| | | |

| Researcher's Name | Signature | Date |
|-------------------|-----------|-------|
| | | |

*** Before starting survey, please check out the list of the online tools to remember. You can also add other online tools not listed.**

*** The survey consists of three part which are Literature Search, User Observations via EC Guide and Teamwork. You can fill in Turkish or English. Feel free!**

Researcher's Contact Information

itirgb@metu.edu.tr

The List of top Online Tools for Education (reproduced from Hart, 2018)

| <i>Online Tools</i> | |
|--------------------------------|---------------------------------------|
| <i>Youtube</i> | Video sharing platform |
| <i>OdiiClass</i> | Leaarning management system for METU |
| <i>Google Docs & Drive</i> | Cloud-based office suite and storage |
| <i>Google</i> | Web search engine |
| <i>Padlet</i> | Online corkboard (collaboration tool) |
| <i>Whatsapp</i> | Messaging app |
| <i>Zoom</i> | Video meeting tool |
| <i>OneNote</i> | Digital notebook |
| <i>Prezi</i> | Online presentation tool |
| <i>Wikipedia</i> | Collaborative encyclopedia |
| <i>Wordpress</i> | Blogging and website software |
| <i>Twitter</i> | Public social network |
| <i>Facebook</i> | Public social network |
| <i>Gmail</i> | Cloud-based email client |
| <i>Google Forms</i> | Forms and survey tool |
| <i>Dropbox</i> | Cloud-based document storage |
| <i>Skype</i> | Messaging app (text and video) |
| <i>One Drive</i> | Cloud-based document storage |
| <i>Camtasia</i> | Screencasting tool |
| <i>Slack</i> | Team collaboration tool |
| <i>Trello</i> | Team project tracker |
| <i>Microsoft Teams</i> | Team collaboration tool |
| <i>Pinterest</i> | Visual bookmarking tool |
| <i>Blackboard</i> | Educational course management system |
| <i>Grammarly</i> | Grammar and plagiarism checker |
| <i>Ted Talks</i> | Inspirational videos |
| <i>Google Maps</i> | Online mapping tool |
| <i>Linkedin</i> | Professional social network |
| <i>Instagram</i> | Photo sharing social network |
| <i>Flipboard</i> | create your own social news magazine |
| <i>Google Calendar</i> | Personal and collaborative calendar |
| <i>Doodle</i> | Collaborative event scheduling |
| <i>Vimeo</i> | Video sharing platform |

Hart, J. (n.d.). Top Tools for Learning 2018. Retrieved March 5, 2019, from <https://www.toptools4learning.com/home/>

Part I : Literature Search

| Tasks in relation to main research activities and tasks | Online Tool | HOW: specifically for what topic and/or purpose? | Satisfaction | | | | |
|---|-------------|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | | | Extremely effective | Very effective | Moderately effective | Slightly effective | Not effective at all |
| Developing general understanding of the project | 1. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 2. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 3. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 4. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Acquiring technical information (how it works, material, energy consumption and conservation) | 1. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 2. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 3. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 4. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Getting users' feedback (recall cases, safety issues, diverse user groups (elderly, children etc.)) | 1. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 2. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 3. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 4. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Looking for user reviews including experiences and comments | 1. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 2. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 3. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 4. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Visiting stores, repair shops, and making | 1. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 2. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

| | | | | | | | |
|---|----|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| observation at stores and shops | 3. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 4. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Searching for academic journals and topic related electronic sources | 1. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 2. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 3. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 4. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Preparing presentation boards | 1. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 2. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 3. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 4. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

If you want to add something, please write down.

Part II: User Observations via EC Guide

| Tasks in relation to main research activities and tasks | Online Tool | HOW: specifically for what topic and/or purpose? | Satisfaction | | | | |
|---|-------------|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | | | Extremely effective | Very effective | Moderately effective | Slightly effective | Not effective at all |
| Understanding the practices, experiences, and the | 1. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 2. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 3. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

| | | | | | | | |
|-----------------------------------|----|--|---|---|---|---|---|
| characteristics of the | 4. | | 0 | 0 | 0 | 0 | 0 |
| Taking pictures | 1. | | 0 | 0 | 0 | 0 | 0 |
| | 2. | | 0 | 0 | 0 | 0 | 0 |
| | 3. | | 0 | 0 | 0 | 0 | 0 |
| | 4. | | 0 | 0 | 0 | 0 | 0 |
| Recording Videos | 1. | | 0 | 0 | 0 | 0 | 0 |
| | 2. | | 0 | 0 | 0 | 0 | 0 |
| | 3. | | 0 | 0 | 0 | 0 | 0 |
| | 4. | | 0 | 0 | 0 | 0 | 0 |
| Taking notes | 1. | | 0 | 0 | 0 | 0 | 0 |
| | 2. | | 0 | 0 | 0 | 0 | 0 |
| | 3. | | 0 | 0 | 0 | 0 | 0 |
| | 4. | | 0 | 0 | 0 | 0 | 0 |
| Sharing and archiving the data | 1. | | 0 | 0 | 0 | 0 | 0 |
| | 2. | | 0 | 0 | 0 | 0 | 0 |
| | 3. | | 0 | 0 | 0 | 0 | 0 |
| | 4. | | 0 | 0 | 0 | 0 | 0 |
| Preparing presentation boards | 1. | | 0 | 0 | 0 | 0 | 0 |
| | 2. | | 0 | 0 | 0 | 0 | 0 |
| | 3. | | 0 | 0 | 0 | 0 | 0 |
| | 4. | | 0 | 0 | 0 | 0 | 0 |

If you want to add something, please write down.

E. Research Stage I Survey II

Middle East Technical University (METU)

Faculty of Architecture Department of Industrial Design

The Role of Online Tools in Design Process and Teamwork within the context of Design Education

April 2019

This research is carried out within the scope of the doctoral thesis of İtir Güngör Boncukçu, who is a PhD student of METU Department of Industrial Design. **The research aims to discover the practices and opinions of industrial design students related to the use of online tools. The term online tools covers all the tools, including websites, applications, and technologies that require internet connection. To develop an in-depth understanding of this research theme, I would like to focus on each design phases separately.**

You have completed the main research phase of the design process of your project. I would like to learn more about the online tools that you use in this process. The list of items below summarizes the main tasks that you have done in this phase individually and/or as a team. Please write down the tools you used and give specific examples in relation to how you utilize them.

Your responses will only be used in the design process, thesis study, scientific publications and presentations for scientific purposes, and your name will not be mentioned for any purpose in the final study. **During the design project, one more survey will be conducted and at the end of the design project, interviews will be taken place with the participants, which will last approximately an hour.** To be able to recall and review the process later, interviews will be recorded and voice recorder will be used during the interviews. All the data received will be anonymous.

By signing this form, you will be agreed that, you understand the information provided to you about the research, and that you accept your participation in the interviews. Signing this form does not waive your legal rights; in addition, the researcher, the students, related persons and institutions remain legally and professionally liable. Participation in the study is on a volunteer basis. You may request explanation or information at the beginning or at any stage of the research process. You are free to withdraw from the study at any time, without giving any excuse. Thank you for your contribution to the study.

| Participant's Name | Signature | Date |
|--------------------|-----------|-------|
| | | |

| Researcher's Name | Signature | Date |
|-------------------|-----------|-------|
| | | |

*** Before starting survey, please check out the list of the online tools to remember. You can also add other online tools not listed.**

*** The survey consists of three part which are Literature Search, User Observations via EC Guide and Teamwork. You can fill in Turkish or English. Feel free!**

Researcher's Contact Information: itirgb@metu.edu.tr

Part I : Biomimicry Sketch Analysis

| Tasks in relation to main research activities and tasks | Online Tool | HOW: specifically for what topic and/or purpose? | Satisfaction | | | | |
|---|-------------|--|---------------------|----------------|----------------------|--------------------|----------------------|
| | | | Extremely effective | Very effective | Moderately effective | Slightly effective | Not effective at all |
| Part I (Individual): Documenting observation (BSA field trip with Zati Bey) and exploring process | 1. | | 0 | 0 | 0 | 0 | 0 |
| | 2. | | 0 | 0 | 0 | 0 | 0 |
| | 3. | | 0 | 0 | 0 | 0 | 0 |
| | 4. | | 0 | 0 | 0 | 0 | 0 |
| Part I (Individual): Finding inspiration from the internet | 1. | | 0 | 0 | 0 | 0 | 0 |
| | 2. | | 0 | 0 | 0 | 0 | 0 |
| | 3. | | 0 | 0 | 0 | 0 | 0 |
| | 4. | | 0 | 0 | 0 | 0 | 0 |
| Part I (Individual): Preparing the board based on A4 template | 1. | | 0 | 0 | 0 | 0 | 0 |
| | 2. | | 0 | 0 | 0 | 0 | 0 |
| | 3. | | 0 | 0 | 0 | 0 | 0 |
| | 4. | | 0 | 0 | 0 | 0 | 0 |
| Part II (Team): Compiling diverse inspirations | 1. | | 0 | 0 | 0 | 0 | 0 |
| | 2. | | 0 | 0 | 0 | 0 | 0 |
| | 3. | | 0 | 0 | 0 | 0 | 0 |
| | 4. | | 0 | 0 | 0 | 0 | 0 |
| Part II (Team): Working with teammates (decision | 1. | | 0 | 0 | 0 | 0 | 0 |
| | 2. | | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | |
|---|----|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| making, task management, communication and etc.) | 3. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 4. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Part II (Team): Preparing biomimicry sketch analyses | 1. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 2. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 3. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 4. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

If you want to add something, please write down.

Part II: Scenario Building

| Tasks in relation to main research activities and tasks | Online Tool | HOW: specifically for what topic and/or purpose? | Satisfaction | | | | |
|---|-------------|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | | | Extremely effective | Very effective | Moderately effective | Slightly effective | Not effective at all |
| Step 1 (individual work): Understanding the themes (the shared home/dorm/office space and the personas in detail) | 1. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 2. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 3. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 4. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Step 1 (individual work): Developing scenario | 1. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 2. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 3. | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

| | | | | | | | |
|--|----|--|---|---|---|---|---|
| | 4. | | 0 | 0 | 0 | 0 | 0 |
| Step 1 (individual work): Preparing presentation boards | 1. | | 0 | 0 | 0 | 0 | 0 |
| | 2. | | 0 | 0 | 0 | 0 | 0 |
| | 3. | | 0 | 0 | 0 | 0 | 0 |
| | 4. | | 0 | 0 | 0 | 0 | 0 |
| Step 2 (Teamwork) Transformation scenario | 1. | | 0 | 0 | 0 | 0 | 0 |
| | 2. | | 0 | 0 | 0 | 0 | 0 |
| | 3. | | 0 | 0 | 0 | 0 | 0 |
| | 4. | | 0 | 0 | 0 | 0 | 0 |
| Step 3 (Teamwork) Bodystorming | 1. | | 0 | 0 | 0 | 0 | 0 |
| | 2. | | 0 | 0 | 0 | 0 | 0 |
| | 3. | | 0 | 0 | 0 | 0 | 0 |
| | 4. | | 0 | 0 | 0 | 0 | 0 |
| Step 4 (Individual Work) Evaluate/Reflect on/Sketch out | 1. | | 0 | 0 | 0 | 0 | 0 |
| | 2. | | 0 | 0 | 0 | 0 | 0 |
| | 3. | | 0 | 0 | 0 | 0 | 0 |
| | 4. | | 0 | 0 | 0 | 0 | 0 |

If you want to add something, please write down.

Part III: Preliminary Jury

| Tasks in relation to main research activities and tasks | Online Tool | HOW: specifically for what topic and/or purpose? | Satisfaction | | | | |
|--|-------------|--|---------------------|----------------|----------------------|--------------------|----------------------|
| | | | Extremely effective | Very effective | Moderately effective | Slightly effective | Not effective at all |
| Understanding the requirements of the pre-jury | 1. | | 0 | 0 | 0 | 0 | 0 |
| | 2. | | 0 | 0 | 0 | 0 | 0 |
| | 3. | | 0 | 0 | 0 | 0 | 0 |
| | 4. | | 0 | 0 | 0 | 0 | 0 |
| Working with team (communication and division of labor) | 1. | | 0 | 0 | 0 | 0 | 0 |
| | 2. | | 0 | 0 | 0 | 0 | 0 |
| | 3. | | 0 | 0 | 0 | 0 | 0 |
| | 4. | | 0 | 0 | 0 | 0 | 0 |
| Finalizing the ideas for pre-jury (making decisions in team) | 1. | | 0 | 0 | 0 | 0 | 0 |
| | 2. | | 0 | 0 | 0 | 0 | 0 |
| | 3. | | 0 | 0 | 0 | 0 | 0 |
| | 4. | | 0 | 0 | 0 | 0 | 0 |
| Preparing presentation boards | 1. | | 0 | 0 | 0 | 0 | 0 |
| | 2. | | 0 | 0 | 0 | 0 | 0 |
| | 3. | | 0 | 0 | 0 | 0 | 0 |
| | 4. | | 0 | 0 | 0 | 0 | 0 |
| | 1. | | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | |
|-------------------------------------|----|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Getting ready for oral presentation | 2. | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 3. | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 4. | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Making 3D presentation models | 1. | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 2. | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 3. | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 4. | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

If you want to add something, please write down.

F. Research Stage I Interview Guide

Middle East Technical University (METU)
Faculty of Architecture Department of Industrial

The Role of Online Tools in Design Process and Teamwork within the context of Design Education

April 2019

This research is carried out within the scope of the doctoral thesis of İtir Güngör Boncukçu, who is a PhD student of METU Department of Industrial Design. The research aims to discover the practices and opinions of industrial design students related to the use of online tools. The term online tools covers all the tools, including websites, applications, and technologies that require internet connection. To develop an in-depth understanding of this research theme, I would like to focus on each design phases separately.

You have completed almost all the stages of the design process of your project. I would like to learn more about the online tools that you use in this process. The list of items below summarizes the main tasks that you have done in this phase individually and/or as a team. Please write down the tools you used and give specific examples in relation to how you utilize them.

Your responses will only be used in the design process, thesis study, scientific publications and presentations for scientific purposes, and your name will not be mentioned for any purpose in the final study. During the design project, one more survey will be conducted and at the end of the design project, interviews will be taken place with the participants, which will last approximately an hour. To be able to recall and review the process later, interviews will be recorded and voice recorder will be used during the interviews. All the data received will be anonymous.

By signing this form, you will be agreed that, you understand the information provided to you about the research, and that you accept your participation in the interviews. Signing this form does not waive your legal rights; in addition, the researcher, the students, related persons and institutions remain legally and professionally liable. Participation in the study is on a volunteer basis. You may request explanation or information at the beginning or at any stage of the research process. You are free to withdraw from the study at any time, without giving any excuse. Thank you for your contribution to the study.

| | | |
|---------------------------|------------------|-------------|
| Participant's Name | Signature | Date |
| | | |
| Researcher's Name | Signature | Date |
| | | |

*** Before starting the interview, please check out the list of the online tools to remember. You can also add other online tools not listed.**

Researcher's Contact Information : itirgb@metu.edu.tr

Interview Guide

Tasarım eğitimi sürecinde kullandığınız çevrimiçi araçlar (online tool) hakkında konuşmak istiyorum. Stüdyo dersi kapsamında üzerinde çalıştığınız proje süreçlerini göz önünde alınarak cevap vermenizi bekliyorum.

Proje kapsamında şu ana kadar farklı aşamaları tamamladınız ve sona yaklaşıyorsunuz. Bu süreçte:

- DESIGN RESEARCH / LITERATURE SEARCH
- DESIGN RESEARCH/EC GUIDE
- IDEATION/BSA (Design Workshop on Biomimicry Sketch Analysis (BSA))(Idea generation and sketching session)
- IDEATION/DESIGN TRANSFORMATION (Scenario building and Lo-Fi prototyping)
- DESIGN DEVELOPMENT/REFINING, COMPILING, and Lo-Fi PROTOTYPING
- PRE-JURY
- DESIGN DETAILING/USER INTERFACE/USER EXPERIENCE (User Interface and Adobe XD Workshop)
- DESIGN DETAILING/CONCEPT PROTOTYPING (Introduction of Concept Prototyping for User Testing)
- DESIGN DETAILING/2D-3D MODELLING (Video presentation)
- PRESENTING YOUR DESIGN /2D- 3D MODELLING
- PRESENTING YOUR DESIGN

Part 1: Literature Search

- Developing general understanding of the project
- Acquiring technical information (how it works, material, energy consumption and conservation)
- Getting users' feedback (recall cases, safety issues, diverse user groups (elderly, children etc.))
- Looking for user reviews including experiences and comments
- Visiting stores, repair shops, and making observation at stores and shops
- Searching for academic journals and topic related electronic sources
- Preparing presentation boards

Part II: User Observations via EC Guide

- Understanding the practices, experiences, and the characteristics of the target user group
- Taking pictures
- Recording videos
- Taking notes
- Sharing and archiving the data
- Preparing presentation boards

Part III: Teamwork

- Communication
- Sharing information
- Archiving data
- Task Management
- Simultaneous working / collaboration on same document and/or file

Part IV: Biomimicry Sketch Analysis

- Part I (Individual): Documenting observation (BSA field trip with Zati Bey) and exploring process
- Part I (Individual): Finding inspiration from the internet
- Part I (Individual): Preparing the board based on A4 template
- Part II (Team): Compiling diverse inspirations
- Part II (Team): Working with teammates (decision making, task management, communication and etc.)
- Part II (Team): Preparing biomimicry sketch analysis

Part V: Scenario Building

- Step 1 (individual work): Understanding the themes (the shared home/dorm/office space and the personas in detail)
- Step 1 (individual work): Developing scenario
- Step 1 (individual work): Preparing presentation boards
- Step 2 (Teamwork) Transformation scenario
- Step 3 (Teamwork) Bodystorming
- Step 4 (Individual Work) Evaluate/Reflect on/Sketch out

Part VI: Preliminary Jury

- Understanding the requirements of the pre-jury
- Working with team (communication and division of labor)
- Finalizing the ideas for pre-jury (making decisions in team)
- Preparing presentation boards
- Getting ready for oral presentation
- Making 3D presentation models

Questions:

1- Öncelikle bu süreçlerde kullandığınız online araçlar neler, sağladığı avantajlar ve kısıtlarını düşünerek aracı değerlendirebilir misiniz?

- Araştırma aşaması
- Fikir geliştirme
- Fikir görselleştirme
- Fikir değerlendirme
- Sunma ve paylaşma arşivleme

2- Süreç boyunca grup çalışmalarını yürütürken kullandığınız araçlar nelerdir?

- İletişim, grup çalışması, iş bölümü

3. Hangi aşamalarda online araçlara **daha çok ihtiyaç** duyuyorsunuz?

4. Süreç boyunca internet/online tool kullanımını **çok işimize yaradı** diye düşündüğünüz anlar oldu mu?

5. Araçları kullanırken **olumsuz deneyim** yaşadınız mı?

6. Araştırma aşamasında online tool kullanımıyla ilgili **önerileriniz** var mı?

- Ne **gibi ihtiyaçlarınız** var?
- Kullandığınız araçlar **beklentilerinizi** ne kadar karşılıyor?
- Bu deneyimleri **iyileştirilmesi için önerileriniz** var mı?

G. Research Stage I Interview Analysis / Online Tools

In this analysis table, the results of the interviews made in the first stage of the research are categorized in terms of online tools. In the table below, the statements of the students on **WhatsApp** are combined and matched with the themes they use for what purpose.

| Online Tool | Team No | Statements | Theme |
|-------------|---------|--|-----------------|
| WhatsApp | Team 4 | Bir kere zaten WhatsApp'la artık her türlü oluyor. En başta ben şeyi önermiştim. OneNote önermiştim | Communication |
| WhatsApp | Team 4 | - En kolay birbirimizle iletişebileceğim yol bence WhatsApp'tı - Zaten sürekli telefonla kontrol edebildiğimiz için | Communication |
| WhatsApp | Team 4 | Buluşmalarımızı genelde WhatsApp üzerinden ayarladık. Ben bir yandan da çalışıyorum. Çalışma programımı atıyorum ya da söylüyorum şu saatlerde çalışıyorum şöyle ya da ben gelemiyorum ve içimden biri gelemiyor. Hocaların feedback'lerini yine oradan paylaşıyoruz. Yüz yüze gelememişsek eğer. Onun dışında genelde planlarımız hep WhatsApp üzerinden buluşma planları. | Time management |
| WhatsApp | Team 4 | Mesela bazen şey olur hocam genelde WhatsApp'ta hem bunların bunun yanı sıra şey atarız mesela ben bunu buldum, şunu buldum. | Sharing |
| WhatsApp | Team 4 | User observation: Yine WhatsApp oldu çünkü şuraya gidelim, buraya gidelim. Bunu yapalım. | Team Discussion |
| WhatsApp | Team 4 | Öyle olunca sürekli Whatsapp'tan o dönem baya daha yoğun konuşmamız gerekiyordu nasıl yapalım diye. WhatsApp gibi bir şey olmasaydı muhtemelen o durumu atlatamazdık gibi geliyor çünkü hepimiz o zaman farklı yerlere, A... kendi yurdunda yapmıştı. İ... 'in evine ben gitmiştim, beraber yapmıştık. Sonra ben yurttan kendim yapmıştım, tekrar ayrı ayrı. | Team Discussion |
| WhatsApp | Team 4 | Karşı grupta WhatsApp grubu kurduk. Mesela öyle bir projede bence çok iyi oldu. Çünkü diğer gruplar kuramayan çok grup vardı, özellikle şeyler. Japonya'yla beraber çalışan grup. Biz Tayland'la çalışıyorduk. Onlar çünkü WhatsApp kullanmıyormuş Japonya'da. Onlar kullanmayınca bizim grup tamam biz sizinkine gidelim vs. Bir şey duymuştum ben diğer gruplardan. O e-mail haberleşme süreci gerçekten çok kötü oldu. Biz böyle çok rahat buluşurken Skype görüşmeleri yapmamız gerekiyordu. Biz çok rahat buluşurken şu an buluşuyoruz. Pardon yarım saat gecikeceğiz bilmem ne diye hemen haberleşirken diğer gruplar gelmedi yarım saat gelmedi biz de çıktık. Ondan sonra onlar gelmiş. Bilmem ne. Bir sürü sıkıntı oldu. WhatsApp olmasaydı gerçekten o dersi nasıl bitirirdik bilmiyorum | Communication |
| WhatsApp | Team 4 | Genelde zaten bakmıyorum. Mesela şu an iki sohbette altı mesaj, şu an baktım ama kaçtan beri? Bayağı saattir var. İsteyen istediğine aslında ulaşabiliyor ama sen istersen ulaşıyor. Ben istemezsem bakmazsam açmıyorum. Çok acil bir şey olursa genelde bakarsam. Çünkü o da şey değil arama gibi şu anda ulaşmam gerekiyor sana gibi bir şey görmüyorum ben WhatsApp. O yüzden bence. | Communication |
| WhatsApp | Team 4 | Ben mesela öyle yapamıyorum hocam. Ben bir kere yaptım, başıma bela açtı. Böyle insanlar o kadar şey ki. Mesela ben gerçekten bazen telefonda oluyor bildirimler. Konuşurken mesela biriyle biri arkada kalıyor. O sırada görmüyorsunuz. Cevap vermiyorsunuz. Sonra tripler ye, bir şeyler yap. | Communication |
| WhatsApp | Team 4 | Bana mı? Mesela grupta acil bir şey olabiliyor genelde. O yüzden mesela proje için olduğu için gruba şeye bakabilirim ama diğer mesela hiç okulla alakası olmayan bir arkadaş grubunun mesajlarına bir gün, iki gün bakmıyorum. Mesela orada tam aşağılara kadar iniyor. Bakmıyorum çünkü o acil bir şey olmadığı kesin ama grupta aciz bir şey olabilir. O yüzden genelde mesela grup mesajlarını o anda açıyorum. | Communication |
| WhatsApp | Team 4 | Şu olabilir. Ben uzatayım dedim. WhatsApp'tan bir Communication yapabiliyoruz ama keşke belki de bir amacını seçebilsem bu da amacını şey yapsam. Dediniz ya her an size olan ulaşılabilir. Mesela bana ulaşılacak istendiği zaman, tam bilmiyorum bunu başarabiliyorum, başaramayan insanlar da var. Mesela o bir akademik konuda bir şeyse belki daha fazla uyarılı ya da daha farklı bir bildirim olabilir. Ya da daha farklı bir şey bile olabilir. Belki de onun kendi öğrencileri düzenleme açısından, bilgi paylaşımı yapmadınız gibi. Ya da şunu eksik yaptınız belki tasarımı sürecini etkileyecek bir şeyler olabilir. | Communication |

| | | | |
|----------|--------|---|-------------------|
| Whatsapp | Team 5 | User Observation - EC Guide Grupça onlara karar verdik. Neler soralım diye. Herkes bir fikir verdi. WhatsApp üzerinden konuşmuştuk. | Team Discussion |
| Whatsapp | Team 5 | Biomimicry gezisinde: not alma: Ben WhatsApp grubuna yazıyordum Ben telefonun notlarını kullanmıştım | Note Taking |
| Whatsapp | Team 5 | Stüdyoda bir araya geliyoruz. Bir araya gelip kararlaştırıyoruz. Dağılmadan önce mutlaka arkadaşlar. Yarın ne yapıyoruz? Da şu gün ne yapıyoruz? Konumuz ne? Neler yapacağız? Bunları kararlaştırıyoruz. Direkt kalem kağıt not tuttuysak fotoğrafını çekip WhatsApp'a atıyoruz. Yoksa da direkt WhatsApp'a yazıyoruz bunlar yapılacak neler gerekse alınacak malzemeleri mesela paylaşıyoruz. | Task division |
| Whatsapp | Team 5 | WhatsApp sizin böyle iş takibi yaptığınız ve iş Task'larını yazdığınız bir şey olmuş o zaman. Evet. Rahat oluyor çünkü internetimiz açıkken direkt telefona bildirim geliyor. Başka bildirim bu kadar net sağlayan başka bir yer yok. O kadar çok kontrol ettiğimiz başka bir medya yok. | Task division |
| Whatsapp | Team 5 | Bir de biz WhatsApp grubuna çok şey yapmıyoruz. Çok iyi anlaşıyoruz o konuda bir sıkıntı yok ama hiç geyik doğru düzgün döndürmüyoruz. Hep dersle ilgili şeyler. Daha resmi kullanıyoruz orayı sanırım. O yüzden çok böyle şey olmuyor. Çok böyle yukarı çıkmam gerekiyor bir şey aramak için. O yüzden rahat WhatsApp bizim için. | Task division |
| Whatsapp | Team 5 | Berber de kullanabiliyorsunuz. Ortak not tutma gibi bir şey olabiliyor mesela. Şimdi bazı gruplar mesela kritiklerde veya bir şeylerde oralarına notları tutmuşlar ama siz böyle bir şey tercih etmediniz. WhatsApp. Evet, aynısını WhatsApp'ta da yapabiliyoruz. | Note Taking |
| Whatsapp | Team 5 | WhatsApp. Grup çalışmasındaki iletişim mi? | Communication |
| Whatsapp | Team 5 | WhatsApp'tan fotoğraf atma çok oluyor ama WhatsApp'ın tarama olayı yok. Taramayı başka uygulamalardan yapıyoruz. Notlar kısmında iPhone 'da var bilmiyorum diğer telefonlarda var mı? Notlardan taranıyor ya da ekstra Scanner programları indiriyoruz. WhatsApp'ın öyle bir özelliği olsa çok iyi olurdu. Hiçbir şeye gerek kalmadı. | Sharing |
| Whatsapp | Team 7 | WhatsApp'ta kullan aslında çoğunlukla. Çünkü Google Drive'a en son yüklüyorduk ama WhatsApp'ta o an paylaşmamıza daha çok kolaylaştırdığı için. | Sharing |
| Whatsapp | Team 7 | WhatsApp'ı sürekli haberleşme aslında, stüdyoya gelmeden önce bile bugün şunu yapacaktım. Bunu yapacaktık. Neredesiniz? Ne zaman buluşacağız? Bu iletişim şeyleri haricinde aynı zamanda ödevleri de paylaştığımız yere. Atıyorum bir posterin son hali oraya gönderiliyor ya da şu siteyi buldum. Bu siteyi buldum. Şuradan araştı. Yan yanayken bile bilgisayarlarımız ayrı olduğu için hemen WhatsApp'tan link yollayıp, ortak olarak oradan atıyorduk. WhatsApp biraz daha kolay bir iletişim aracı olduğu için ilk başta WhatsApp grubu kurmuştuk. | Sharing |
| Whatsapp | Team 7 | Yapılacak şeylerin listesini WhatsApp'a atıyoruz aslında. Sadece şimdi, şunu kim alır? Bunu kim alır? Gibi bir iş dağılımını internet-- Bir şey üzerinde yapmıyoruz. | Task division |
| Whatsapp | Team 7 | Whatsapp - Şu an yok ben ses kaydı attım bir sürü. Hatta bir tanesinde kayıt tuşuna basmamışım 10 dk konuştum sonra tekrar konuşmam gerekti. | Sharing |
| Whatsapp | Team 7 | Yani telefon. Şimdi WhatsApp'ın bu olumlu yanlarından birisi hem WhatsApp web var hem WhatsApp var. Tuvalete gitsem buradan devam edebiliyorum da ne bileyim bilgisayarın açık olmasa bakacak olsam bir şeye buradan da bakabiliyorum. Gerçi Google Drive var yine ama bir şey olacaksa eğer sadece bilgisayardan ulaşabileceğimiz değil de Application'lı da işi kolaylaştırabilir aslında. | Multiples devices |
| Whatsapp | Team 7 | WhatsApp'tan atamıyoruz önemli bir şey olduğu zaman. Boyutu değişiyor değil mi? Hem boyutu hem çözünürlüğü. | Sharing |
| Whatsapp | Team 7 | WhatsApp'tan fotoğraf atınca bence kalitesi bozulmasın. | Sharing |
| Whatsapp | Team 7 | ODTÜ Class hep kullanıyoruz en son. Onu yüklerken mesela WhatsApp'tan atmıştık en son hallerini ya da Drive'den atmıştık. Drive'a yükleyip orada atmıştık. Bir de ben şeyi kullanmıştım. Whatsapp'ı benim gözlemlediğim insanın şeyleri-- Bir yer vardı EC Guide'da onun eskiden yaşadığı bir şeyler, Grilling üzerinde varsa eğer. Onu doldurmuştu. Sonra ben en son dakika WhatsApp'tan yazıp şöyle bir soru var. "Bunu cevaplar mısın?" Deyip böyle bir yarım saat içinde öyle bir cevap aldığım olmuştu. | User Research |

H. Research Stage I Interview Analysis / Purposes of Usage

In this analysis table, the results of the interviews made in the first stage of the research are categorized in terms of purposes of usage. In the table below, the statements of the students on **Sharing** are combined and matched with the online tools.

| Theme | Team No | Statements | Online Tool |
|---------|---------|--|-----------------|
| Sharing | Team 4 | Mesela bazen şey olur hocam genelde WhatsApp'ta hem bunların bunun yanı sıra şey atarız mesela ben bunu buldum, şunu buldum. | Whatsapp |
| Sharing | Team 5 | WhatsApp'tan fotoğraf atma çok oluyor ama WhatsApp'ın tarama olayı yok. Taramayı başka uygulamalardan yapıyoruz. Notlar kısmında iPhone 'da var bilmiyorum diğer telefonlarda var mı? Notlardan taranıyor ya da ekstra Scanner programları indiriyoruz. WhatsApp'ın öyle bir özelliği olsa çok iyi olurdu. Hiçbir şeye gerek kalmadı. | Whatsapp |
| Sharing | Team 7 | WhatsApp'ta kullan aslında çoğunlukla. Çünkü Google Drive'a en son yüklüyorduk ama WhatsApp'ta o an paylaşmamıza daha çok kolaylaştırdığı için. | Whatsapp |
| Sharing | Team 7 | WhatsApp'ı sürekli haberleşme aslında, stüdyoya gelmeden önce bile bugün şunu yapacaktım. Bunu yapacaktık. Neredesiniz? Ne zaman buluşacağız? Bu iletişim şeyleri haricinde aynı zamanda ödevleri de paylaştığımız yere. Atıyorum bir posterin son hali oraya gönderiliyor ya da şu siteyi buldum. Bu siteyi buldum. Şuradan araştır. Yan yanayken bile bilgisayarlarımız ayrı olduğu için hemen WhatsApp'tan link yollayıp, ortak olarak oradan atıyorduk. WhatsApp biraz daha kolay bir iletişim aracı olduğu için ilk başta WhatsApp grubu kurmuştuk. | Whatsapp |
| Sharing | Team 7 | Whatsapp - Şu an yok ben ses kaydı attım bir sürü. Hatta bir tanesinde kayıt tuşuna basmamışım 10 dk konuştum sonra tekrar konuşmam gerekti. | Whatsapp |
| Sharing | Team 7 | WhatsApp'tan atamıyoruz önemli bir şey olduğu zaman. Boyutu değişiyor değil mi? Hem boyutu hem çözünürlüğü. | Whatsapp |
| Sharing | Team 7 | WhatsApp'tan fotoğraf atınca bence kalitesi bozulmasın. | Whatsapp |
| Sharing | Team 4 | Mesela arkadaşınız size bir PDF dosyası atıyor. Onu mesela bilgisayarda açmanız gerekiyorsa çok iyi oluyor. Onun hakkını da yiyemem. Çünkü mesela geçen grupta atılıyor. Mesela Pafta atılıyordu, bilgisayara kaydetmek direkt WhatsApp web'e çıkıyor | Whatsapp Web |
| Sharing | Team 5 | Dosyaları Drive'a koyduk bir de WhatsApp'tan da paylaştık. WhatsApp web'ten daha doğrusu. Aslında tüm projede WhatsApp web ve birçok kullandık diyebilirim. Paylaşma amacıyla kullandık. Evet. Daha sonra WhatsApp web üzerinden böyle bir şeyler gönderdik. | Whatsapp Web |
| Sharing | Team 5 | Tek bilgisayar üzerinden Pafta'yı yaptık ama diğer bilgisayarlarda yaptığımız düzenlemeler. Mesela Pafta'nın bir kısmı bir bilgisayar üzerinden yapıldığı fotoğrafın arkası temizlenecekti mesela. O başka bilgisayardan yapılıyordu onları birleştiriyorduk. Onları birbirlerine aktarma işini nasıl yaptınız? Mail. Dosya attık direkt. Ya da WhatsApp web. WhatsApp web'i daha çok kullandık sanırım. Pdf haline dönüştürüp. | Whatsapp Web |
| Sharing | Team 7 | Bilgisayarı çevirmek ve taşımak sıkıntı o yüzden yan yana çalışsak bile bir ekranı çevirmek yerine WhatsApp web'ten link yolluyoruz. Çünkü o bile bir efor oluyor yani. Telefonu göstermek bile şey oluyor. Herkes bilgisayara açıkken direkt ekrana hızlı olabilecek şekilde. | Whatsapp Web |
| Sharing | Team 7 | Sadece telefon da değil aslında WhatsApp web verilen şey bence WhatsApp'ın kullanımını çok arttırdı. Bilgisayarın başında. Senin bana messengerden attığın görseller vardı. Mesela neden WhatsApp web'den değil de neden messengerden attığını anlamıyorum. Kesin Facebook açıktır o an. Muhtemelen şu yüzden atmışımıdır, ben genelde o yüzden Facebook'u kullanıyorum mümkünse. WhatsApp ve benim bilgisayarımda direkt WhatsApp web girer girmez açık olmuyor. Ben her girdiğimde kendim açacağım. | Whatsapp Web |

| | | | |
|----------------|--------|--|--------------|
| Sharing | Team 7 | WhatsApp web'ten indirilen görseller Illustrator'e doğrudan atılmıyor. Hata veriyor. Evet, JPG olarak iniyor çünkü. Önce Paint'te açıp sonra Illustrator'e atmak gibi bir şeyle uğraşmak zorunda kalıyoruz. O yüzden Drive daha iyi. | Whatsapp Web |
| Sharing | Team 7 | Bir de takım içi paylaşım da çok önemli. Çünkü bulduğumuz her şey birbirimize Flash ile aktardığımızı düşünürsek kötü olurdu. WhatsApp web bayağı iyi bence. | Whatsapp Web |
| Sharing | Team 4 | Drive'da ortaak klasörümüz yoktu: Çok böyle çok büyük boyutlu şeyler sürekli atmadığımız için sürekli sürekli dağıtmamız gerekmediği için. | Drive |
| Sharing | Team 4 | Biomimicry : Sadece fotoğraf çektik. Daha sonra şöyle bir şey oldu. İpek gelmediği için ben Drive'a paylaştım. | Drive |
| Sharing | Team 4 | Bizi mesela geçen köpek projesi yaparken araştırma grup kurdum. Grup olmuştu. Orada mesela diğer grubum benim kendi grubumda o direkt Drive dosyası açılıp başlıklara bölünmüştü. Herkes bulduğu şeyleri oraya atıyordu. Mesela ben Pafta yapıyordum. Oradan direkt herkesin bulduğu şeyleri alıp Pafta'yı öyle yapabildim. | Drive |
| Sharing | Team 5 | Drive'ı aslında şey için böyle çok fazla herkes bir şey araştırıyor. Atıyorum 10-15 tane resim veya yazı gönderecekse Drive daha yararlı oluyor ama şu anki projenin bu kısmında veya atıyorum bir önceki kısımda çok fazla görsel gibi artık gerek olmadığı için kendimiz çizip bir şeyler koyduğumuz için Drive gerek olmuyor mu? Dosya boyutu büyük şeyler olduğuna Drive'ı daha çok kullandık. Bir de görüntü kalitesi düşmesin diye | Drive |
| Sharing | Team 5 | Hızlı tarama yapıyorduk sonra beğendiklerimizi arkadaşlar şunun orijinali nedir? Drive'a yükleyelim şeklinde konuşuyorduk. Bir de Pafta hazırlarken özellikle Drive'ı kullanıyoruz. Çünkü görsellerin orijinal boyutu hepimizde bulunan çizimler, fotoğraflar onların taramaları bunların taramaları için Drive'ı kullanıyoruz. Paftayı da yine Drive'a yüklüyoruz. Çıktı almak için. Kritiklerdeki notları oradan paylaşıyoruz. | Drive |
| Sharing | Team 7 | Birbirimizle paylaşırken de yine internet üzerinden Drive üzerinden paylaşımlar yaptık çoğunlukla. Klasörler açıp konular için ayrı ayrı. | Drive |
| Sharing | Team 7 | Ama şeyde zor oluyordu. Diğer Literature Search'de ki posterleri hazırlarken herkes bulduğu fotoğrafları oraya atıyordu Drive. Evet, ama orada böyle hangisinin yeni olduğu hangisinin yeni geldiğini bulmak zor oluyordu. O klasöre bir fotoğraf yükleniyordu ama o an hangisinin en son yüklendiğini göremiyorduk. | Drive |
| Sharing | Team 7 | Pre-jury En çok kullandığım şey, bir şey çizip fotoğrafını çekip Drive'a atıp, Drive'den indirip, Illustrator'a atıp, Illustrator'da düzenleyip post haline getirmek. Bütün sürecim böyle geçti. Çok kullandım yani. Drive kullandım. | Drive |
| Sharing | Team 7 | Bir de çok ilk aşamada değil aslında bu yaptığımız. Biraz şey olacak mı bilmiyorum ama Instagram'dan da bazen değişik bir şey karşımıza çıktığında Instagram'dan da birbirimize fotoğraf paylaştığımız oluyor. Evet. Orada da bir grubumuz var. | Instagram |
| Sharing | Team 7 | Instagram : Orada grup konuşması yapabiliyorsunuz o zaman. Ben eski grubumla hala yapıyorum. Oradan konuşuyoruz. Bazen görselde atıyoruz. | Instagram |
| Sharing | Team 4 | Drive varken DropBox'ın çok işlevsel gelmiyor açıkçası. Çünkü bir şey de vardı. Bu yine Global Design Studio'da. İtalyanlar vardı bizim karşımızda. İtalyan birisi bana DropBox için atmıştı ama onun için indirmen gerekiyor bilgisayarı vs. Bir şeyler olmuştu. O yüzden ben bir şey oldum böyle indirmek zorundayım hepsinde. O yüzden bir hoş gelmiyor şu anda da bana. Çok aşırı kullanmadığımız için Drive hafızası dolmadıkça kullanılmaz bence DropBox. Eski telefonum da vardı. Direkt inmiş olarak geliyordu. O zaman çok az ben kullanırdım ama sanki çok şey değil gibi Drive çok kolay. | Dropbox |

I. Research Stage I ID 302 2018-19 Spring Project Calendar

METU Department of Industrial Design | 2018-2019 Spring Semester | ID 302 Industrial Design III

Sustainable design solutions for a flexible, adaptable cooking platform enabling healthy eating habits for shared kitchens in collaboration with Vestel

Project Calendar

| Week | TOPICS | MONDAY | THURSDAY |
|------|--|---|---|
| 1 | DESIGN RESEARCH / LITERATURE SEARCH What is this course about, how does it work and how is it evaluated? What is the project brief? How to collect data for the literature search? | 11 February | 14 ID 302 course syllabus Warm-up exercise |
| | | | Video presentation Distribution of project brief and calendar Set-up teams Literature search brief Teamwork on literature search |
| 2 | DESIGN RESEARCH/EC GUIDE What should we do in the field research and user observations via Experience Chart? How to conduct user interviews? | 18 | 21 PRESENTATION LITERATURE SEARCH |
| | | Crits on Literature search | Disassembly Workshop (for explaining product parts, working principles, and product breakdown reasons) The Experience Chart (EC) Guide Preparing research questions Conducting EC Guide |
| 3 | DESIGN RESEARCH/EC GUIDE IDEATION/BSA How to gain user insights? What are the product breakdown reasons? How to organize and present findings and insights via EC? | 25 | 28 PRESENTATION OF EXPERIENCE CHART POSTERS |
| | | EC guide - critiques | Design Workshop on Biomimicry Sketch Analysis (BSA) BIOMIMICRY PRESENTATION BSA-PART 1 |
| 4 | IDEATION/BSA How to generate creative design ideas? How to be inspired by nature via BSA? Here are our early ideas!! | 4 March | 7 Discussion of BSA part 1 outcomes Intro of BSA part 2 |
| | | Biomimicry - Field trip | BSA part 2 - Idea generation and sketching session BSA part 2 - wall crits on idea generation outcomes |
| 5 | IDEATION/DESIGN TRANSFORMATION Idea generation through team collaboration. | 11 | 14 Scenario building and Lo-Fi prototyping (developing diverse ideas for 3 practices for feedback) |
| | | Peer-review of BSA ideas Design Workshop on Design Transformation via Scenario building and Lo-Fi prototypes | Scenario building, Roleplaying and Body storming |
| 6 | DESIGN DEVELOPMENT/REFINING, COMPILING, and Lo-Fi PROTOTYPING This is the scenario we work with. This is how our idea is supposed to work and how it fits our scenario! | 18 | 21 Refining 1 compiled idea and developing lo-fi models |
| | | Refining and compiling ideas (one compiled idea for 3 practices) and developing lo-fi models | Scheduled design crits (on refined idea and models) |
| 7 | DESIGN DEVELOPMENT/REFINING, COMPILING, and Lo-Fi PROTOTYPING PRE-JURY | 25 | 28 PRE-JURY |
| | | Scheduled design crits (on refined idea and models) | Introduction of Refreshment Project |

| | | | |
|----|---|--|---|
| 8 | <i>REFRESH</i> The topic of project to be announced. | 1 April | 4 REFRESHMENT PROJECT |
| | | REFRESHMENT PROJECT | REFRESHMENT PROJECT |
| 9 | DESIGN DETAILING/USER INTERFACE/USER EXPERIENCE | 8 | 11 UI (user interface) / UX presentation Developing design solutions for UI |
| | | REFRESHMENT PROJECT JURY | UI & Adobe XD workshop Building the user interface |
| 10 | DESIGN DETAILING/CONCEPT PROTOTYPING | 15 | 18 Crits on toolkit Testing the design solution including UI (developing alternatives for product parts and user interface) |
| | | Introduction of Concept Prototyping for User Testing Preparation for testing the design solution including UI (developing alternatives for product parts and user interface) | Rehearsing the testing session |
| 11 | DESIGN DETAILING/2D-3D MODELLING | 22 | 25 Preparation for 3D modeling and technical details |
| | | VIDEO PRESENTATION Proof of concept prototype and testing the design concept Gaining insights and revising ideas | Scheduled Crits |
| 12 | DESIGN DETAILING/2D-3D MODELLING | 29 | 2 May Thematic Scheduled Crits |
| | | Scheduled Crits | |
| 13 | PRESENTING YOUR DESIGN/2D-3D MODELLING | 6 | 9 FINAL SCREENING presentation boards, technical drawings and model making |
| | | Scheduled Crits Preparation for 3D modeling and technical details - scheduling for 3D printing and other tools in the workshop | |
| 14 | PRESENTING YOUR DESIGN | 13 | 16 FINAL JURY |
| | | Revising presentation boards, technical. drawings and models | |

J. Research Stage II Interview Guide

Middle East Technical University (METU)
Faculty of Architecture Department of Industrial Design

THE ROLE OF ONLINE TOOLS FOR EMPOWERING TEAMWORK WITHIN THE CONTEXT OF DESIGN
EDUCATION AND DESIGN PROCESS

November 2019

This research is carried out within the scope of the doctoral thesis of İtir Güngör Boncukçu, who is a PhD student of METU Department of Industrial Design. The aim of this research is to review the opportunities and challenges for integrating online tools into design process to promote teamwork experience in design education in line with the characteristics and needs of new generations and developments of technologies. To develop an in-depth understanding of this research theme, I participated the design process, I have followed the work of the team regularly from the excel document, and conduct regular weekly meetings as you know.

You have completed the design process of your teamwork project. I would like to learn more about your experiences about how process went for you and how the tools and meetings contribute to your process and your suggestions about the how this process can be improved. Please explain your experiences and suggestions in detail and give specific examples in relation to topic.

Your responses will only be used in the design process, thesis study, scientific publications and presentations for scientific purposes, and your name will not be mentioned for any purpose in the final study. The interviews will be taken place with the all team members, which will last approximately an hour. To be able to recall and review the process later, interviews will be recorded and voice recorder will be used during the interviews. All the data received will be anonymous.

By signing this form, you will be agreed that, you understand the information provided to you about the research, and that you accept your participation in the interviews. Signing this form does not waive your legal rights; in addition, the researcher, the students, related persons and institutions remain legally and professionally liable. Participation in the study is on a volunteer basis. You may request explanation or information at the beginning or at any stage of the research process. You are free to withdraw from the study at any time, without giving any excuse. Thank you for your contribution to the study.

| Participant's Name | Date | Signature |
|--------------------|-------|-----------|
| | | |
| Researcher's Name | Date | Signature |
| | | |

* Before starting the interview, please check out the documents (first hand-out, print-screens of the excel document and project calendar) to remember.

Researcher's Contact Information
itirgb@metu.edu.tr
05383261962

Project Calendar

| Week | TOPICS | MONDAY | THURSDAY |
|------|--|--|---|
| 1 | DESIGN RESEARCH / LITERATURE SEARCH What is this course about, how does it work and how is it evaluated? What is the project brief? How to collect data for the literature search? | 23rd September | 26 Crits on Literature Search Taking portrait pictures |
| | | ID 301 course syllabus Intro to teamwork Warm-up exercise Distributing project brief and assignment | SEMINAR Conducting user research WORKSHOP Preparing user research |
| 2 | DESIGN RESEARCH What should we do in the field research and user observations? How to conduct user interviews? How to analyze our research findings? | 30 | 3 October PRESENTATION Presenting user research |
| | | PRESENTATION Literature Search Presentations | WORKSHOP (intro) Scenario building and idea generation |
| 3 | IDEATION & Participatory design What is a scenario and how do we use it? How do we identify design directions and generate creative design ideas? Here are our early ideas!! How to validate our initial designs? | 7 | 10 |
| | | WORKSHOP <u>Submission:</u> Scenario building and idea generation for two diverse themes Preparing for co-design workshop. | CO_DESIGN WORKSHOP in Nesibe Aydin Primary School |
| 4 | IDEATION/CONCEPTUALISATION How do we evaluate our idea's using the workshop outcomes? | 14 | 17 Scheduled crits Feedback on your project Building Lo-Fi prototypes |
| | | CO_DESIGN WORKSHOP in Merakli Kedi Primary School | |
| 5 | REFINING and Lo-Fi PROTOTYPING Refining your scenario and design solutions. What is a mock-up? How do we use it? | 21 | 24 Scheduled crits Feedback on your project and presentation |
| | | PRE JURY Presentation with full size mock-ups | |
| 6 | FINAL SCREENING: PRESENTING YOUR PROJECT This is the scenario we work with. This is how our idea is supposed to work and how it fits our scenario! | 28 | 31 FINAL FEEDBACK Final Evaluation in collaboration with Merakli Kedi Primary School |
| | | Holiday | FINAL FEEDBACK Final Evaluation in collaboration with Nesibe Aydin Primary School |
| 7 | FINAL JURY: PRESENTING YOUR PROJECT This is our final scenario and design solution! | 4 November | 7 |
| | | FINAL SCREENING Screening of design boards explaining design details Getting feedback on your project presentation and boards | FINAL JURY PROJECT 1 START OF PROJECT 2! |

Interview Guide

Review and Analysis of the Process

- Proje sürecini kısaca nasıl tanımlarsınız?
- **(First Hand-out)** Projenin başında size dağıtılan dokümandan nasıl yararlandınız? Süreç içinde bu bilgilendirme dosyasından başka bir kaynağa ihtiyaç duyduunuz mu? İçeriğinde neler olmasını beklerdiniz? Nasıl iyileştirilebilir?
- **(Excel-Task Management)** Excel dosyasının sürecinize nasıl katkısı oldu? Avantajları dezavantajları nelerdi?
 - o En çok kullanılan kısımlar nelerdi? Neden?
 - o Kullanılmayan kısımlar nelerdi? Neden? Nasıl iyileştirilebilir?
 - o Neler eklenebilir veya eklenmeli?
 - o Bu amaç için kullandığınız başka program veya araçlar var mı? Varsa, önerilen programı excel dosyasıyla karşılaştırır mısınız?
- **(Group Meeting)** Grup toplantılarınızın içeriğini nasıl belirliyordunuz? Toplantılarda iş bölümü yapılıyor muydu? Excel dosyasının toplantılarına ne gibi katkıları oluyordu? Excel dosyasını ne zaman dolduruyordunuz?
- **(Weekly Meeting)** Haftalık yaptığımız toplantıların içeriği, süresi ve sıklığı konusunda ne düşünüyorsunuz? Proje sürecine ne gibi katkıları oldu? Bu değerlendirme toplantılarına excel dosyasının ne gibi katkıları oldu?
- **(Leadership)** Süreç boyunca dönüşümlü liderlik yapma konusunda ne düşünüyorsunuz?
 - o Proje süreçlerini tekrar gözden geçirdiğinizde hangi süreçte kimin liderlik yapması daha uygun olurdu? Böyle bir değişiklik yapmak ister miydiniz?
 - o Hangi aşamada kimin lider olacağına nasıl karar verilmeli?
 - o Grup içinde en iyi liderlik kim yaptı? Neden? Diğer liderlerin artıları eksileri nelerdi?
 - o Liderlik sürecinde excel dosyasının kullanılması aşamalarında hangi lider daha etkindi? İş bölümü aşamalarını hangi lider daha etkin bir şekilde organize etti?
 - o İş bölümü yapma sürecinde excel dosyasından nasıl yararlandınız? Bu sürecinizi nasıl etkiledi? Buna yönelik önerileriniz neler?
- **(Other Online Tools)** Proje süreci boyunca grup iletişimi ve dosya paylaşımı / arşivlemesini nasıl yönettiniz? Excel kullanımı diğer toolların kullanımını etkiledi mi? Nasıl?
 - o Takım çalışma süresince iletişim ve arşivleme dışında çevrimiçi araçlardan nasıl yararlandınız? Nelere ihtiyaç duyduunuz? Bu konuda önerileriniz neler?

Evaluation and Suggestions

- Bu proje sürecinde takım çalışması yönetimiyle ilgili neler öğrendiniz? Bundan sonraki takım çalışmalarınızda neler kullanırsınız? Kullandığınız aracın takım çalışmalarına katkısı ne oldu? Tekrar kullanmak ister misiniz?
- Süreçle ilgili genel yorum ve önerileriniz var mı?

K. Research Stage II ID 301 2019-20 Fall Project Brief

METU Department of Industrial Design / Fall 2019-20 / ID 301 Industrial Design III

Assoc. Prof. Dr. Çağla Doğan, Asst. Prof. Dr. Senem Turhan, Inst. Aernout Kruithof, Res. Asst. Ayşe Kaplan, Res. Asst. Zeynep Yalman Yıldırım, Res. Asst. İtir Güngör Boncukçu

23 September 2019, Monday

Project 1

Healthy and Informed Eating: Engaging Sustainability Scenarios for Encouraging Children's Healthy Eating Behaviour in Collaboration with Meraklı Kedi ve Nesibe Aydın Primary Schools

Childhood is when people start developing long-lasting and sustainable behavioural patterns in both educational and family settings. Among these patterns, healthy eating is a fundamental behaviour to be fostered for physiological, social and personal development of children. In this project, we reconsider healthy eating as a process for making informed food choices with emphasis on reducing food waste as well as raising awareness on food to develop inspirational sustainability scenarios for encouraging children's healthy eating behaviour. In this project food refers to lunches and snacks that may include fruits, vegetables and meals and drinks, which can be consumed in the school environment.

Reducing food waste as one of the main goals of the project can be addressed by portioning, proper storage and transportation of food to keep it fresh, and exploring composting options for reducing and/or eliminating waste. As an interconnected goal, raising awareness can be supported by understanding the origin and sourcing of food through local consumption such as community and/or school gardens (e.g. observing and tracking the growth of plants and gaining biology and observation skills, and sense of responsibility). This can be also achieved through providing necessary nutrition and dietary information, eliminating and reducing related food packaging, and gaining insights from older generations on effective consumption of food.

The main way of enabling these sustainable design solutions will be through "engaging and participatory scenarios". Primary school children between 7 and 9 years old comprise the target group of this scenario-based design project.

Your sustainability scenario will demonstrate the following aspects:

Features of the scenario: That would include the stages of encouraging children's healthy eating in order to reduce food waste and raising awareness, setting the goal, identifying the context and actors involved, rethinking eating habits and demonstrating the overall impact of the sustainability scenario. The scenario can also take into consideration how the cycle of food consumption occurs for enabling behavioural change on healthy eating.

Within the scenario, design solution(s) may include products, services and/or systems addressing the problems or opportunities identified in the scenario.

The project will explore the following approaches for the design process:

- Enabling and engaging design: Developing design solutions which foster children's long-lasting healthy eating behaviour; reducing food waste and raising awareness on the issues identified in the brief.
- Participatory design: Incorporating target users and stakeholders into the early phases of the design process; co-developing ideas with the involvement of children and stakeholders.

- Scenario building: Developing an inspirational and locally relevant sustainability scenario focusing on children's healthy eating behaviour.
- Resource effectiveness: Developing design solutions which promote changes in user behavior and usage patterns in line with reducing food waste, eliminating unnecessary packaging and effective use of resources during the life cycle of food (e.g. growing plants vegetables, fruits, preparing, transporting, consuming, composting).

Grading

Literature search presentations (2.5%)

User research and analysis (2.5%)

Preliminary jury (12.5%)

Final jury (22.5%)

Sketchbook (7.5%)

Healthy and Informed Eating: Engaging Sustainability Scenarios for Encouraging Children's Healthy Eating Behaviour in Collaboration with Meraklı Kedi ve Nesibe Aydın Primary Schools

Project Calendar

| Week | TOPICS | MONDAY | THURSDAY |
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| 2 | DESIGN RESEARCH What should we do in the field research and user observations? How to conduct user interviews? How to analyze our research findings? | 30 | 3 October PRESENTATION Presenting user research |
| | | PRESENTATION Literature Search Presentations | WORKSHOP (intro) Scenario building and idea generation |
| 3 | IDEATION & Participatory design What is a scenario and how do we use it? How do we identify design directions and generate creative design ideas? Here are our early ideas!! How to validate our initial designs? | 7 | 10 Rehearsing for the workshop. |
| | | WORKSHOP <u>Submission</u> : Scenario building and idea generation for two diverse themes | CO_DESIGN WORKSHOP Location and time t.b.a. |
| 4 | IDEATION/CONCEPTUALISATION How do we evaluate our idea's using the workshop outcomes? | 14 | 17 Scheduled crits Feedback on your project Building Lo-Fi prototypes |
| | | CO_DESIGN WORKSHOP Location and time t.b.a. | |
| 5 | REFINING and Lo-Fi PROTOTYPING Refining your scenario and design solutions. What is a mock-up? How do we use it? | 21 | 24 Scheduled crits Feedback on your project and presentation |
| | | PRE JURY Presentation with full size mock-ups | |
| 6 | FINAL SCREENING: PRESENTING YOUR PROJECT This is the scenario we work with. This is how our idea is supposed to work and how it fits our scenario! | 28 | 31 FINAL FEEDBACK Final Evaluation in corp. with Meraklı Kedi Primary Schools |
| | | FINAL FEEDBACK Final Evaluation in corp. with Nesibe Aydın Primary Schools | Scheduled crits Feedback on your project and presentation |
| 7 | FINAL JURY: PRESENTING YOUR PROJECT This is our final scenario and design solution! | 4 November | 7 FINAL JURY PROJECT 1 |
| | | FINAL SCREENING Screening of design boards explaining design details Getting feedback on your project presentation and boards | START OF PROJECT 2! |

L. Research Stage II Interview Analysis / Sample Sheet

In this analysis table, the results of the interviews made in the second stage of the research are categorized in terms of the themes. In the table below, the statements of the students on **First Day Presentation** are combined and matched with the sub-themes.

| Theme | Sub-theme | Statements | Problem Areas Properties Examples | Insights | Team No |
|------------------------|-------------------------|--|---|--|---------|
| First day presentation | Hand-out general review | <ul style="list-style-type: none"> -Evet. Ya Excel için bayağı yararı olmuştu bence hani. Nasıl kullanacağımızı birazcık daha açıklaması çünkü hani Excel'e çok familiar değiliz aslında yani hiç bilirmiz. -Evet, çok kullanmadığımız bir şey. -Aynen.. O yüzden hani o anlamda nasıl kullanacağız, nasıl böleceğiz, o konuda iyiydi. -Babamne gibiydik biz Excel kullanırken. -Bence buna baktık ya, en son işte şey. İlk defa böyle bir çalışma yaptığımız için "Ne yapacağımız şimdiki?" deyip. Hani buna baktık ve şey hani bir daha size sorma ihtiyacı da hissetmedik. "Hocam böyle mi yapacağız, ne yapacağız şimdiki?" falan gibi. -Güzel. -Zaten okuyunca dedik: "Şöyle olacak, böyle olacak. | <p>Hand-out and presentation helped us how to use excel document. We are not very familiar with the excel, we had difficulties while using.</p> <p>We read the document as it was our first time and it was quite understandable.</p> | <p>Excel was chosen considering that it is a program that everyone knows about. There were those who had difficulties in using it because it was not a very frequently used program in our department.</p> | Team 3 |
| First day presentation | Hand-out general review | <ul style="list-style-type: none"> - Çok güzel. Ben görev dağılımı yapmayı severim diye düşündüğümü hatırlıyorum. Sonra bir daha görmedim. - Ekstra anlaşılmasını çok bir durum yoktu o zaman. - Yani anlaşılmadığı kısımda zaten haftalık.. - Toplantı yapmıştık. - 1-2 haftada bir toplantı yapmıştık. Toplantıda siz de açıklıyordunuz ama genel olarak takip etmesi ve işte diğer arkadaşlarımız liderler takip etmesi rahatı ama bazen işte yoğunluktan dolayı mesela işte insan unutabiliyordu, geç geç kalabiliyordu. O anda hani hemen "Tamam, bu iş bitti işi hallettim." gibisinden bazen o senaryo işlemebiliyor. | <p>I like to distribute the tasks. I did not see it again after the first day.</p> <p>You were also explaining at the meeting, but it was comfortable to follow in general.</p> | <p>Weekly meetings also helped students to get expectations and give opportunity to them to ask a question when they have.</p> | Team 4 |
| First day presentation | Hand-out general review | <ul style="list-style-type: none"> (handout) - O sırada incelediğimi hatırlıyorum. Ondan sonra bence incelemedik. - Ben de bir daha incelemedim. Sunumu hatırlıyorum yani sadece. | <p>I examined it the first day, but didn't look later.</p> | <p>it is not a permanent document. He was only a guide during the presentation first day.</p> | Team 5 |
| First day presentation | Hand-out general review | <ul style="list-style-type: none"> - Bence yaparken öğrendik o Excel tablosunu falan. Bazı yerde hem o liderin ne yapacağını falan daha çok süreçte öğrendiğimizi düşünüyorum yani. - Hatta ilk hafta bendim. O kadar etkili iş yapamamıştık. O kadar önemli olduğunu düşünmemiştik. | <p>We learned how to fill the excel file and what the leader should do, while doing</p> | <p>Since they had no previous experience, certain things become clear in the process.</p> | Team 5 |
| First day presentation | Hand-out general review | <ul style="list-style-type: none"> - İlk haftada önemini kavayamadığımız için çok yapmamıştık. - Haftalık olarak sizin bizimle konuşacağınızı falan çok şey yapmamıştık. - Oturup toplu doldurduk hatta, yani birkaç gün geçti. | <p>We did not fully understand its importance in the first week. We didn't know that we would talk to you every week.</p> | <p>More detailed information about the process should be provided or not collectively, team by team</p> | Team 5 |
| First day presentation | Hand-out general review | <ul style="list-style-type: none"> Karışıcı ama biraz bence havada kalmış olabilir. Lider dediğimiz kişi tam olarak ne olacak? Ne olacak? Hani böyle bu kadar önemli mi görevi? Onu böyle çok anlayamamış olabiliriz sadece. | <p>We did not fully understand what the leader should do?</p> | <p>More detailed explanation is needed especially for telling the expectations, tasks, leadership.</p> | Team 5 |
| First day presentation | Hand-out general review | <ul style="list-style-type: none"> - Bence bu Excel dosyasının amacı ve kullanım şeyi daha detaylı olabilirdi. - Hafta hafta hepimizin lideri, onu en başından beri biliyorduk, evet. Bugün hani benden sonra birinin lider olacağını... | <p>The aim of the excel file and how to use it can be explained in more detailed.</p> | | Team 5 |

| | | | | |
|------------------------|-------------------------|--|--|--------|
| First day presentation | Hand-out general review | Bir de ben iki şey düşündüğümü hatırlıyorum. Acaba buraya yazacağım şeyler işte zaten bize brief'te verilen şeyler mi? Bugüne bu ödev var, bugüne bu ödev. Ben onu zannetmişim ilk mesele. - Bir de şeyi çok ayıramadım ben ilk başta. Bu da hani ödevin bir parçası gibi görmüştüm. Sanki hani bu bir yöntem ve bunu bütün farklı grup ödevlerinde uygulayabileceğim bir şey gibi değil de sanki çok böyle projenin aynen projesine özel bir şey zannettim. O yüzden de bu şeyi. Excel dosyası bir yöntem gözüyle bakmadım. -Başta çok yeni bir şey olduğu için böyle bir şey anlamakta zorlandık hani kim neye ne yazıyor, işte sonrası bana nasıl geçiyor? -Ondan biraz kafamız karıştı. Benim karıştı ama sonra dağıttığınız şey çok güzel anlatıyordu yani bence. -Sizin stüdyo ekibine dahil olmadığınızı 3. hafta falan öğrendik. Sonra bu Excel mecel muhabbetlerini zaten liderlik bana geçtiği zaman öğrendim. Onun dışında bir kere gruba bir şey attım, bir şey söyledim. Lider miydim hatırlamıyorum. Çağın da şey dedi: "Grup dağılımlarını Excel'den, işte ödev paylaşımlarını da Drive'a yükleyerek yaparsak daha güzel olur." dedi. • Baştan o zaman bir anlaşılmadı herhalde ne yapacağınız tam. • Evet. Ya bir de şey hani. Ben bunu stüdyo için yapıyoruz falan zannetmişim. Bu hani team çalışmasını grup çalışmasını daha verimli hale getirmek için ayrı bir şey olduğunu bilmiyordum ama bayağı başarılı bir süreç sağladı bize yani. Güzel oldu yani. | It was not clear what to write the excel document? | Team 5 |
| First day presentation | Hand-out general review | | I thought this was something specific to the project. not thought this is a method and I can apply this in all different team assignments. | Team 5 |
| First day presentation | Hand-out general review | | Even though we were confused while you were presenting, hand-out was very descriptive. | Team 6 |
| First day presentation | Hand-out general review | | I learned how to use the excel document when I became a leader. | Team 6 |
| First day presentation | Hand-out general review | | I thought we were doing this for the studio. I didn't know that this is a separate thing to make our teamwork more efficient, but it provided us with a very successful process. | Team 6 |
| First day presentation | Hand-out general review | Herkesin 1 hafta, 2 hafta lider olduğuna dair... -Biraz ufak kalmış gibi sanki. Şunun gibi bir detay yani bu mesele bir şeyin detayı gibi. Asıl mesele bu sanki biraz da ama onların içindeki yapılacak şeyler gibi eşit kalmıştı. | leadership process should be explained in more detail in hand-out | Team 6 |
| First day presentation | Hand-out general review | • Bir de hocam belki yazılabılır olabilir bunlar. Kendimiz isimlerimizi yazınız karıştırmamak adına başlangıçta... | maybe hand-out can be written. We can write our names at the beginning so as not to confuse ... | Team 6 |
| First day presentation | Hand-out general review | -lik başta evet, sonrasında unuttuk gibi bir şey oldu aslında. -lik genel olarak böyle "Ne olabilir?" tarzında bakmışlık. "Böyle yapalım, şöyle yapalım," diye konuşmuştuğ WhatsApp'tan. • Hocam bence ilk gün böyle bir sürü brief verildi; anlatıldı ya. İlk gün gerçekten... • Evet. Bu şey olarak iyi oldu bence hani. Excel dosyasında ne yapmamız bekleniyor dosyası olarak açıklayıcı oldu ama ben daha sonra açıp bakmadım. Bakttım, anladım böyleymiş diye ama çok detaylı bir okuma yapmadım. | Can it be permanent? informative but not permanent for the first day. does it have to be? So it is not needed? | Team 7 |
| First day presentation | Hand-out general review | | On the first day, many such briefs were given, told. The first day really may not be the right time for this. | Team 7 |

| | | | | |
|------------------------|-------------------------|--|---|---------|
| First day presentation | Hand-out general review | <ul style="list-style-type: none"> Bunun ne kadar önemli olduğu belki vurgulanabilirdi. Evet. Ne anlamda önemli? Aslında işi baya görmeyi kolaylaştırdığı. Yani daha mesela ilk haftalarda ilk liderden mesela daha ayrıntılı yapılabilir. Yapılması daha iyi olabilir gibi. Biz daha sonra anladık mesela bence bunun kıymetini gibi geliyor bana. Önemli biretik daha belirtmeli. | Its importance should be mentioned more. We later realized, for example, I think the value of it. | Team 7 |
| First day presentation | Hand-out general review | <ul style="list-style-type: none"> Hiç değilse mesela ikinci bir hatırlatma olsaydı. "Bu hafta yapacağınız. Unutmayın." tarzında. Orada "Tamamı." diyebilirlik çünkü cidden aklımızdan çıkmış daha önce böyle bir şey yapmadığımız için Ben aslında şöyle bir yorum yapabilirim. Bence bu anlatılırken, ilk anlatıldığında gerçekten güzel anlatıldı ama diğer şeylerle çok karıştırdığı için muhtemelen biz bunu ilk başta anlamadık. Her şey peş peşe proje brief'iyle beraber anlatılınca karıştı. Aynen. Hani burada bizden beklenenin bu olduğunu çok net anlamadım ben mesela o anda. Hani böyle bir Excel tablosu dokümanla edelim falan gibi. Sonra sizinle tekrar bulduğumuzda daha net oturmuştu yani. Bunu bu yüzden kullanmamız gerek iyi olacak proses için de. Belki Perşembe günü yapılan toplantıyı pazartesi yapma imkanı oluşturmış... O daha iyi olurdu. | We forgot because we haven't done it before. It could be a second reminder. It was described really well when it was first told, but we probably didn't understand it at first because it mixed with other things. | Team 7 |
| First day presentation | Hand-out general review | <ul style="list-style-type: none"> Teoride aslında bunları biz yaptık ama buradan yapmadık hiçbirini pratikte işte. İlk günkü konuşmalarımız kimin hangi gün dersleri var. Zaten hep bunları aslında ama buraya aktarmadık. İşte için görürüğü çok kritik bir nokta. Zaten bütün problemlerin çıkış noktasının ben bu olarak gözlemlediğim için Ben o kısmı sevmişim. Şu kısım açıklayıcı olmuştu diyorsun. Evet bu kısım açıklayıcı olmuştu. Yani şu da. Mesela ne yaptığımızı takip etmek açısından. Hocam şu kısımda biz bir sorun yaşamıştık. Hatta yanlış yapmıştık. Başta anlamamıştık. | In the first meeting we held with you, everything was settled more clearly. | Team 7 |
| First day presentation | Hand-out general review | <ul style="list-style-type: none"> Excel'in biraz daha açıklayıcı olması o zaman önemli olabilir. Hani kim nereyi nasıl dolduracak kısmı. Yani hocam bunlar örnek falan diye parantezle belirtilsin falan. | Being able to hold a meeting on the first day would have been beneficial for the comprehensibility of the process. | Team 7 |
| First day presentation | hand-out general review | <ul style="list-style-type: none"> Ben o kısmı sevmişim. Şu kısım açıklayıcı olmuştu diyorsun. Evet bu kısım açıklayıcı olmuştu. Yani şu da. Mesela ne yaptığımızı takip etmek açısından. Hocam şu kısımda biz bir sorun yaşamıştık. Hatta yanlış yapmıştık. Başta anlamamıştık. | Although we interviewed who had lessons on which day on the first day, we did not make it visible. it was vey explanatory. some parts did not fully understand. | Team 8 |
| First day presentation | hand-out general review | <ul style="list-style-type: none"> Excel'in biraz daha açıklayıcı olması o zaman önemli olabilir. Hani kim nereyi nasıl dolduracak kısmı. Yani hocam bunlar örnek falan diye parantezle belirtilsin falan. | who will fill in where and how can be explained in more detail. | Team 8 |
| First day presentation | hand-out general review | Dönüp de bakmadık. | we did not look back | Team 10 |
| First day presentation | Hand-out leadership | <ul style="list-style-type: none"> Senin için kafa karıştırıcı olan şey oldu o zaman. Her liderin ayrı bir sayfası olacağını anlamadın. O sayfa hepimizin kullanacağını düşünün. Evet. Şu ayırım şey yaptı beni. Hani bu benim için, bu diğer lider için... | I didn't realize that each leader had a separate page, so I was undecided on where to fill in. confusing part : each leader has her own page | Team 1 |

| | | | | | |
|------------------------|------------------------------|---|---|--|---------|
| First day presentation | Hand-out leadership | (Ben şey hatırlıyorum sizin grupta. İlk hafta tanışmamıştı da sanki. Lider seçilmemişti, Excel dolduramamıştı.) Sorumluluğu kimse almamıştı. Yoksa hani aslında durumu anlarmıştık | First leader was selected late due to avoiding responsibility. | resistance to this different teamwork model. | Team 2 |
| First day presentation | Hand-out leadership | Anladık ama yapmadık | they understood what was expected, but they didn't. | Although everything is clear for them, they know that they should select the first leader, they prone to reject this process, resistance to this different teamwork model. | Team 2 |
| First day presentation | Hand-out leadership | Kimse çok sorumluluk istemiyordu belki de o yüzden. | avoiding the responsibility | (ilk gün pazaritesi grup üyelerinden biri beraber lideri karar verildi.) Since one of the team member was not on Monday, the leader was decided together at our first meeting on Thursday. | Team 2 |
| First day presentation | Hand-out leadership | -Çünkü süreç içinde zaten çok fazla diğer liderlerle konuştuğumuz için aslında ilk liderle daha az iletişime geçmiş gibi oldum belki de bilmiyorum nasıl hissettim de. -Bir güde line belki daha iyi olurdu şu anda düşünmek olursam, geçmişe dönüp bakacak olursam. Olsa daha iyi olurdu. | especially a guideline for the first leader. | | Team 7 |
| First day presentation | hand-out leadership | . Whatsapp üzerinde lider ne yapması gerekiyordu. . Konuştuğum işte ne yapıyor sun diye. Lider ne yapması gerekiyordu? Onları şey yaptık. Konuşma üzerinden işte ??? . O zaman Whatsapp üzerinden bu durumu değeriendiririz. Lider ne yapacak, kim lider olacak diye. | We talked about what the leader should do on whatsapp | While there are opportunities face to face, determining a leader and the tasks of the leader were discussed over Whatsapp. | Team 10 |
| First day presentation | hand-out leadership | . Yani şey mesela bu Handout'ta belki gerçekten böyle bir şey belirlebiliriz. Biz de ona göre liderliği belli ediyorduk. Birinci haftaki liderden böyle böyle şeyler bekleniyor, böyle böyle özellikler beklenir. İşte ikinciden böyle şeyler beklenir. | It could be explained in the hand-out that such things are expected from the leader of the first week, such characteristics are expected. Such things are expected of the second. | Explaining the expectations from the leader in different periods would allow students to choose the leadership accordingly. | Team 10 |
| First day presentation | Sample Google Sheet document | Ama zaten yani hani Excel dosyasının örneğini açınca o da gayet anlaşlırdı yani. Çok açıklayıcıydı. | the sample excel file was pretty understandable | sample excel file helped to understand expectations | Team 3 |
| First day presentation | Sample Google Sheet document | - Excel dosyası çok açıklayıcıydı bence. - Açıklayıcı. - Evet. Orada Excel dosyasına bakınca neyi nasıl yapabileceğimizi şey yaptık daha çok. | We understood better what and how to do it after looking at the sample excel file. | sample excel file helped to understand expectations from the process | Team 4 |
| First day presentation | Sample Google Sheet document | -O çok daha nasıl tasarımlar oluşturduğumuz konusunda iyi olmuştu. İşte zaten şey kısmı birazcık şeydi. Görevi "tamamlanmış" olarak işaretlemek hiç aklıma gelmiyordu. Assign ediyordum ama hani "tamamlanmış" olarak işaretlemek benim hiç aklıma gelmedi. | excel file helped us how to define the tasks | | Team 4 |
| First day presentation | Sample Google Sheet document | - Özellikle şey güzeldi. Ben onu sevdim. İlk bir hafta vardı sanırım. Once siz bir örnekler koymuşsunuz. Dedim; "Ah çok tatlı. hepimizin liderlik sürece böyle olacak." - Böyle yapacağı belli. - Bana geldiğinde tek bir dolu satır yoktu. Bomboş. Ama örnek olması güzeldi çünkü ilk başta kimse bunu nasıl kullanacağını bilmiyordu. | There were sample tasks in the first week, but not in the following weeks. I thought it would happen. | The first week's tasks were done just to set an example of how to write tasks and to illustrate how I expected them to use excel. | Team 5 |

M. Research Stage III.I Teamwork and Online Tools Survey

**2020-21 Fall Semester
3th Grade (Teamwork and Online Tools Survey)**

Qs for 3th years:

Dear Students,

Your experiences and reflections on COVID-19 distance learning are really valuable for improving the learning experience and planning the studios.

This research is carried out within the scope of the doctoral thesis of İtir Güngör Boncukçu, who is a PhD student of METU Department of Industrial Design. The research aims to discover the practices and opinions of industrial design students related to teamwork and the use of online tools.

*confidentiality note:

You are free to withdraw from this survey process at any time. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification if you need.

Your responses will only be used in the design process, thesis study, scientific publications and presentations for scientific purposes, and your name will not be mentioned for any purpose in the final study.

P.S. You can fill in Turkish or English. Feel free!

Distance education and Teamwork Process:

1. Could you please share your experiences on the teamwork project, considering the use of online tools and other tools if applicable?
 - a. collaboration among the team members & leadership & interaction and communication with the teammates
 - b. division of labour & time management & task description and workload for the assignments
 - c. design critiques sessions & presentations and feedback such as preliminary and final juries
 - d. suggestions for improving the design process for team projects via online platforms and tools

Comparison of teamwork experiences

1. Please indicate your previous teamwork projects in terms of project title, term and its duration.
2. How would you evaluate your previous teamwork experiences compared to the teamwork process of this project? What were the pros and cons?
3. What did you learn about teamwork management during this project? How would you use it in your next teamwork?

General comments and suggestions

1. Please provide your further comments and suggestions about the teamwork.

Healthy and Informed Eating: Engaging Sustainability Scenarios for Encouraging Children's Healthy Eating Behaviour in Collaboration with Meraklı Kedi ve Nesibe Aydın Primary Schools

Project Calendar

| Week | TOPICS | MONDAY | THURSDAY |
|------|--|--|--|
| 1 | DESIGN RESEARCH / LITERATURE SEARCH What is this course about, how does it work and how is it evaluated? What is the project brief? How to collect data for the literature search? | 23rd September | 26 Crits on Literature Search Taking portrait pictures |
| | | ID 301 course syllabus Intro to teamwork Warm-up exercise Distributing project brief and assignment | SEMINAR Conducting user research WORKSHOP Preparing user research |
| 2 | DESIGN RESEARCH What should we do in the field research and user observations? How to conduct user interviews? How to analyze our research findings? | 30 | 3 October PRESENTATION Presenting user research |
| | | PRESENTATION Literature Search Presentations | WORKSHOP (intro) Scenario building and idea generation |
| 3 | IDEATION & Participatory design What is a scenario and how do we use it? How do we identify design directions and generate creative design ideas? Here are our early ideas!! How to validate our initial designs? | 7 | 10 Rehearsing for the workshop. |
| | | WORKSHOP <u>Submission</u> : Scenario building and idea generation for two diverse themes | CO_DESIGN WORKSHOP Location and time t.b.a. |
| 4 | IDEATION/CONCEPTUALISATION How do we evaluate our idea's using the workshop outcomes? | 14 | 17 Scheduled crits Feedback on your project Building Lo-Fi prototypes |
| | | CO_DESIGN WORKSHOP Location and time t.b.a. | |
| 5 | REFINING and Lo-Fi PROTOTYPING Refining your scenario and design solutions. What is a mock-up? How do we use it? | 21 | 24 Scheduled crits Feedback on your project and presentation |
| | | PRE JURY Presentation with full size mock-ups | |
| 6 | FINAL SCREENING: PRESENTING YOUR PROJECT This is the scenario we work with. This is how our idea is supposed to work and how it fits our scenario! | 28 | 31 FINAL FEEDBACK Final Evaluation in corp. with Meraklı Kedi Primary Schools |
| | | FINAL FEEDBACK Final Evaluation in corp. with Nesibe Aydın Primary Schools | Scheduled crits Feedback on your project and presentation |
| 7 | FINAL JURY: PRESENTING YOUR PROJECT This is our final scenario and design solution! | 4 November | 7 FINAL JURY PROJECT 1 |
| | | FINAL SCREENING Screening of design boards explaining design details Getting feedback on your project presentation and boards | START OF PROJECT 2! |

N. Research Stage III.I Teamwork and Online Tools Survey Answers

In this table below, the first question answers of the survey conducted in the third stage of the research are combined and matched with the insights.

| | Theme I | Insights |
|----------------|---|--|
| | collaboration among the team members & leadership & interaction and communication with the teammates through considering the use of online tools | |
| Participant 1 | Teammates are more understanding to each other. And it is easy to arrange netting time proper for everyone because of the lock down. | Lock down provides teams to arrange meeting dates easily |
| Participant 2 | şu anki grubumuzda belğin bir lider yok. birbirimiz aramızdaki iletişim gayet iyi, anlayışlıyız ve birbirimizi dinliyoruz. projeye başladıkta birkaç hafta sonra ben covid oldum ve ekip arkadaşlarım hem bana moral verdi hem de iş paylaşımı konusunda gerçekten çok yardımcı oldular bana. çok ısrar etmeme rağmen siz iş verdiler bana hasta olduğum için. Birbirimizin açığını kapatabildik ve güzel fikirler üretebildiğimiz düşünüyorum. aramızdaki iletişimi discord ve whatsapptan konuşarak sağlıyoruz. bazen figma ve miroda da comment ekleyerek ya da arkadaşımızın olduğu yere yeni post-it açarak sorularımızı vs soruyoruz. | good team relations, a sharing and supportive team environment Discord and whatsapp |
| Participant 3 | Buluşma saatlerimizi whatsapp üzerinden belirleyip discordda sesli arama şeklinde çalışmaya başlıyoruz. Bir kişiye genelde bu buluşmalar için öncül olmasn gerekiyor, herkes bu konuda eşit efor sarf etmiyor. Grup içinde lider belirlemenin gibi bir durum söz konusu olmasa da bir kişi ister istemez bu rolü üstlenmek zorunda kalıyor. Senkron çalışmadığımız vakitlerde Miro/Figma gibi yerlerde birbirimize yorum bırakarak da beraber çalıştığımız anlar oluyor. | lack of leaders - leads to shortcomings in organizing the meeting day. |
| Participant 4 | Relationship between team members is good. There is no leadership, everybody manages the project and share their ideas equally. Sometimes contradictions happened but it was a natural process | |
| Participant 5 | I think we have been communicating with each other quite well. We can have fun while working on the project. Also, we all aware of our responsibilities so we did not have any problem till now. | responsible team members |
| Participant 6 | Online platformda iş bölümü yapmak çok zordu. İletişimin en büyük sıkıntısı mesaj ya da arama yoluyla iletişim kurmakt. Ancak uluslararası bir öğrenci ile grup olduğumuz süreçte arama ile ulaşamıyor, bir iş için ertesi gün WhatsApp'ı kullanıyor, bu yüzden süreç çok aksıyordu. Ayrıca grup içerisinde bir tartışma ve problem olduğunda yüz yüze olduğu gibi görülmeye gidilmekte ya daha da aksiyonlar ya da kestirip atılıyor. İş bölümü yan yanayken takip edilebilir olduğu halde online dönemde 4 dersin de grup görevi yapmak, üzerine ders saati de eklendi her akşamın başka bir buluşma, hafta sonlarının 3-4 grupla planlanması şeklinde çok yorucu bir düzende ilerledi. | Teams that have problems in communication within the team have difficulty in dividing the work, following the process and being organized. |
| Participant 7 | Normalde yüz yüze buluşmalarımızda grup arkadaşlarımızın konuya katılımı zorunlu olurken şimdi kendimizi "mute" alma sansimiz olduğu için bir grup arkadaşımız buluşmalarda 1-2 saat mute modda kalıp tartışmaya katılmıyabiliyor bu da bizi olumsuz etkiliyor. Genelde olarak iletişiminiz online dönemde daha da azaldı aktivizadakinin normalde elimizde çizerek gösterebilirken şimdi çizip çekip atmanız demek bu ve usenme durumunu yasunabiliyo | online platforms reduce interaction and cause some group members to not contribute enough. it can be difficult to deal with online platforms visually. What they normally describe by drawing, they now have to draw, photograph and share. |
| Participant 8 | Bence Online Eğitimin bariz bir şekilde iletişim zorluğu yok idi, online araçlar son derece elverişli. İnternet kesintisi olmadığı sürece herhangi bir güçlük çekmedim. | |
| Participant 9 | Communication was not hard but can be hard to create friendships because the only way to communicate is through zoom | |
| Participant 10 | Online platformlar üzerinden özellikle yakından tanınmadığımız insanlarla iletişim kurmak ve derdimizi anlatmak oldukça zor. Normalde birbirimizin yanındayken çizerek ve ya başka bir şekilde gösterip anlatabileceğimiz şeyleri online platformlarda birbirimize anlatmakta güçlük çekiyoruz. Çünkü derdimizi sadece konuşarak anlatmaya çalışıyoruz bu da yeterli olmuyor. | it can be difficult to deal with online platforms visually. What they normally describe by drawing, they now have to draw, take a photograph and share. |
| Participant 11 | Final projesinde 3 kişilik grubumuzda herhangi bir iletişim ve uyum sorunu yaşamadık. Grup olarak birbirimize uyumlu çalışarak bir ekip olduk. Proje için UI/UX üzerine olması da çalışma sürecini kolaylaştırdı bence. Tüm draftlarımız, çalışmalarımız online programlar üzerinde zaten. Biz süreç içerisinde çalışmamızı genelde şöyle planladık; öncelikle bir sonraki kritiğe kadar yapılması gerekenler madde madde sıralandı sonrasında görevleri öze böldük. Herkes bireysel çalışıyor fakin çalışma saatlerimizde zoom veya discord üzerinde buluşarak arka planda birbirimizle sohbet ederek tamamladık çalışmalarımızı. Dosyalarımızı ve notlarımızı birbirimizle paylaşmak için google drive, ortak çalışma için de miro board ve figmayı tercih ettik. Aynı anda hem bireysel çalışıyor hem de senkronize bir şekilde birbirimizi takip edebiliyorduk. | Even though they work individually after a good division of labor, they complete their tasks at the same time by being aware of each other via the online platform. a very effective method, a good division of labor saves time, and being able to work at the same time and be aware of each other opens up a process follow-up. |
| Participant 12 | Our collaboration between our teammates was good, but some of our friend had major problems. I think doing group work online is much harder than physical | online teamwork is much harder |
| Participant 13 | Ben bu dönem inanılmaz problem yaşadığım iki grup projesi yürütmek durumunda kaldım. Online dönemde olduğumuz, iki grup arkadaşım da yurtdışında yaşadığı için arayarak onlara ulaşamıyordum. Mesajlara günler sonra ya da saatler sonra geri dönüş aldığımız, işleminin inanılmaz aksadığı durumlar oluyordu. Ortak saatleri o zaman dilimine göre organize etmeye çalışıyorduk. Ekip içerisinde işlerin birinin liderliğinde gerçekleştirilmesi durumu rahatlatılabilen oluşan fikir ayrılıkları uzak mesafede bizi çıkmaza sokuyordu. Uzun süre haber alınmadığında deadline yaklaştığı için o grup üyesinin kısmını biz yapıyorduk, bu yüzden hem daha çok çalışıyor hem de sonra bana neden boş yere iş yaptırıyorsunuz gibi ödev sabahı bir tartışma oluyordu. | Online education allowed students to be in different cities or even in different countries. This caused disruptions in team communication. Internet problems, different time zones, personal and physical problems, etc. affected team interaction. |
| Participant 14 | Online toolar ile sketebok tutmak zor oluyor. Tabletini yok, doğal olarak bi şeyi çizip göstermek yerine yapip gösteriyordum. Dönem sonu sketchbook una çok fazla fikirlerimi koyamadım doğal olarak. Grup çalışmaları çok vakit yiyor. Sabahın buluşup akşama kadar konuşupunuzu biliyorum. Anlaşmak açısından sıkıntı, ortak zaman açısından sıkıntı. Genelde geceleri çalışıyoruz derslerimiz olmadığı için, ders yitken çok yoğun her derste. İletişim çok farklı değil, sadece daha çok vakit alıyor. Yorucu bir dönemdi | Having different classes and curfews led students to work in the evening for teamwork. this was a psychologically exhausting process for the students. |
| Participant 15 | Grubunda denk gelen arkadaşlarımla iş bölümünü ve ortak çalışmayı çok iyi sağladık bu benim için çok büyük bir şans. Online olarak sürekli zoomda bunlarla buluşmak ve birbirimize bir şeyleri açıklamak çok zordu. İnternet sıkıntılarımız bazen çok büyük oluyordu ve birbirimizi anlamakta ve iletişim kurmakta çok zorluk çekiyorduk. Her ne kadar grup arkadaşlarımızdan memnun olsam da bireysel çalışmanın bu dönemde daha sağlıklı ilerleyeceğini düşünüyordum. | constantly trying to communicate on the online platform was difficult and tiring for the students. An internet problems caused disruptions in this communication. |
| Participant 16 | Online olarak kullandığımız araçlar birlikte aynı anda çalışmamıza çok yarar sağladı. | |
| Participant 17 | Grup projelerinde herkesin derse/proje ve verdiği önceliğin benzer sıralamalarda oluşu grup içi iletişimin en önemli faktörlerinden oluyor. Kura ile seçilen grubumuzdaki herkesin elinden geleni yapmak için çabaları olmuş, detaylara verdiği önemin fazlalığı işimizi kolaylaştırdı ve içimizi rahatlatı. İletişiminizi güçlü tutmamıza rağmen gün içinde de online platformlarda derse girdiğimizden, ders sonrası hala buluşuyoruz başından kalkamamakta ilgili sıkıntılar sebebiyle iş bölümü yapip bireysel çalışmayı seçiyorduk. Oysa beraberken ortaya çıkan bir fikir güzel başka bir fikre sebebiyet verebiliyordu. | Due to the tiredness of being on the online platform all the time, the students divided the work and turned to individual work, although they thought that this was less effective. |
| Participant 18 | I think it was easier to arrange a meeting through online platforms since it requires less activity such as going to the meeting place. Other than that, I think the project being based on an interface design helped a lot since working collaboratively was easier in Figma in contrast to working in Fusion 360 etc. | |
| Participant 19 | i personally did not have much problem about communicating or collaborating with my teammates, but it was sometimes an issue that we could not manage our time due to the variety of other electives we are taking | |

O. Research Stage III.I ID 301 2020-21 Fall Project Brief

Middle East Technical University Faculty of Architecture Department of Industrial Design
Fall 2020-21 – ID 301 Industrial Design III

Assoc. Prof. Dr. Çağla Doğan, Asst. Prof. Dr. Senem Turhan, Inst. Aernout Kruithof, Inst. Dr. Mehtap Öztürk Şengül,
Res. Asst. Koray Canlar, Res. Asst. Ayşe Kaplan, Res. Asst. Zeynep Yalman Yıldırım, Res. Asst. İtir Güngör Boncukçu

10 December 2020, Thursday

Project 2

Passing On Skills and Experiences through Learning and Sharing: Sustainability Scenarios for Encouraging Children's Engagement in Online Courses

Childhood is when people start developing long-lasting and sustainable behavioural patterns in both educational and family settings. Among these patterns, **sharing skills, knowledge and experiences** are fundamental behaviours to be fostered for social, cognitive, intellectual and emotional development of children. **Learning and sharing** appear to be challenging particularly for primary school children who have to get involved in online education and related courses considering the conditions of our times. The priority of formal education is changing towards online courses. Furthermore, social, visual, and physical activities such as painting, dancing, acting, instrument playing and physical fitness in fact enhance children's creativity and increase their attention span. The courses that include these types of activities encourage children's interaction and communication among their peers, with their parents and teachers. The primary school children between 7 to 11 years old comprise the target group of this **scenario-based user experience design project**.

In this project, we reconsider **learning and sharing** as a process for **passing on skills, knowledge and experiences for generational bonding** (e.g. among children, between children and parents, between children and teachers, etc.) through developing inspirational sustainability scenarios for children's learning and sharing behaviour.

Intangible things including, skills, knowledge and experiences provide excellent means of creating emotional bonding among children, and encourage a sense of community and place (social sustainability). The main way of enabling these sustainable design solutions will be through "playful, engaging and participatory scenarios" that may use different mediums to **encourage learning and sharing behaviour**.

The design solutions will aim for:

- **sharing skills, experiences, memories, and exchanging knowledge with parents and other children to learn** from each other, and have a better awareness of time and spending time together;
- **facilitating collaboration among children** through sharing and learning via how to use different mediums, rehearse, and share their performances;
- **encouraging students' engagement and teamwork skills** into online courses.

To encourage the sharing behaviour, we will focus on one of the following areas for this project:

The main topics for ID 301 Section 1:

- painting and collage making
- dancing and acting

The main topics for ID 301 Section 2:

- instrument playing
- physical fitness via exercising

In the exploration of the concept of sharing for passing on memories and experiences, we will think about:

- What can be learned and shared, and what would children like to learn and share to develop generational bonding?
- What is the context of use? The context of use is also related to whether your **learning and sharing** scenario involves a collective or individual goal.
- Who else will be among the actors of your sharing scenario (parents, siblings, teachers, other children and students, etc.), and what role will they play in it?

Within the scenario, design solution(s) may include products, services and/or systems addressing the problems or opportunities identified in the scenario.

The project will explore the following approaches for the design process:

- **Enabling and engaging design:** Developing design solutions which foster children's long-lasting sharing behaviour; promoting learning, collaboration and sharing.
- **Participatory design:** Incorporating target users and stakeholders into the early phases of the design process; co-developing ideas with the involvement of children and stakeholders.
- **Scenario building:** Developing inspirational and locally relevant sustainability scenarios focusing on children's learning and sharing behaviour.

Grading Project 2 (teamwork) (50 %)

- User research and analysis & Literature search presentations (10%)
- Codesign workshop submission (25%)
- Final jury (50 %)
- Sketchbook (15%, individual)

Project Calendar

| Week | TOPICS | MONDAY | THURSDAY |
|------|--|--|--|
| 1 | DESIGN RESEARCH / LITERATURE SEARCH What is this course about, how does it work and how is it evaluated? What is the project brief? How to collect data for the literature search? | (Dec. 7th) | (Dec. 10th) Introduction Intro to teamwork Distributing project brief and assignment |
| 2 | DESIGN RESEARCH What should we do in the field research and user observations? How to conduct user interviews? How to analyze our research findings? | (Dec. 14th) Working on Miro board for literature search and user research | PRESENTATION Presenting user research Introducing scenario building and idea generation brief |
| 3 | IDEATION & Participatory design What is a scenario and how do we use it? How do we identify design directions and generate creative design ideas? Here are our early ideas!! How to validate our initial designs? | (Dec. 21) WORKSHOP working on scenario building and idea generation for two diverse themes Preparing for co-design workshop. Building UI design working prototype | (Dec. 24) CO_DESIGN prep. & DESIGN CRITS Crit sessions on 'design directions' Building UI design working prototype |
| 4 | IDEATION/CONCEPTUALISATION How do we evaluate our idea's using the workshop outcomes? | (Dec. 28) CO_DESIGN WORKSHOP (first round of workshop sessions planned by each team) via online platforms | (Dec. 31) DESIGN CRITS Feedback on your project based on the first round of workshop sessions. Revising UI design working prototype |
| 5 | REFINING and Lo-Fi PROTOTYPING Refining your scenario and design solutions. What is a mock-up? How do we use it? | (Jan. 4) CO_DESIGN WORKSHOP (second round of workshop sessions planned by each team) via online platforms | (Jan. 7) CO_DESIGN WORKSHOP and DESIGN CRITS Feedback on your project based on the second round of workshop sessions. Refining and finalizing UI design working prototype |
| 6 | FINAL SCREENING: PRESENTING YOUR PROJECT This is the scenario we work with. This is how our idea is supposed to work and how it fits our scenario! | (Jan 11) FINAL FEEDBACK Final Evaluation if applicable | (Jan. 14) FINAL FEEDBACK (end of classes) Final feedback on the UI design solution Screening of design boards explaining design details Getting feedback on your project presentation and boards. |
| 7 | FINAL JURY: PRESENTING YOUR PROJECT This is our final scenario and design solution! | (Jan 18) | (Jan. 21) FINAL JURY PROJECT 2 |

P. Research Stage III.II Observation Notes

The first two weeks of the weekly meetings and observation notes with the teams within the scope of the third stage of the research can be seen in the example.

**Middle East Technical University / Faculty of Architecture / Department of Industrial Design
ID 302 Industrial Design IV / Spring 2020-21**

Week 1 / On 18 March 2021 / Meeting Notes

The research is conducted based on the studio project titled “Sustainable Design Solutions for Rethinking and Reusing Waste Materials to Extend Product Life Span in Collaboration with Aslteks” in the third year industrial design studio course, Spring 2020 - 21 semester. Seventy-three students and eighteen teams have taken part in the project. One team has five members, and the others are four-member teams.

In the first week of the five-week project, the students were divided into 18 teams in total. The studio teams and students teams were divided into three sections, and each section included six teams, one lecturer, and one research assistant. Teams and sections were created entirely randomly. I have been assigned to follow and consult the teamwork and to be responsible for all teams independent from the sections. On Monday, the project brief was announced to the students, and a research assignment was given. On Thursday, while the teams received their first critiques about the research assignment from the instructors in their own sections, I did 10-15 minute meetings with all teams.

Because of the pandemic situation, distance education has been continuing, and lessons were conducted on Zoom. While all the teams were working in their break-out rooms, I visited all the teams' rooms and talked about their teamwork. The first meeting topic was related to how the teamwork process could be more beneficial and effective for them. I first got their first impressions and thoughts and made suggestions about the issues to be discussed and decided at the beginning of the teamwork process.

It seemed that all teams have set up a WhatsApp group for communication and their meetings among themselves, except one team, prefers to use Telegram. The teams used platforms such as Discord, Zoom, and Google Meet to conduct their team meetings. Although they are used to using zoom, it was observed that the students were looking for a different platform because the accessible version of the zoom only allowed 40 minutes, and the meeting closed automatically after that. However, it is seen that there are teams continue to use zoom despite this problem.

As in the previous semester, students were encouraged to use the Miro board this term as well by the studio team. Separate boards were opened for each phase of the project, and the teams were assigned their own Miro boards. This platform, which enables students to work together simultaneously, also enables the studio team to follow this process one-to-one and to criticize it interactively on that platform.

At the meeting, four main themes: communication, shared calendar (meeting), leadership, and task division were discussed, and suggestions were made to the teams. For the communication, as mentioned before, teams were using WhatsApp groups, but I warned that please avoid dual talking and making decisions, make sure everyone in your team is aware of everything. Also, one of the difficulties of working remotely is that people can reach you at any time due to online tools, even when you take the time for yourself. Therefore, inform your team members about your special situations and requests from the first week. It is important to do this from the first week because such requests that arise afterward can be misunderstood and cause problems. Students were supported to create a team discipline that each team member can approve.

Another topic we talked was about the team meetings and arranging a common time for the meeting. The students were asked to stay away from the meeting of 2 and 3 as much as possible and to find a common time that all team members could be involved. Thus, it was stated that any of the team members could be prevented from missing something and would not cause a loss of motivation. It has been observed that some students who did not participate in a few meetings or did not participate in decision-making partially isolated from teamwork. It was suggested to use a common calendar to

prevent all this and to facilitate the process. Common available times, important dates for the meeting and project (juries, submissions etc.) could be added to the common calendar. They were asked to make the project process more visible to all team members. Thus, the processes of organizing the tasks and setting the meeting date could be easier for the teams. Also, it was suggested that Miro boards could be used for this time management process too. They can add a calendar or create their own time table easily.

Miro board was suggested, because, it is used regularly and frequently among all the team members. It is important that such platforms are used regularly by all team members to make sure that all team members are aware of the process and in order to provide interaction. A single program in which they carry out the whole process, rather than an extra different program, provides convenience and practicality for team members. In my previous study, a separate excel file was used and it was observed that only the person who was the leader that week, used in that process and the interaction was reduced. It has been observed to be impractical. It is also important to set up time management through a less time consuming and practical program that is already used.

Another point discussed with the teams was about the leadership. The teams were asked whether they chose a leader or not and in general, it was observed that the teams did not choose a leader, but, some students in a few teams voluntarily assumed such a task without labeling themselves. Since there are things that need to be organized and followed in teamwork, someone has to manage this process. Therefore, the leadership or responsible person is inevitable should be. For this reason, I suggested the teams, rather than selected one leader, organize this process rotationally. When someone from the team takes this task constantly without agreement within the team; this may create problems for the team in the future. The leader may not want to continue this task after a while or other team members may not be satisfied with this process, where there is no consensus. In case of being a leader by team decision, this process is prevented from being experienced by other team members. Considering that this is an educational project, it should be a goal of these projects to enable students to take responsibility for different tasks and discover their own potential such as being a leader. For this reason, shared leadership process could reduce potential problems and ensure equality between students. This rotational responsibility could increase the motivation and sense of belonging of the team members both for the team and the project. In the previous research, it was stated that this shared leadership process increased the sense of responsibility of the students and made them realize their abilities. So, it was suggested that each team member could lead each week of the four-week project. Thus, each student could have experience on this process and get opportunity to get awareness about their abilities.

The duties of the leader could be to organize the meetings, to decide the platform to be used for the meeting and to inform the teammates about the meeting details and to remind the meetings. Apart from the meeting organizations, to follow up the assignments that need to be uploaded to Oduclass and to organize the division of task process. Although these are very simple things, these steps make the process of teamwork very practical and systematic. In improvised teamwork processes, missed tasks and time problems can be encountered too much, which can reduce the motivation of students and also it can cause them to spend too much time when necessary.

All teams started working by dividing tasks from Monday to Thursday. They had made the necessary preparations for the critiques sessions that they would receive that day, so they had their first experience as a team until our first meeting. A few important points to be aware of while dividing the task were repeatedly reminded. The most important of these is that the division of tasks should not remain in the notebook of one of the team members. Once the division of task was done, they were told they had to write it down and make sure that it was visible to all team members. The so-called task division can cause misunderstanding and / or incomplete understanding, and this may be a problem for the teams in the next meetings. For this reason, making it written and making it visible to everyone will eliminate these problems. It has

also been observed that this situation increases the sense of responsibility in students. It has been suggested that they can use any platform including Miro boards, as well as make a very simple table that includes the tasks to do, who will do and deadlines. At the end of the course, it was seen that some teams started to implement these suggestions and a common calendar and a table for task management were added in their miro boards.

It was stated that while dividing the tasks, it is necessary to manage a process where all team members agree and it is normal for everyone to choose the areas they are good at or want to do. In this process, the expected from the leader is not to say to the team members that you do this. It was stated that it is to carry out this process and to manage this table if they will use it. In addition, the problems that students fear most in their previous teamwork experiences are the unbalanced division of task and some team members not doing the given task. In order to prevent and control this, they were said to make the division of task as visible as possible. A visible task division plan increases students' awareness of their responsibilities and reduces problems to some extent. In addition, another method is not the individual division of task, but the division of task can be done in two and accordingly, so that the team members support each other and the students who have difficulty in providing their own motivation and self-discipline are supported.

It was stated to the students that in general, they should discuss these issues from the first week and decide what kind of working style they want to establish. Solutions developed against the problems that occur in the following weeks can lead to a weary process.

In addition, it was stated to the teams that we will continue to conduct such short meetings every Thursday and if they have any questions or problems, they can contact me whenever they want. It was said in the meetings that we would discuss how they spent that week and how we could make the process more effective.

Week 2 / On 25 March 2021 / Meeting Notes

Meeting was held with 13 of the 18 teams. Meetings were shorter compared to the previous week. How they spent the 1-week process, whether they had a problem and what they did about the topics discussed in the previous week were discussed.

| | |
|---------------|--|
| Team 1 | There does not seem to be a problem with teamwork. The leader has not been selected and they do not have a leader. They made the division of task among themselves in the classical method. Balances and relations between team members seem good. But their motivation about the project topic is very low, and by talking about it, they influence each other and reduce their motivation. This loss of motivation can cause problems in the coming weeks. |
| Team 2 | A common calendar has been created on the miro board. Division of task was done on the miro board too, but was deleted as the tasks was completed. I haven't seen an example of this. They didn't choose a leader. They go on without a leader, but they organize the process on the Miro board. B....'s mood was low. She said it should be a covid test due to a suspicious contact. I guess it is not a general situation. |
| Team 3 | No meeting could be made with this team. |
| Team 4 | G.... is knowledgeable and experienced in this regard, as she participated in the work I did last year. That's why he became the first leader. But they said the leader didn't have much to follow, as they held frequent meetings at short intervals. They created a common calendar on the miro board. Generally, they met, divided the work and left, they held a longer meeting on the last day and combined their work up to that day together. |
| Team 5 | The leader of the first week was F.... S.... would take over after Fatih. In the team, they started using Trello with F... 's suggestion and they seemed happy with this experience. S... said that she liked it even though she had never used it before. Since it looks like Trello, I added Kanban to their Miro boards and suggested that they can do this on the Miro board too. Often they divided the tasks and left. They put it back together for the presentation. E... 's internet is a bit problematic. As far as I understand, it has not created such a disruption that it affects teamwork. |
| Team 6 | A.... (in Eskişehir) could not attend a meeting because the electricity was cut off. They also held 2 meetings together. They both met and worked together, and they divided the tasks and left. While dividing the tasks, |

| | |
|----------------|---|
| | they wrote their names on post-it on their poster on the miro board and made the task division visible. Although there does not seem to be a problem for now, based on previous experience, ...'s problems will hopefully not affect teamwork. |
| Team 7 | They did not choose a leader, they did not need it as they said. A Shared calendar created on miro board. They usually divide up the tasks at the meetings and left, then bring them together. Since E... 's sister had a wedding very recently, she returned to her family and had to travel. Due to this personal intense process, there may be disruptions in her contribution to teamwork. Instead of having long meetings, you should have short meetings that everyone can attend and divide the tasks and leave. |
| Team 8 | No meeting could be made with this team. |
| Team 9 | No meeting could be made with this team. Shared task and time management tables appears on the Miro board. |
| Team 10 | No meeting could be made with this team. |
| Team 11 | Recommendations were not taken into consideration. No shared calendar has been created. Nothing was used for task distribution and no leader was selected. While only dividing the task, there was a double task distribution. Task distribution was made over Whatsapp and zoom and it was said that the process went smoothly. The previous week, E... had mentioned that sometimes it was very difficult to provide motivation, and I told them that they could work in 2, so that they could support each other. Third suggestion was taken into account. It seems that it will be important for the motivation of this team to ensure that Ege does not leave the process. As the process intensifies, things can get a little more difficult. |
| Team 12 | No meeting could be made with this team. A shared calendar made on the Miro board. |
| Team 13 | They met 3 times during this week. They said everything was fine and they didn't have a problem. They did nothing about the division of task, calendar, and leadership. The division of task was made verbally in the meetings. They weren't keen to talk about teamwork this week. They may have seen it unnecessary because everything went well. |
| Team 14 | E... could not attend the meeting. They usually held meetings and worked together. Therefore, the division of task was not made. They said they didn't have time problems. They do not prefer to use a shared calendar and leadership. The Team is like a closed box. |
| Team 15 | They described the one-week process intensely. They met every day. They said it was difficult to organize this whole process, as they also worked in teams in other lessons. However, they did not make a shared calendar or division of task schedule that could facilitate this process. But the shared leadership has begun. The first leader was A..., the next B.... To ease the process a little, I said it might be better for them to have short meetings and detailed division of tasks rather than long and frequent meetings. In this way, I think it is possible to work individually and bring together what was done in the meetings and make the next division of tasks over the deficiencies. |
| Team 16 | Y... has taken the lead. While meeting on Zoom, they worked on Miro separately so that they were informed about each other and speeded up the process with the individual division of task. They stated that they were satisfied with this method. Although it could be a good method, it can be difficult to set up such a long common time as the process intensifies; that is why they were advised not to insist on this method of work. |
| Team 17 | Nothing has been done on the proposed about shared calendar, division of tasks and leadership. The process was progressed through Whatsapp and task tracking was made. They held meetings 2 times. They stated that they did not have a problem. They may have seen this teamwork management process unnecessary because everything went well. |
| Team 18 | Selen was the leader and said that she organized the meetings in general. They said that they met 4 times, they generally preferred to hold meetings after 9pm due to the lockdowns. The division of task was made on Miro, but I did not see what they did because it was deleted as it was completed. They stated that they did not have a problem. Not everyone might want to work in the evenings, but if they agree, continue with this method of work. |

Q. Research Stage III.II ID 302 2020-21 Spring Project Brief

Middle East Technical University Faculty of Architecture Department of Industrial Design
Spring 2020-21 – ID 302 Industrial Design IV

Assoc. Prof. Dr. Çağla Doğan, Asst. Prof. Dr. Senem Turhan, Inst. Aernout Kruithof, Res. Asst. Koray Canlar, Res. Asst. Ayşe Kaplan, Res. Asst. Zeynep Yalman Yıldırım, Res. Asst. İtir Güngör Boncukçu

19 April 2021, Monday

Sustainable Design Scenarios and Solutions for Encouraging Water Effectiveness in Bathroom Environments.

Among the United Nations Sustainable Development Goals, “clean water and sanitation (Goal 6)” emphasizes the importance of safe access for everyone to clean water resources (United Nations Development Program, 2020). Domestic water consumption (10.3%) appears to be insignificant compared to industry (18.4%) and irrigation (71.3%) areas where water is used. However, the household water consumption influenced by user behaviors and attitudes, and mainly resulted from diverse activities in the bathroom environment can be addressed by various **design interventions for effective use of water**.

With the increased effects of the pandemic situation, we can experience water shortages in the near future in Turkey. Acute crisis situations such as a pandemic can negate a crisis such as water shortage, which is comparatively less visible (Bouman et al., 2020). The increasing water consumption in this condition is also closely related to the hygiene perception of the individuals. This change, which can be easily observed in daily practices, may cause problems with the adequacy and accessibility of clean water resources, especially in the long term (Cheval et al., 2020).

The frequent use of the bathroom environments for personal care, hygiene practices, and the perception of hygiene transformed during the pandemic can lead to a significant increase in domestic water consumption. The aim of the project is to **explore and develop sustainable design solutions which focus on the effective use of water mainly affected by user needs, preferences and behaviors in the bathroom environment through considering attitudinal and contextual factors** in the following two specific areas:

- **showering area:** shower sets consist of a hand shower, shower bar, shower hose, other related accessories, and controls and displays for adjusting the flow and temperature of the water, and
- **sink area:** bathroom sink taps, other related accessories, and controls and displays for adjusting the flow and temperature of the water.

The bathroom is a shared environment accommodating diverse users' needs and attitudes, which would have a significant effect on water consumption in relation to the perception of hygiene, and the frequency and duration of daily routines of diverse users or personas such as:

- people with diverse needs (elderly, people with disabilities)
- extended family
- families with children
- young professionals

With our design solutions, we will aim to develop:

- sustainable design scenarios and considerations for the effective use of water,
- responsive product-user interactions and experiences for visible and precise control of water (flow, temperature, etc),

- inclusive and engaging product-user interactions to meet the needs and preferences of diverse user groups (elderly, children, adults, etc.),
- easy to clean and aesthetically appealing forms and surfaces,
- affecting behaviors of individuals in sustainable ways.

The project phases for grading and evaluation will involve the following:

- Design research: literature search and user observation % 25
- Preliminary jury: scenario board and conceptual prototyping % 30
- Final jury % 45

REFERENCES

Bouman, T., Steg, L., & Zawadzki, S. J. (2020). The value of what others value: When perceived biospheric group values influence individuals' pro-environmental engagement. *Journal of Environmental Psychology, 71*, 101470.

Cheval, S., Mihai Adamescu, C., Georgiadis, T., Herrnegger, M., Piticar, A., & Legates, D. R. (2020). Observed and potential impacts of the COVID-19 pandemic on the environment. *International Journal of Environmental Research and Public Health, 17(11)*, 4140.

United Nations (2015). Sustainable Development Goals.
<https://www.un.org/sustainabledevelopment/sustainable-consumption-production/>

PROJECT SCHEDULE

| Week | TOPICS | MONDAY | THURSDAY |
|------|--|--|--|
| 1-5 | PROJECT 1 | | |
| 6 | DESIGN RESEARCH / LITERATURE SEARCH What is the project brief? How to collect data for the literature search? What should we do in the field research and user observations via Experience Chart? How to conduct user interviews? | 19 April 2021 Project II Project brief and calendar Literature search brief User research (Experience Chart Guide) brief Setting up teams for design research | 22 April SCHEDULED CRITS: Literature search topics Compiling findings The Experience Chart (EC) Guide Preparing research questions Conducting EC Guide |
| 7 | DESIGN RESEARCH/EC GUIDE How to organize and present findings and insights via Literature Search and User Observations? | 26 Miro Board preparation for literature search and user observations presentations (teamwork) | 29 April PRESENTATIONS: LITERATURE SEARCH / USER OBSERVATIONS |
| 8 | DESIGN RESEARCH / DESIGN FOR USER INTENTIONS (DUI) WORKSHOP What are the attitudes and behaviors for water consumptions? How are the potential design solution areas to focus on | 3 May DESIGN FOR USER INTENTIONS (DUI) WORKSHOP by Dilruba Oğur Aydın developing design solution areas and design considerations (strategies) for diverse users | 6 May DUI WORKSHOP PRESENTATIONS Each team member will present the DUI workshop Design Solution Areas DUI WORKSHOP FEEDBACK Feedback on the DUI method |
| 9 | TERM BREAK | 10 & 13 MAY 2021 TERM BREAK | |

| | | | |
|----|---|---|--|
| 10 | IDEATION Idea generation emerged from the Design for User Intentions (DUI) workshop | 17 May | 20 May |
| | | DUI WORKSHOP FEEDBACK Feedback on the DUI method | SCHEDULED DESIGN CRITS Developing and compiling ideas |
| 11 | DESIGN DEVELOPMENT/REFINING, COMPILING, and Lo-Fi PROTOTYPING This is the scenario we work with. This is how our idea is supposed to work and how it fits our scenario! | 24 May | 27 May |
| | | CONCEPT PROTOTYPING User Testing Preparation for user testing the design solution including UX (developing alternatives for product parts and user interface) | DESIGN CRITS Refining and compiling ideas considering UX Proof of concept prototype and testing the design concept Gaining insights and revising ideas |
| 12 | DESIGN DEVELOPMENT/REFINING, COMPILING, and Lo-Fi PROTOTYPING PRE-JURY | 31 May | 3 June |
| | | Miro Board preparation for preliminary jury | PRELIMINARY JURY Presenting design solutions |
| 13 | DESIGN DETAILING | 7 June | 10 June |
| | | Preparation for 3D modeling and technical details | DESIGN CRITS Preparation for 3D modeling and technical details |
| 14 | DESIGN DETAILING | 14 June | 17 June |
| | | Preparation for 3D modeling and technical details | DESIGN CRITS Preparation for 3D modeling and technical details |
| 15 | DESIGN DETAILING/2D-3D MODELLING | 21 June | 24 June |
| | | Final screening | FINAL JURY |

R. Recommended Teaching Responses & Strategies

This table includes recommended teaching responses and strategies for effective teamwork process reproduced from Tucker, et al. (2014).

| | Recommended Teaching Responses and Strategies | | |
|--------------------------|---|--|---|
| | Teamwork Challenges | Description | Recommended Teaching Responses & Strategies |
| Task Design Variables | 1 | Task Structure and Description | Task structure i.e. duration, sequence and interrelationship of tasks has a considerable influence on team processes. Students should be clear about what is expected with regards to both product (the design artefact) and process (teamwork skills). |
| | 2 | Team Size | Task structure and assessment need to be considered in relation to the size of team. There can be a relationship between the effectiveness of teamwork processes and team size. |
| | 3 | Task Assessment Criteria | Task assessment criteria need to be determined taking into account issues such as assessment of individual contributions, students' perception of fair assessment and assessment of both product and process of teamwork. |
| Individual Level Factors | 4 | Knowledge and Skills | The differing levels of knowledge and skills in students about the task can influence the team performance and also the comparative performance of teams in cohorts. |
| | 5 | Learning and Personality Styles | Learning styles of students can be reflected by student engagement in teamwork and may influence the types of task that teammates choose and how well they are able to complete them. The personality type of teammates can affect team processes with regards to many dimensions of communication. |
| | 6 | Attitudes and Motivation | Attitudes to teamwork informed by previous experiences can correlate with motivation and thus engagement with team processes. |
| Team Level Factors | 7 | Leadership and Role | The leadership approach that student teams adopt and the ways that roles are structured and assigned in a team have impacts on the performance of teams. |
| | 8 | Team Contract and Climate | The team contract which establishes agreed ways of working together can inform the leadership approach, role structure, team climate, shared goals and methods for dealing |

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| | | | with conflict. Team climate determines how freely teammates share ideas. | students and encouraging them to adhere to the team contract. |
| | 9 | Team Composition | Team composition including the range of individual differences in terms of age, gender, cultural background, past experience, personality and learning styles influences team processes and hence the team performance. | -Ensure diversity in teams with regards to gender, culture and past experiences through adopting appropriate team formation methods. - Provide support for students to cope with diversity in teams. |
| | 10 | Team Cohesion | Team cohesion is defined as “a dynamic process which is reflected in the tendency for a group to stick together and remain united in the pursuit of its goals and objectives” (Carron 1982 , p. 124). | -Ensure team cohesion through positive interdependence. In addition to structuring tasks to allow for independent individual contributions and demand design collaboration, you can: (1) Apply ‘jig-sawing’ team membership (See (Frey, Fisher et al. 2009)); (2) Promote student-led reciprocal teaching; and (3) Encourage the use by teams of project work plans. |
| Teaching Practive and Support Structure | 11 | Team Formation | Teachers have two basic ways to form teams: by forming the teams themselves or by allowing students to self- select. Both ways have pros and cons that teachers and students should be aware of. | -Consider forming single-sex teams, If a team cannot have at least two members of one sex. - For culturally diverse teams, try not to isolate single members of a culture different from the rest of their teammates. - Consider location or where students live to facilitate out-of-class meetings. - Closely examine the consequences of team formation methods before adopting one. |
| | 12 | Teaching Teamwork | Students are asked to form teams in a large proportion of built environment courses, but in most cases are taught little if anything about teamwork. | -Teach student both generic teamwork skills and collaborative design skills. - Provide basic training in teamwork skills for teaching staff. - Acknowledge the different characteristics of graduate and undergraduate students and determine the teaching style that suits each cohort. |
| | 13 | Process Feedback on Teamwork | Team processes should be monitored continuously so that feedback can be regular and on both the product (the designed artefact) and the team processes that created the product. | -Create interim steps in a team design assignment for discussing individual and team progress. - Use SAPA or face-to-face discussions regularly as a tool for process feedback encouraging team members to give feedback on their own and their teammates’ performance. |
| | 14 | Conflict Intervention by the teacher | Even when taught conflict resolution skills, students need to be offered intervention strategies for problems that escalate. Teachers can model effective conflict resolution through such strategies. | -Offer teams intervention forums and try to resolve conflict at the team level. - Consider relocating individuals to other teams as a very last resort e.g. in cases of bullying and harassment. - Preferably choose a neutral person to resolve the conflict e.g. a teacher who is not assessing the student’s work. |
| Team Processes | 15 | Coordination | The use of project plans produced at the beginning of assignments and then updated at regular intervals is one way to encourage coordination of tasks and responsibilities by teams. | -Encourage teams to coordinate tasks and responsibilities through the use of project plans. - Require students to submit updated project plans regularly throughout the project. These should be assessed as part of final and interim submissions. - Gantt charts are a useful medium for recording work plans due to their common use in the design industries. |
| | 16 | Communication | Interpersonal communication and team building skills are necessary for effectively functioning teams. For design, oral and drawing interpersonal communications skills are particularly important. | -Require teams to negotiate and agree on mediums and rules of communication. - Encourage students to consider advantages of face-to-face communication for complex design negotiations. - Ensure students devise rules for communication via sms that recognise its limits. |

| | | | | |
|--------------------|----|---|---|---|
| | | | | - Teach students how to use thumbnails, diagrams and partis to communicate ideas. |
| | 17 | Idea Evaluation | Idea evaluation in design teams involves generating, evaluating and developing ideas in a manner that is inclusive of all team members. | -Require teams to negotiate and agree on mediums and rules of communication. - Encourage students to consider advantages of face-to-face communication for complex design negotiations. - Ensure students devise rules for communication via sms that recognise its limits. - Teach students how to use thumbnails, diagrams and partis to communicate ideas. |
| | 18 | Decision Making | Decision-making in a team requires an understanding of available strategies and selecting the approach that responds to the team task. | -Teach students common team decision-making models. - Encourage students to consider models other than democratic decision-making. - Support students to practice consensus-building skills and reflect on these teamwork processes in team/individual design journals. |
| | 19 | Conflict Management Skills | Conflict management skills include the skills that team members should develop in order to recognise and productively resolve conflict. | -Teach students how to recognise and resolve conflict in a lecture and through a conflict management skills manual. - Support students to practice conflict management skills via role- play in workshops that recreate conflict scenarios. |
| Team Output | 20 | Quality of the Submitted Product (Design) and Learning of Unit-Specific Knowledge and Skills | Task performance is evaluated by the quality of the submitted product (design) and the learning demonstrated of course-specific knowledge i.e. the skills and knowledge taught that are NOT related to teamwork (unless teamwork is the primary focus of the course). | -Ask students to differentiate between individual work and teamwork in interim review submissions. - Ensure the final submissions are team submissions and do not identify individual contributions. Use SAPA to individualise marks by generating multipliers of team marks. |
| | 21 | Learning of Generic and Collaborative Design Teamwork Skills | Two broad areas of teamwork skills in design include: • Generic teamwork skills which are the skills commonly needed for groupwork and teamwork, irrelevant of field e.g. leadership, management, delegation, consensus seeking and the capacity to effectively handle conflict; and • Collaborative design skills e.g. idea selection and development, shared understanding through graphic communication, and reflective practice (Schön 1987). | -Explore forms of artefact that present teamwork skills and ask students to submit these for assessment. - Allow students time to work together in class to practice and demonstrate teamwork skills. - Give students feedback on teamwork skills (preferably by teachers trained in teamwork). |
| | 22 | Attitudes to Future Teamwork | A significant element of team effectiveness is students' attitude to teamwork which is heavily informed by previous experiences of teamwork. | -Require students to reflect on their experiences of teamwork in a reflective journal at the completion of assignments. - Encourage students to reflect on positive team experiences and the strategies that might lead again to these, and of negative team experiences and the strategies that might avoid these in future. - Require students to consider the skills they have learned and what skills they need to improve. |

CURRICULUM VITAE

Surname, Name: GÜNGÖR BONCUKÇU, İTR

EDUCATION

| Degree | Institution | Year of Graduation |
|-------------|-------------------------------------|--------------------|
| MS | METU Industrial Design | 2012 |
| BS | METU Industrial Design | 2015 |
| High School | Kanuni Anadolu High School, Trabzon | 2007 |

FOREIGN LANGUAGES

Advanced English

PUBLICATIONS

1. Kulaksız, M., GÜNGÖR-BONCUKÇU, İ., OĞUR, D., PAKSOY, Y., TURHAN, S., & DOĞAN, Ç. (2017). Generative Design Research for Sustainability: Exemplary Cases for the Adaptation of the EC Guide Tool and the ERM Method. *IASDR 2017, Re: Research Conference*, 31 October-3 November, Cincinnati, Ohio.
2. Kaygan, H., Demir, Ö., Korkut, F., & GÜNGÖR-BONCUKÇU, İ. Encounters and Shifting Identities: Students' Experiences of Multi-Stakeholder Participatory Design. *Conference Proceedings of the Design Management Academy: Research Perspectives on Creative Intersections*, vol. 5, edited by E. Bohemia, C. de Bont and L. S. Holm, 1685-1702. Hong Kong, 2017.