A DESIGN-BASED RESEARCH ON SHARED METACOGNITION THROUGH THE COMMUNITY OF INQUIRY FRAMEWORK IN ONLINE COLLABORATIVE LEARNING ENVIRONMENTS

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ABSTRACT

A DESIGN-BASED RESEARCH ON SHARED METACOGNITION THROUGH THE COMMUNITY OF INQUIRY FRAMEWORK IN ONLINE COLLABORATIVE LEARNING ENVIRONMENTS

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This study advances the emerging research on shared metacognition through the lens of the Community of Inquiry Framework. It seeks components and utterances of the community of inquiry and shared metacognition in online collaborative learning environments to bring to the fore an instructional design model and instructional design principles. A three-cycle Design-Based Research method was followed in two cases of university students (associate degree and graduate degree) by triangulating quantitative and qualitative data. As data collection tools, a coding scheme was developed to code utterances of collaborative group discussion posts, the Shared Metacognition Questionnaire was adapted in Turkish, and one-to-one and focus-groups interview protocols were developed to collect self-reported data. Quantitative data were interpreted through descriptive, inferential statistics, and qualitative data were interpreted by an open/selective coding process. The findings pointed out that the Community of Inquiry Framework presented a powerful theoretical ground to investigate and also distinguish cognitive, social, and teaching presence episodes from shared-metacognition episodes. Orientation-Planning, Monitoring, and Evaluation-Reflection were proved as three main components of the shared-metacognition construct in online collaborative learning settings. This study further advances the specification of each component from the group related (collaboration)

regulative actions and task (content/comprehension) related regulatory actions. Besides modeling the shared metacognition construct, six instructional design principles were offered to be used by practitioners and instructional designers to prepare online collaborative courses based on the offered model and CoI framework.

Keywords: E-learning, Online Collaborative Learning, Community of Inquiry, Shared Metacognition, Design-Based Research

ÖZ

ÇEVRİM İÇİ İŞ BİRLİKLİ ÖĞRENME ORTAMLARINDA SORGULAYICI ÖĞRENME TOPLULUĞU ÇERÇEVESİNDEN PAYLAŞIMLI ÜSTBİLİŞ KONUSUNDA TASARIM-TABANLI BİR ÇALIŞMA

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Bu çalışma, Sorgulayıcı Öğrenme Topluluğu Çerçevesinden paylaşılan üst biliş kavramını incelemeye yönelik çalışmalara katkı saklamak amacıyla gerçekleştirilmiştir. Çalışmada, bir öğretim tasarımı modeli ve öğretim tasarımı prensipleri ortaya koyabilmek amacıyla çevrim içi iş birlikli öğrenme ortamlarında sorgulayıcı öğrenme ve paylaşılan üst bilişi oluşturan bileşenler ve ifadeler araştırılmıştır. Ön lisans ve yüksek lisans öğrencilerinden oluşan iki ayrı durum, üç aşamalı Tasarım Tabanlı Araştırma yöntemiyle incelenmiştir. Veri toplama aracı olarak, iş birlikli grup tartışmalarındaki ifadeleri kodlayabilmek amacıyla bir kodlama şeması oluşturulmuş, Paylaşımlı Üst Biliş Ölçeği Türkçe'ye adapte edilmiş, katılımcılarla görüşme yapabilmek amacıyla birebir ve odak-grup görüşme protokolleri geliştirilmiştir. Nicel veriler betimleyici ve çıkarımsal istatistiksel yöntemlerle, nitel veriler ise açık /seçici kodlama süreci ile yorumlanmıştır. Bulgular, Sorgulayıcı Öğrenme Topluluğu Çerçevesinin çevrim içi iş birlikli öğrenme ortamlarında paylaşımlı üst-bilişe ilişkin ifadeleri bilişsel, sosyal ve öğretimsel buradalığa ilişkin ifadelerden ayırt etme ve inceleme konusunda güçlü bir teorik yapı sunduğunu ortaya koymuştur. Oryantasyon-Planlama, İzleme ve Değerlendirme-Yansıtma bileşenlerinin çevrim içi iş birlikli öğrenme ortamlarında

paylaşılan üst biliş kavramının 3 temel bileşeni olduğu ortaya konmuştur. Ayrıca, bu üç temel bileşeninin her birinin grup tabanlı (iş birliğine yönelik) ve konu tabanlı (içerik ve anlamaya yönelik) düzenleyici işlemleri barındırdığı kanıtlanmıştır. Paylaşılan üst biliş kavram yapısını modellemenin yanı sıra, sunulan model ve Sorgulayıcı Öğrenme Topluluğu çerçevesine dayalı çevrim içi iş birlikli eğitimlerde kullanılabilmesi amacıyla uygulayıcı ve öğretim tasarımcılarına yardımcı olabilecek 6 öğretim tasarımı ilkesi önerilmiştir.

Anahtar Kelimeler: E-öğrenme, Çevrim içi İş birlikli Öğrenme, Sorgulayıcı Öğrenme Topluluğu, Paylaşılan Üst biliş, Tasarım-Tabanlı Araştırma

Dedicated to my dear family

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ABBREVIATIONS

CISE	Computer/Internet Self Efficacy
CSCL	Computer Supported Collaborative Learning
CoI	Community of Inquiry
ComReg	Comprehension Regulation
ColReg	Collaboration Regulation
CP	Cognitive Presence
CR	Co-Regulation
CRL	Co-Regulated Learning
DE	Distance Education
E	Evaluation
EP	Evaluation Phase
GP	Group Performance
GR	Group Regulation
IM	Individual Monitoring
IP	Individual Performance
IR	Individual Regulation
LC	Learner Control
M	Monitoring
M	Mean
MFL	Motivation for Learning
Max.	Maximum
Min.	Minimum
N	Number
O	Orientation

OCL	Online Collaborative Learning
OCSE:	Online Communication Self-Efficacy
OR	Online Readiness
OTS	Off Task Statement
P	Planning
PIM	Practical Inquiry Model
PL	Perceived Learning
R	Reflection
SD	Standard Deviation
SDL	Self-Directed Learning
SM	Shared Metacognition
SP	Social Presence
SR	Self-Regulation
SRL	Self-Regulated Learning
SSRL	Socially Shared Regulation of Learning
TD	Task Difficulty
TP	Teaching Presence
TR	Task Regulation

CHAPTER 1

INTRODUCTION

This chapter introduces the background of the study, problem statement, purpose of the study, research questions, significance of the study, and lastly the definitions of terms.

1.1 Background of the Study

Online education, as a branch of distance education, is defined "as the use of the Internet to access learning materials; to interact with the content, instructor, and other learners; and to obtain support during the learning process, to acquire knowledge, to construct personal meaning, and to grow from the learning experience" (Anderson, 2008, p.5). Online collaborative learning, one of the models of online education, focuses on discourse and collaboration to enhance learning (Harasim, 2012). The Community of Inquiry (CoI) framework, as an online collaborative constructivist learning model, was developed by Garrison, Anderson, Archer in 2001 on the focus of creating individual meaning and collaboratively exploring new ideas for sharing understanding in the fusion of discourse and reflection within deep and meaningful experience in online education. The collaborative constructivist philosophy of CoI aligns with the philosophy of John Dewey who argues that personal meaning is constructed through transactional and collaborative effort (Garrison, 2011). Vygotsky's social constructivist view, "the notion of learning as a process of inquiry" through the zone of proximal development, supports and informs the CoI (Wells, 2000; Garrison, 2013). According to Vygotsky's (1978) general law of genetic development, each cognitive function of a child, also mentioned as higher mental processes (Schunk, 2012), occurs both in intra-psychological (individual) and inter-psychological (social) level. Vygotsky's theory highlights the point that

development and learning cannot be detached from the contexts they occurred. The way learners communicate with their universes—with the people, tools, and foundations in it—changes their reasoning (Schunk, 2012). CoI framework, providing a coherent description of collaborative inquiry, consists of three dynamic interdependent elements, which are Social, Cognitive, and Teaching Presence (Garrison, Anderson, & Archer 2001; Garrison, 2007; Akyol & Garrison, 2011; Garrison, 2013). This theoretical lens provides a coherent perspective to study the dynamics of Cognitive and Social Presence with the binding function of Teaching Presence. Garrison and Akyol (2015) state that parallel with the adoption of collaborative approaches in learning settings, an individual, and shared the role of learners when they metacognitively regulate their learning becomes a prominent issue.

Shared-metacognition has been studied theoretically through the CoI framework since 2015 by Garrison & Akyol, via developing a Shared-Metacognition-questionnaire. There have been, on the other hand, a few attempts to study the metacognition construct on inter-individual level. A review of the literature showed that shared-metacognition has been studied across a body of empirical research mostly in collaborative settings (e.g. Chen, Chiu, & Wang, 2012; Goos, Galbraith, & Renshaw, 2002; Hurme, Järvelä, & Palonen, 2006; Iiskala, Vauras, Lehtinen, 2004; Iiskala, Vauras, Lehtinen, & Salonen, 2011; Khosa & Volet, 2014; Larkin, 2009; Rapchak, 2018a). Collaborative settings give chances to take part in metacognitive regulation with at least one or more peers. Contingent upon the degree of correspondence inside joint regulative activities, asymmetrical metacognitive co-regulation, and common socially shared metacognitive regulation can be distinguished (De Backer, Van Keer, & Valcke, 2015a). Within a type of metacognitive regulation ("individually-oriented, co-regulated, and socially-shared metacognitive regulation"), the most significant level of interpersonal regulative commitment is found in socially shared metacognitive regulation (De Backer, Van Keer, & Valcke, 2015a, p.65). Despite shared-metacognition's potential beneficiary and contributing impact, research on it is still in its infancy. The latest studies on the

shared-metacognition deal with embedding metacognitive scaffolding (Jafarigohar & Mortazavi, 2016; Jafrigohar & Mortazavi, 2017); use of collaboration scripts to explicitly orient students (Kollar, Fischer & Hesse, 2006; Wang, Kollar, & Stegmann, 2017); developing design principles and frameworks to promote shared-metacognition (Borge & White, 2016; Kim & Lim, 2018), and developing technology-enhanced regulation systems to promote metacognitive expertise (Borge, Ong, & Rose, 2018; Borge & Shimoda, 2019). The use of psychological tools such as technological systems, collaboration roles, scripts in order to investigate how metacognitive regulation processes are disseminated over the individuals to a social group from the lens of collaborative constructivist CoI framework, underpin the rationale of this study.

1.2 Problem Statement

There is a developing need to comprehend the procedure of collaborative thinking and learning in an increasingly associated world because of the intrusion of ubiquitous technological advancements. Limits between the individual and the group are getting progressively obscured. As a result of this, there is an urgent call for more interactive and collaborative methods. That's "simple connectivity is no guarantee of the thoughtful collaboration" (Garrison & Akyol, 2015, p.66). Although online education has been thought of as an option beside face to face education, there might be inevitable conditions in which online education turns to the only way to sustain educational facilities. The Covid-19, in this sense, has left no way than online education almost all over the world. Unfortunately, an unexpected pandemic has left us to concentrate mostly on student-content interaction, solving technical problems, supporting educators to prepare online learning materials. Thus, student-student interaction and student-teacher interaction have become a current issue, though it has already been stressed in the literature (e.g. Iiskala, Vauras, & Lehtinen, 2004). The quality of collaboration can allude both to the cognitive discussion content and metacognitive characteristics of interaction (Iiskala, Vauras, & Lehtinen, 2004).

Through shared-metacognition, group members can monitor each other's actions, can create shared understanding, evaluate their actions (Chen, Chiu, & Wang, 2012; Iiskala, Vauras, Lehtinen, & Salonen, 2011). The empirically validated CoI, a collaborative constructive framework, provides a systematic lens to study Cognitive and Social Presence dynamics with the binding function of Teaching Presence. The commonalities among the dynamic dimensions of metacognition construct and categories of TP, CP, and SP lead to conduct further research the examine the shared-metacognition (Garrison & Akyol, 2015, pp.66-67). Thus, although the dynamic structure of collaborative learning environments can coherently be studied with CoI (Garrison & Akyol, 2015), there is a paucity of research investigating shared-metacognition within the dynamic components of CoI. Although previous literature partially distinguished shared-metacognition from other types of episodes (Hurme, Merenluoto, & Järvelä, 2009; Iiskala, Vauras, Lehtinen, & Salonen, 2011), CoI "provides the context to conceptually and operationally define and operationalize metacognition in a socially shared environment" (Garrison, 2017, p.62)

Conceptual clarity of the terms used in literature is another issue. The social perspective of metacognition has been stressed with several terms such as shared-metacognition (Garrison & Akyol, 2015), socially mediated metacognition (cf. Larkin, 2009), social metacognition (cf. Chen, Chiu, & Wang, 2012), socially shared metacognition (cf. Jafarigohar & Mortazavi, 2017; Iiskala, Vauras, Lehtinen, & Salonen, 2011; Hurme, Merenluoto, & Järvelä, 2009; Iiskala, Vauras, & Lehtinen, 2004), socially-shared metacognitive regulation (De Backer, Van Keer, & Valcke, 2015). However, these terms lack of commonality, synchronization, and sharing of metacognitive reasoning. Moreover, most of the researchers who have contributed too much to the advancement of metacognition in social context have mentioned metacognition with individualistic terms (e.g. Goos & Galbraith, 1996; Khosa & Volet, 2014; Yarrow & Topping, 2001). Besides this, an examination of the shared-metacognition construct in collaborative environments has still lack of congruence. For example, Wang, Kollar, and Stegmann (2017), mentioned the term as "shared-regulation", and gave the codes as "planning, monitoring, reflection" (p.162). In

another exemplary work, Borge and White (2016) used the term socio-metacognitive expertise and offered "joint-planning, practice through situated activity, and joint process reflection" as cycles of learning (p.327). Furthermore, exemplary categories have been reported as Planning, Monitoring and Evaluating (e.g. Khosa & Volet, 2014; Kim & Lim, 2018), or Orientation, Planning, Monitoring, and Evaluation (e.g. De Backer, Van Keer, Valcke, 2015a), or expanded as Orientation, Planning, Monitoring, Evaluation and Reflection (e.g. Molenaar, Chiu, Sleegers, & van Boxtel, 2011; Meijer, Vennman, & van Hout-Wolters, 2006).

1.3 Purpose of the Study and Research Questions

The purpose of this study is to explicate and investigate students' Community of Inquiry and Share-Metacognition (SM) levels and observed utterances in online CSCL environments, designed iteratively based on the components of CoI and SM. Additionally, it is aimed to reveal instructional design principles through this iterative design by considering components of CoI, SM, and other systemic factors. Parallel to the purpose of the study, the main research questions are constructed under 5 main categories, which are CoI, SM, Group Utterances, Group Dynamics, and Design Principles. The regarding research questions of each category are listed below:

1. *Community of Inquiry*
    1.1. What are the students' perceived community of inquiry levels (Cognitive presence, Teaching Presence, Social Presence) in synchronous OCL environments?
    1.2. Is there any significant difference on perceived community of inquiry levels of students by Design 1, 2 and/or 3?
2. *Shared Metacognition*
    2.1. What are the students' perceived shared metacognition levels in synchronous OCL environments?

2.2. Is there any significant difference on shared metacognition levels of students by Design 1, 2 and/or 3?

3. *Group Utterances*
   3.1. What kind of community of inquiry utterances are visible/observed in synchronous OCL environments?
   3.2. What kind of shared regulative utterances are visible/observed in synchronous OCL environments?
4. *Group Dynamics*
   4.1. What are the students' perception levels on group dynamics (perceived learning, individual performance, group performance, task difficulty, role distribution, evaluation phase, planning phase) in synchronous OCL environments?
   4.2. Is there any significant difference on perceived group dynamics levels of students by Design 1, 2 and/or 3?
5. *Design Principles*
   5.1. How should synchronous OCL environments be designed by considering shared metacognitive regulation?

1.4 Significance of the Study

The results of this study will be of significant methodological and practical contributions to understanding shared-metacognition construct and design collaborative learning environments by focusing on enhancing students' shared metacognition in those settings. The dimensions and structure of metacognition change in online collaborative CoI; that is, "Metacognition is no longer simply a self-regulated ability and, therefore must consider issues of shared metacognition and co-regulation". Based on this perspective, there is a need to explicate how individuals could be metacognitively active in collaborative learning environments (Garrison & Akyol, 2015, p.66). Snyder and Dringues (2014) stress that further studies are needed to investigate the possible ways to ease the development of metacognition and the

ways teachers and students apply metacognitive skills effectively. At that point, this study provides a coding scheme to analyze shared-metacognition construct and empirically verifies the observable utterances of the shared-metacognition construct over the two cases. Additionally, by adapting a shared-metacognition questionnaire in Turkish, the self-reported data obtained through this questionnaire serves an alternative source to measure shared-metacognition in multiple ways. Besides developing and adapting data collection tools and triangulating data to examine the construct, iterative nature of the DBR over multiple cases yields important design considerations for *instructional designers and researchers.*

Besides contributing conceptual clarification of the shared-metacognition construct, this study reveals instructional design principles to promote shared-metacognition in online community of inquiry for the *practitioners* who seek ways of creating online collaborative learning environment. Although there has been extensive research in OCL over the last ten years, there is a paucity of research about how the groups can be assisted to engage in, endure and regulate collaboration in a productive way (Järvelä & Hadwin, 2013; Kollar & Hesse, 2006). Moreover, it is hard for students to take part in the kinds of advanced aggregate sense-production that good collaboration effort requires. Students are generally so centered around finishing the collaborative task that they don't focus their own processes. When students act with design scripts that show desired collaboration, other group members can see an exemplary model of collaboration (Borge & Ong, 2018). However, the flexibility and amount of the scripts can be a double-edged sword. If designed too coercively, they can inhibit students' regulation (Kim & Lim, 2018). As a powerful aspect of this study, the iterative nature of research design over multiple cases provides an opportunity to calibrate the design scripts repeatedly over two cases. The instructional design model that shows the components of shared-metacognition construct and related instructional design principles will serve as a guide to practitioners to design their own online collaborative setting. The Shared-Metacognition focused Instructional Design (SM-ID) Model's structure and the instructional design principles also serves as a preliminary guide for *instructional*

designers to set the features of an online collaborative system. Since the quality of online education have been lately criticized in terms of not being interactive, collaborative as much as face to face instruction especially during Covid-19 pandemic period, in which there is no choice other than online education, this study will serve one of the preliminary remedies to show how to design collaborative online education.

1.5 Definition of Terms

Cognitive Presence (CP)

CP means "the extent to which the participants in any particular configuration of a community of inquiry can construct meaning through sustained communication" (Garrison, Anderson, & Archer; 2001, p.89).

Community of Inquiry (CoI)

COI is a framework based on the assumption that learning occurs within a group of individuals (teachers, students…) through the interaction of three core elements, which are cognitive, social and teaching presence (Garrison, Anderson, & Archer; 2001, p.88).

Co-regulation (CR)

CR was theorized as "a manifestation of emergent interaction within a zone of proximal development" in which participants' progress from co-regulation to self-regulation (as cited in Hadwin & Oshige, 2011, p.247). Garrison and Akyol (2015) state the co-regulation of cognition dimension as meaning "metacognitive monitoring and managing strategies and skills when engaged in the collaborative learning process as a member of a purposeful and coherent group of learners" (p.68).

Metacognition

Metacognition means "knowledge or beliefs about what factors or variables act and interact in what ways to affect the course and outcome of cognitive enterprises"

(Flavell, 1979, p.907). Conceptualization of metacognition, according to Akyol and Garrison (2011) comprises three dimensions as knowledge of cognition, monitoring of cognition, and regulation of cognition (p.184).

Online Education

Online Education is defined as "as the use of the Internet to access learning materials; to interact with the content, instructor, and other learners; and to obtain support during the learning process, to acquire knowledge, to construct personal meaning, and to grow from the learning experience" (Anderson, 2008, p.5).

Online Collaborative Learning

Online Collaborative Learning (OCL), points out educational implementations focusing on collaborative communication and knowledge building through Internet; which leads learners to work together to determine and develop understanding issues, and use, transfer them into action to solve problems, conduct plans, etc (Harasim, 2012).

Self-regulation (SR)

SRL is defined as "self-generated, thoughts, feelings, and actions that are planned and cyclically adapted to the attainment of personal goals" (Zimmerman, 2005, p. 14). Garrison and Akyol (2015) state self-regulation of cognition as "reflecting metacognitive monitoring and managing strategies and skills when the individual engaged in the personal reflective learning process" (68).

Shared Metacognition (SM)

Socially-shared metacognition happens when the message of a group member contributes to the joint conversation about how to handle an undertaking/task and affects collaborative problem-solving when other members of the group recognize and additionally build up the message (Hurme, Merenluoto, & Järvelä, 2009).

Social Presence (SP)

SP “is defined as the ability of participants in the Community of Inquiry to project their characteristics into the community, thereby presenting themselves to the other participants as ``real people." (Garrison, Anderson, & Archer; 2001, p.89).

Teaching Presence (TP)

TP refers *to the design and development* of the educational experience including selection, organization, and primary presentation of course content, activities, assessment, and *facilitation* of these processes to enhance cognitive and social presence (Garrison, Anderson, & Archer; 2001, p.90).

CHAPTER 2

LITERATURE REVIEW

This chapter starts with philosophical and theoretical foundations of the study, then mentions online learning to provide the roots of this work. Then, two main pillars of the study, the community of inquiry and shared metacognition, were explained and explicated based on the results and interpretations of two systematic literature reviews.

2.1 Philosophical and Theoretical Foundations

Metacognition, typically pictured from an individual perspective, has been expanded to comprise the inter-individual learning processes from a societal perspective (e.g., Jafarigohar & Mortazavi, 2017; Iiskala, Vauras, Lehtinen, & Salonen, 2011; Hurme, Merenluoto, & Järvelä, 2009). Due to the theoretical structure of shared metacognition, consisting of individual and social components (Garrison, 2015), this study is based on Vygotsky's sociocultural theory, distributed cognition theory, and CoI framework, which is rooted in Dewey’s perspective.

Vygotsky’s (1978) general law of genetic development, each cognitive function of a child, also mentioned as higher mental processes (Schunk, 2012), occurs both in intra-psychological (individual) and inter-psychological (social) level. Vygotsky’s theory highlights the point that development and learning cannot be detached from the contexts they occurred. The way students/learners communicate with their universes—with the people, tools, and foundations in it—changes their reasoning (Schunk, 2012). Vygotsky’s ideas were influenced by Marx and Engels’ general concepts, which are based on Hegel 's idea that people create various societies

wherein work gives the methods for seeing the world as separate objects and acting subjects. Marx and Engels kept up that the tools of work are the basic factor in changing human instinct A little conversely, as indicated by Vygotsky, psychological tools (signs and symbols) instead of the devices of work achieve the change of human awareness. Specialized technical devices change an outer circumstance; however psychological tools direct the brain and change the way of the thinking process. Instances of psychological tools and their intricate systems incorporate language, various types of numeration and tallying, mnemotechnical methods, mathematical imagery, masterpieces, composing, schemes, charts, maps, outlines, a wide range of traditional signs, and so forth (as cited in Gredler, 2005). Furthermore, rather than the physical qualities of a stimulus, the virtue of it being used as an influential tool on cognition and behavior makes it a psychological tool (as cited Gredler, 2005, p.310). At that point, implementing scripts to help learners share their cognitive, social, and metacognitive regulation processes and embedding some kind of roles, responsibilities to help create collaboration rooted in Vygotsky's views of psychological tools.

The distributed cognition theory, similar to other cognitive theories, searches for understanding the structure of cognitive systems. In contrast to customary cognitive theories, it incorporates cooperation among individuals and with assets and materials in the setting. It is significant from the beginning to comprehend that distributed cognition alludes to a point of view on the entirety of cognition as opposed to a specific part of it (Hollan, Hutchins, & Kirsh, 2000). Hutchins (2000) emphasized three types of distributed cognition processes to understand human cognition: cognitive procedures might be disseminated over the individuals from a social group; cognitive processes might be dispersed as in the activity of the cognitive system that includes coordination among inner and outside (material or natural) structure, and procedures might be appropriated through time so that the results of prior occasions can change the idea of later occasions. The underlying foundations of distributed cognition are profound, yet the field appeared under its present name in the mid-1980s. In 1978, Vygotsky's Mind in Society was distributed in English, while

Minsky's Society of Mind was published in 1985. The almost immaculate mirror evenness of the titles of Vygotsky's and Minsky's books propose that something extraordinary may be going on in the distributed processing, regardless of whether the processors are neurons, connectionist hubs, parts of a cerebrum, entire people, groups of people, or groups of groups of people (Hutchins, 2000). Both the Vygotskian perspective and theory of distributed cognition stress that the cognitive development of human-being cannot solely be clarified by alluding what we have in our skull.

The CoI theoretical framework means a procedure of making a profound and significant (collaborative, constructivist) learning experience via the advancement of three related components SP, CP, and TP. It gives the setting to operationally and conceptually characterize cognition and metacognition. Metacognition in CoI mediates between interior knowledge development and collaborative activities (Garrison & Akyol, 2013). From a philosophical perspective, the CoI framework stems from the work of Dewey (Garrison, 2017; Stenbom, 2018). Dewey (1938) identified the standards of interaction, which bound the individual and social universes. Through this communication, thoughts have produced that light up the outer world. That is, meaning is built through continued sharing of opinions and thoughts. Through deliberate collaboration, thoughts are conveyed and knowledge is built and affirmed. Dewey dismissed all dualistic speculation especially concerning the individual and society (as cited in Garrison 2017, p.12). In the CoI framework, individual and collaborative aspects of learning practice are stressed, and this view is consistent with the shared-metacognition's proposed components, including individual and co-regulated aspects (Garrison & Akyol, 2015). Because CoI's theoretical orientation is consistent with the share metacognition's proposed structure and reflects the inquiry process by including personal and shared views, CoI was followed as a theoretical lens in this study.

2.2 Online Learning

Distance Education (DE) is defined as "teaching and planned learning in which teaching normally occurs in a different place from learning, requiring communication through technologies as well as a special organization" (Moore & Kearsley, 2011, p.2). The history of DE begins with mail, also called "correspondence", followed by "broadcast radio and television", "open universities", "teleconferencing" and lastly "Internet/web" (Moore & Kearsley, 2011, p.2). The advents in information technologies evolved the different kinds of DE. E-learning, used in the mid-1990s parallel with the advancement in World Wide Web (www) and asynchronous discussion groups, is defined as "electronically mediated asynchronous and synchronous communication for constructing and confirming knowledge" (Garrison, 2011, p.2). Two fundamental applications of e-learning are online and blended learning (Garrison, 2011). There are many different definitions of online learning. Although some researchers define it as the delivery of educational material through Web technologies, Anderson (2008) puts the learner and learning process at the center and defines online learning as "the use of the Internet to access learning materials; to interact with the content, instructor, and other learners; and to obtain support during the learning process, to acquire knowledge, to construct personal meaning, and to grow from the learning experience" (p.5).

According to existing research on online learning, the role of students and instructors change. While learners are required to be more autonomous, self-motivated, and self-controlled, instructors are required to facilitate, guide, and direct the learning process (Anderson, 2008; Kilis, 2016). With the change in roles, different models of online learning appeared. Three models of Online Learning are stated by Harasim (2012) as online collaborative learning, online distance education, and online courseware. Although all these types of online learning use the Internet and Web; the methods, technologies, and the underlying pedagogies change for each one. The online distance education model is grounded on the correspondence models aiming at inexpensive and faster delivery of material and feedback to support individualized

learning. Online courseware, based on cognitive learning theory, is an individualized way of learning (without student-student, student-instructor interaction) through prepacked content. Online collaborative learning, lastly, focuses on the discourse and collaboration processes and put a significant role to the instructor (Harasim, 2012).

2.3 Computer Supported Collaborative Learning (CSCL)

Constructivism is both a learning theory explaining the way people learn, and an epistemology explaining the nature of the knowledge; moreover, it is an umbrella term associated with Piaget's cognitive constructivist views and Vygotsky's social constructivism, one of which explaining learning from the biological perspective, and other explaining it from the social perspective, respectively. The constructivist perspective of learning produced a portion of teaching approaches based on four main principles, which are "active learning, learning-by-doing, scaffolded learning, and collaborative learning" (Harasim, 2012, p.68). In a collaborative learning environment, people interact during all the process and produce the output together. Commonly, collaboration points out a small group consisting of three-five students up to 20 students discussing, working together, doing a project etc. In scaffolding and cognitive apprenticeship collaborative approaches, there is always a collaboration between students and instructors; whereas, in other collaborative approaches such as in peer collaboration or learning communities, interaction among group members or interaction with others comes into prominence (Harasim 2012; Lave & Wenger, 1991).

Online Collaborative Learning (OCL), points out educational implementations focusing on collaborative communication and knowledge building through Internet; which leads learners to work together to determine and develop understanding issues, and use, transfer them into action to solve problems, conduct plans, etc. Typically, discourse in OCL is text-based, but web-based tools and conferencing tools are used in OCL as well (Harasim, 2012). With the development in online technology such as synchronous, web-based applications, cloud-based conferencing applications, or

shared documents features, the opportunities for constructing collaborative learning activities continually increased (Robinson, Kilgore, & Warren, 2017). Harasim (2002) suggests three phases for OCL theory about discourse, which are Idea Generating, Idea Organizing, and Intellectual Convergence. At the Idea Generating phase, idea divergence occurs through verbalization of thoughts, brainstorming, etc. In the second phase, generated ideas are clustered according to the similarities, differences, and at the Intellectual Convergence phase, shared ideas are synthesized and a consensus is reached.

Computer-Supported Collaborative Learning (CSCL) refers to the context in which learning is supported with computers and networked devices synchronously or asynchronously. CSCL is also implemented in a face-to-face learning environment, where computers are used to play a simulation of scientific representation, or a common interactive representation (Stahl, Koschmann, & Suthers, 2006). CSCL assumes the idea that constructing knowledge and solving problems collaboratively can be eased by the use of developing technology (Jeong, Hmelo-Silver, & Jo, 2019). In that study, although the main technology used throughout the study was Computers, OCL, as a more generic and comprehensive terminology, instead CSCL was used.

Being a computer-mediated group is an important consideration in CSCL. The level of interaction changes according to the nature of the learning environment. Graham and Misanchuk (2003) state that while the level of interdependence is none in a self-study learning environment, it is the highest in collaborative groups. The continuum of interdependence from lowest to highest points starts with self-study and continues with discussion groups, cooperative groups, and lastly collaborative groups. Successful, entertaining, and efficient learning can be obtained through effective interaction; that is, as the effort during interactions is not shared among the group members, an undesirable level of interactions occurs. Thus, it is prominent to determine the reasons affecting the quality of the collaboration process (Zheng, Xing, & Zhu, 2019).

Regulated learning is a prominent and ultimate skill in collaborative learning (Hadwin, Järvelä, & Miller, 2011; Wang, Kollar, & Stegmann, 2017). Working collaboratively refers to constructing shared understanding, strategies, and group goals together. Additionally, it refers to regulating learning by controlling behavior, motivational and cognitive issues, and through shared-metacognitive monitoring (Hadwin, Järvelä, & Miller, 2011). Järvelä and Hadwin (2013) argue that when the task representations and goals are not shared among the group members, the collaborative study may become uncontrolled, or the level of satisfaction decreases, and it may result in less entertaining, efficient, and effective learning. They further argue that the success of CSCL is determined based on self-regulation, co-regulation, and shared-regulation among the group members. Thus, the individual, peer, and group level regulation affect the success of CSCL. To improve collaborative activity, it is important to guide students to regulate and think about their collaboration (Borge, Ong, & Rose, 2018; Borge & White, 2016; Järvelä & Hadwin, 2013). The ability of a group to regulate, monitor their interactions to correct and advance their collaboration is called as socio-metacognitive expertise (Borge & White, 2016), while other researchers call it as socially-shared metacognition (Iskala, Vauras, & Lehtinen, 2004; Iskala, Vauras, Lehtinen, & Salonen, 2011). Although shared-metacognition/social metacognitive expertise is mostly neglected in CSCL (Järvelä & Hadwin, 2013), there have been a few attempts to develop these skills in CSCL environments.

2.4 Community of Inquiry (CoI)

The Community of Inquiry Framework was developed by Garrison, Anderson, Archer in 2000 on the focus of creating individual meaning and collaboratively exploring new ideas for sharing understanding in the fusion of discourse and reflection within a deep and meaningful experience. The community is defined both as a purpose and a context and its essential components are described as “having mutual interdependence, connectedness, interactivity, overlapping histories among

members, spirit, trust, common expectations, and shared values and beliefs" (Alfred, 2002, p.42). Collaboration in this regard is based on "communication free of coercion and intimidation while valuing rational argument and discourse" (Garrison, 2013, p.2).

The collaborative constructivist philosophy of CoI framework aligns with the philosophy of John Dewey who argues that personal meaning is constructed through transactional and collaborative effort (Garrison, 2011; Garrison, 2013). Vygotsky's social constructivist view, "the notion of learning as a process of inquiry" through a zone of proximal development supports and informs the CoI as well (Wells, 2000; Garrison, 2013). CoI framework, providing a coherent description of collaborative inquiry, consists of three dynamic interdependent elements, which are Social, Cognitive, and Teaching Presence (Garrison, Anderson, & Archer, 2001; Garrison, 2007; Akyol & Garrison, 2011; Garrison, 2013).

2.4.1 Social Presence

Social Presence, which is based on the Mehrabian's (1969) "immediacy" referring to "those communication behaviors that enhance closeness to and nonverbal interaction with another" (p.203); later, it is described as the learners' ability to project themselves with their social and emotional aspects; in that way, being perceived as "real people" in the used medium of communication (Mehribian, 1969; Short, Williams & Christie, 1976; Gunawardena & Zittle, 1997; Garrison, Anderson & Archer, 2000; Rourke, Anderson, Garrison & Archer, 1999; Garrison, & Arbaugh, 2007). The sub-categories of social presence are defined as Emotional Expression, Open Communication, and Group Cohesion by Garrison, Anderson, and Archer (2001). Also, in 2001, Rourke, Anderson, Garrison, and Archer revised the categories of social presence as Affective, Interactive, and Cohesive.

2.4.2 Cognitive Presence

Cognitive Presence is defined as "the exploration, construction, resolution, and confirmation of understanding through collaboration and reflection in a community of inquiry" (Garrison, 2007, p.65). The dimensions of cognitive presence are operationalized by the Practical Inquiry Model (PIM) based on Dewey's reflective thinking. According to PIM, participants move purposefully from comprehending a problem or task and through exploration, integration, and resolution phases. Within the triggering event phase, an issue or problem is identified; in the exploration phase learners individually and collaboratively explore ideas to deal with the given task; in the integration phase participants of CoI construct meaning and share through the community; in the resolution, phase confirm their understanding collaboratively through the discourse Understanding and being aware of the inquiry process is stated as extremely useful to decide on the selecting appropriate learning strategies; in that way, ease the metacognition process (Garrison, Anderson, & Archer, 2000; Akyol & Garrison, 2011).

2.4.3 Teaching Presence

Garrison et al. (2000) argue that though social and content-related interaction is needed for effective learning, it is not sufficient to ensure that it occurs. Interaction and discourse are important for higher-order learning, but the design of the instruction, facilitation, and directing is required as well (Garrison, 2007). The binding element in CoI for appropriate Social and Cognitive Presence is the Teaching Presence (Garrison et al., 2000). Anderson, Rourke, Garrison, and Archer (2001) categorized TP as comprising three elements: "instructional design and organization, facilitating discourse (building understanding)" and "direct instruction".

The literature mention SP as affecting CP in a CoI (Rourke, Anderson & Garrison, 1999; Kozan & Richardson, 2014) and is significantly related with TP (Rourke, Anderson & Garrison, 1999; Garrison & Arbaugh, 2007; Kozan & Richardson,

2014; Başdoğan, 2015; Kilis, 2016). Among these three dimensions of CoI, Teaching Presence provides tools and principles to the instructors or designers to enhance Cognitive and Social Presence. Anderson et al. (2001) stated the planning and design of the course structure, interaction, and evaluation aspects under the design and organization category. For facilitating discourse, the instructor should share meaning, identify the points of agreement and disagreement, raise questions (Anderson et al., 2001; Coppola et al., 2002; Shea et al., 2003). In addition to the facilitator role that may be shared among group members, the instructor has a subject-matter expert role through which comments and discourse are diagnosed; resources are provided and learners are guided with scaffolding (Anderson et al., 2001). CoI theoretical lens provides a coherent perspective to study the dynamics of cognitive and social presence with the binding function of teaching presence (See Table 2.1).

Table 2.1 Dimensions of CoI Framework

Social Presence	Cognitive Presence	Teaching Presence
Affective responses • Expression of emotions • Use of humor • Self-disclosure **Interactive (Open communication)** • Continuing a thread • Quoting from other's messages • Referring explicitly to each other's messages • Asking questions • Complimenting/expressing appreciation • Expressing agreement **Cohesive responses** • Vocatives • Referring to group using inclusive pronouns (e.g. we, you, us) • Phatics/salutations	**Triggering Event** • Recognize problem • Puzzle statement **Exploration** • Divergence • Information exchange • Suggestions • Brainstorming • Intuitive leaps **Integration** • Convergence • Synthesis • Solutions **Resolution** • Apply • Test • Defend	**Instructional Design and organization** • Setting curriculum • Designing methods • Establishing time parameters • Utilizing medium effectively • Establishing the netiquette **Facilitating discourse** • Identifying areas of agreement/disagreement • Seeking to reach consensus/understanding • Encouraging, acknowledging, or reinforcing student contributions • Setting climate for learning • Drawing in participants, prompting discussions • Assess the efficacy of the process **Direct Instruction** • Present content/questions • Focus the discussion on specific issues • Summarize the discussions • Confirm understanding through assessment and explanatory feedback • Diagnose misconceptions • Inject knowledge from diverse sources, e.g., textbook, articles, internet, personal experiences • Responding to technical concerns

2.4.4 Recent studies about Community of Inquiry

The latest studies on Community of Inquiry are reviewed based on a recent systematic literature review published in 2018 by Stenbom. The Stenbom's review was expanded by including studies done from 01.01.2018 to 12.31.2019. The same limiters were implemented in that expanded review. Peer-reviewed articles between 2018 to 2019 with "Community of Inquiry" AND (survey or questionnaire) keyword in Scopus, Web of Science, and ERIC content providers were implemented. In total, 19 studies including Stenbom's review were obtained. One of 19 studies was not available, and one of the studies did not use CoI but referred to the keyword. Thus, the remaining 17 studies were included (See Appendix A for a list of the studies).

Stenbom (2018) reviewed the articles according to "bibliometric results (authors, journals, years), demographic results (participant sample size, country, the subject area of instruction, participants' level of education), the performed study (purposes of employing the CoI survey, Included CoI elements, Modifications of the survey, Additions to the survey, Other data, Statistical analysis methods), and lastly Synthesis of the results and conclusions (Validity and Reliability of data, Correlations and causal relationships, Results underpinned CoI survey, Online and Blended Learning, Synchronous and asynchronous interaction, Students' retention, disciplinary differences, and differences in learner characteristics)" (pp. 23-27). In that review, the author indicated that the majority of the studies were published by more than one author, in 47 different journals (mostly in Internet and Higher Education) with an accelerating trend from 2008 to 2017. The sample size ranged from 5 to 64,781. The majority (N = 55) of 103 studies were done in the United States. The most frequent instructional area was E-learning. The studies were mostly implemented at the undergraduate and/or graduate level. There were descriptive, comparative, and correlational studies. The studies included three components of CoI, and nine studies included new components like learner presence, emotional presence, or revised teaching presence as faculty presence/instructor social presence. According to the synthesis of results, the CoI was found/confirmed as a reliable and

valid tool in many languages. There was a positive correlation among the components of CoI. Causal relationships between other constructs/measurements like self-efficacy, effort regulation, and achievement. The studies compared online and blended delivery, and found results in favor of blended learning. Three studies dealt with synchronous/asynchronous delivery, and two found synchronous or combination of synchronous and asynchronous delivery as more effective, while in other studies, there was not a significant difference. Two studies measured the relationship between the student's retention and CoI. In one study, the social presence was found as an important predictor of persistence, while in another study, there was not an overall relationship, but item-based relationships existed. While items 1 and 25 were related to low disenrollment, 6 and 31 were related to high disenrollment. Concerning disciplinary differences, the harder disciplines preferred the direct instruction sub-category of teaching presence rather than facilitating discourse. Lastly, concerning learner characteristics, though most of the studies did not measure them, age and age/grade were found significant in a few studies.

In this complementary systematic review, 16 more were reviewed according to the same criteria followed by Stenbom's systematic literature review (2018). Two of the sixteen articles were published in Computers & Education Journal (Kovanovic et al., 2018; Kilis & Yıldırım, 2018), two were published in The Internet and Higher Education (Caskurlu, 2018; Hilliard & Stewart, 2019), and two were published in Online Learning Journal (Gurley, 2018; Oplak & Kiliç Çakmak, 2018), and each of rest was published in different journals like The Quarterly Review of Distance Education, BMV Medical Education, E-Learning and Digital Media, International Review of Education, Journal of Multilingual and Multicultural Development, European Journal of Engineering Education, Online Journal of Distance Learning Administration, EURASIA Journal of Mathematics, Science and Technology Education, Nurse Education in Practice, and Interactive Learning Environment. The sample size of the studies ranged between 24 (Redstone, Stefaniak, & Luo, 2018) and 1535 (Kilis & Yıldırım, 2018). All of the studies were conducted within a university setting in each in various subject areas like Learning Design and

Technology (Caskurlu, 2018), Medical education (Lee & Kim, 2018), Journalism (Baisley-Nodine, Ritzhaupt & Antonenko, 2018), Digital Content Marketing (Hsu & Shiue, 2018), Foreign Language Learning (Kim & Koh, 2018), and Information and Communication Technology (Kilis & Yıldırım, 2018).

In the reviewed fourteen studies, there was another literature review including articles published between 2007 and 2018 (Redstone, Stefaniak, & Luo, 2018), two confirmation studies (Caskurlu, 2018; Olpak & Kiliç Çakmak, 2018), two MOOC studies (Kovanovic et al., 2018; Gil-Jaurena & Dominguze, 2018). For the rest, one of the studies was implemented through Flipped Classroom setting (Lee & Kim, 2018), one was conducted in a setting enhanced with Twitter, and the rest were correlational, causal-comparative studies on sub-dimensions of CoI (Baytiyeh, 2018; Cutsinger, Wall, & Tapps, 2018; Chang-Tik, 2018; Gurley, 2018; Hilliard & Stewart, 2019; Hsu & Shiue, 2018; Kilis & Yıldırım, 2018; Kim & Koh, 2018; Smadi, Parker, Gillham, & Müller, 2019).

The synthesis of the results and conclusions showed that CoI is a valid and reliable tool (Caskurlu, 2018; Olpak & Kiliç Çakmak, 2018). An exploratory study exposed five factor-structure of the CoI model, which are "sense of belonging, self-directedness, self-actualization, interaction, and instructional guidance" (Baytiyeh, 2018, p.265). The results showed that there was a positive relationship between the three sub-dimensions of CoI (Baisley-Nodine, Rizhaupt & Antonenko, 2018). For MOOC related studies, one of the articles expanded the three-factor model with three additional factors, which are "course organization and design" as a sub-dimension of TP, "group affectivity" as a sub-dimension of SP, and "resolution phase of inquiry learning" as sub-dimension of CP (Kovanovic et al., 2018). In another MOOC study, results revealed that teachers' roles did not change through digital technologies have facilitated the evolution in education (Gil-Jaurena & Dominguze, 2018). Kilis and Yıldırım (2018) found that self-regulation, metacognition, and motivation significantly predicted CoI and its sub-dimensions, and they offered a new dimension regulatory presence to the tentative emergent model. Hilliard and Stewart (2019)

compared high blended and medium blended courses, and found that the perceived levels of TP, CP, and SP was higher in high blended (50% online) than the values perceived in medium blended courses (33% online). Smadi, Parker, Gillham, and Müller (2019) examined the level of awareness to use CoI in online and blended nursing courses in Australia and revealed that only 20% of the participants were aware of the CoI Framework, yet 90% thought it as essential. But, 70% of the respondents did not use any framework for instructional design.

2.5 Metacognition

The simplest definition of metacognition is made by Flavell in 1979 as cognition about cognition. Martinez (2006) stated that "metacognition is the monitoring and control of thought" (p.696). Although it is important to begin with definitions, we need to explicate the dimensions of the metacognition construct to understand the nature of it. Schraw (2001) stated that most of the researchers make a distinction between two dimensions of metacognition as knowledge of cognition and regulation of cognition (p.114).

Knowledge of cognition means the level of knowledge individuals have about their cognition or the meaning of cognition in general. Knowledge of cognition consists of their metacognitive awareness types as declarative, procedural and conditional knowledge. Regulation of cognition means some kinds of activities helping individuals to control their learning process (Flavell, 1987; Paris & Winograd, 1990; Hacker, 1998; Garrison, 2003; Murphy, 2008; Schraw, 2001; Shunk, 2012).

Three essential regulatory skills are stated as Planning, Monitoring and Evaluation (Schraw & Moshman, 1995), which are also called as metacognitive strategies (Jafarigohar & Mortazavi, 2016). Planning consists of choosing suitable strategies and distribution of resources affecting performance (Schraw & Moshman, 1995, 354). Questioning the nature of task, goal, the required strategies, time, and other kinds of resources are listed as regulatory planning skills (Schraw, 1998).

Monitoring is defined as someone's dynamic awareness of comprehending content and performing a task (Schraw & Moshman, 1995, 354). Thinking about whether someone understands a task clearly, questioning whether the task is meaningful, whether being on a way of achieving goals and assessing whether a change is needed or not are monitoring skills (Schraw, 1998). Evaluation means assessing the value of products and the regulatory procedure of learning (Schraw & Moshman, 1995, 354). Assessing whether the goal is reached or not, assessing the operative and inoperative components, deciding what to do in the next are considered under evaluation skills (Schraw, 1998).

Recently, researchers argue that there are three dimensions of metacognition. Pintrich, Wolters, & Baxter (2000) measures metacognition through three interdependent components as metacognitive knowledge, metacognitive judgment, and monitoring and self-regulation and control. Metacognitive knowledge like knowledge of cognition consists of declarative, procedural, and conditional knowledge concerning cognition, cognitive strategies, and task variables. While metacognitive knowledge is static, metacognitive judgments and monitoring are more dynamic and process-oriented components and deal with continuing metacognitive activities individuals may interest while performing a task. These metacognitive activities are task difficulty or ease of learning judgments, learning, and comprehension monitoring or judgments of learning, feeling of knowing, and confidence judgments. The third component of metacognition, self-regulation, and control include activities that individuals deal with to adapt and change their cognition. Planning activities like setting goals, time use; "strategy selection and use", "allocation of resources" and "volitional control" which refers to controlling and regulating motivation, emotion, and environment are four components of the third dimension of metacognition (Alexander, Schallert, & Hare, 1991; Pintrich, Wolters, & Baxter, 2000; Akyol & Garrrison, 2011).

With the movements in metacognition theories, there is a shift from individualistic developmental and cognitive models of metacognition to socially situated models

(Larkin, 2009, p.151). From this point of view, Akyol and Garrison (2011) bring a new perspective on the definition of metacognition. They state that activities within each dimension of metacognition reflect both individual and shared regulation of other people's metacognition. They mention three dimensions of metacognition as Knowledge of Cognition (KC), Monitoring of Cognition (MC), and Regulation of Cognition (RC). KC means the awareness of individuals; MC means the awareness of the thinking and learning process and lastly, the RC refers to the on-action dimension of individuals' learning experience. While KC is a more general aspect and can be observed anytime, MC and RC components occur during the process of learning. Thus, according to Akyol and Garrison (2011), in an online community of inquiry in which an individual has the opportunity to interact with others; metacognition is the total of "knowledge and skills to monitor and regulate manifest cognitive processes of self and others" (p.184). The dimension and regarding activities of metacognition construct within a community of inquiry are elaborated by Akyol and Garrison (2011) as in Table 2.2 below:

Table 2.2 Metacognition in Community of Inquiry

Knowledge of Cognition (KC) (Entering Knowledge/Motivation)	**Monitoring of Cognition (MC)** (Assessment/Task Knowledge)	**Regulation of Cognition (RC)** (Planning/Strategies)
Pre-Task Reflection • Knowledge of the inquiry process • Knowledge of critical thinking and problem solving • Knowledge of factors that influence inquiry and thinking • Knowledge of self as a learner • Entering motivational state • Knowledge of discipline • Knowledge of previous experiences • Expectancy of success	*Reflection on Action* • Declarative; judging • Commenting on task, problem or discussion thread • Asking questions for confirmation of understanding • Commenting about self's and others' understanding • Making judgments about validity of content • Commenting on or making judgments about the strategy applied • Asking questions about progression or stalling • Expressing emotions during learning • Assessing motivational	*Reflection in Action* • Procedural; planning • Setting goals • Applying strategies o Providing/asking for support o Challenging self or others o Asking questions to deepen thinking o Asking for clarification o Request information o Self-questioning • Questioning progression, success • Taking control of motivation and effort • Facilitating/directing • Inquiry

The recent recognition is that metacognition is not concerned with only individual activities (Akyol & Garrison, 2011). Even in 1987, Flavell argues that metacognition is required when individuals want or need to communicate and confirm their thinking with themselves and with other people. In that sense, metacognition is seen as a connection between internal knowledge and collaborative activities. The community of Inquiry presents a framework to support and sustain discourse through collaborative constructivist approaches that enable to consider metacognition construct with the context variables. (Akyol & Garrison, 2011; Garrison & Akyol, 2013).

2.6 Shared Metacognition

Garrison and Akyol (2015) state that parallel with the adoption of collaborative approaches in learning settings, individual and shared roles of learners as they meta-cognitively regulate their learning becomes a prominent issue. Ubiquitous communication technologies change the boundaries among learners and groups to a more blurred status. These changes call for needs such as how these collaborative environments might change how we think and how we share our understanding with others. Metacognition is seen as a crucial construct that is not just a self-regulated ability but also has a shared aspect. In more detail, in a community of inquiry, an individual has the opportunity to regulate his/her learning personally and according to group support and feedback. Individuals in a community of inquiry can construct personal meaning as well as can confirm his/her constructed meaning through the discourse with members of the group. Within the social aspect in mind, Garrison and Akyol (2015) developed the shared metacognition construct which includes two interdependent constructs as self-regulation and co-regulation.

Self-regulation (SR) means to self-constructed "thoughts, feelings, and actions that are planned and cyclically adapted to the attainment of personal goals" (Zimmerman, 2005, p.14). The process self-regulation is stated as cyclical since the feedback from

a previous performance is used to adjust current effort. Since personal, behavioral, and environmental factors are changing during the learning and performance; thoughts, feelings, and actions are adjusted using three self-oriented feedback loops as covert, environmental, and behavioral self-regulation. The reciprocal effects of personal, behavioral, and environmental factors on self-regulation are highlighted by other researchers as well (Meyer & Tuner, 2002; Patrick & Middleton, 2002).

Models of self-regulation are implemented in developmental psychology, cognitive psychology, and learning and instruction. When the theory of self-regulation is applied to the learning area, the name of construct changes to self-regulated learning (SRL), which "refers to strategic and metacognitive behavior, motivation, and cognition aimed toward a goal." (Volet, Vauras & Salonen, 2009, p243.). Zimmerman and Schunk (2011) defined SRL as the "processes whereby learners personally activate and sustain cognitions, affects, and behaviors that are systematically oriented toward the attainment of personal goals (p.1). The role of social situations in SR has changed during the last 20 years. The common idea in research on SRL has concentrated on personal learning situations; however, the approach that social context is important in SRL is affirmed in many studies, and research on the social aspects is continuing to increase (Volet, Vauras & Salonen, 2009; Hadwin, Järvelä & Miller, 2011; Panadero & Järvelä, 2015). These kinds of studies are "theoretically grounded in the Vygotskian (1930/1978) notions of Zone of Proximal Development and scaffolded guidance from other regulation to self-regulation" (Volet, Vauras & Salonen, 2009, p.216). The contextual variables which can contribute to the development of individuals are based on socio-cognitive theory, situated and distributed cognition studies, and sociocultural and simulative perspectives (Volet, Vauras & Salonen, 2009, p.216; Meyer &Tuner, 2002; Patrick & Middleton, 2002; Zimmerman, 2000). Across different perspectives on regulatory constructs, while self-regulation concentrates on the cognitive and metacognitive actions that an individual use to plan, obtain their goals; social regulation focuses on how individuals mutually regulate each other's cognitive and metacognitive processes and at sometimes share the courses of cognitive and metacognitive

regulation (Volet, Vauras & Salonen, 2009). That is, the learning process might be affected by instructors or other social agents in the learning community (Hadwin & Oshige, 2011). The level of social regulation is described with different terminology, and Co-regulation is one of these terms.

Co-regulation (CR) comprises an individual and another person who is more capable of sharing the regulation of an individual's learning process. Through the co-regulation process, the expert and novice roles are assumed by all participants during shared activity; in other words, as opposed socio-cognitive view of SRL, which focuses on external model and feedback for an individual, co-regulation stresses the emergence and sharing of regulation through a zone of proximal development (ZPD) (Volet, Vauras & Salonen, 2009; Hadwin & Oshige, 2011; Panadero & Järvelä, 2015). McCaslin and Hickey (2001) and McCaslin (2009) also state that CR is grounded directly on the "Vygotsky's (1962, 1978) idea of ZPD and social origins of higher psychological course of actions." (p.137) and define CR as a manifestation of ongoing interaction through ZPD. Hadwin and Oshige (2011) exemplify CR; that is, instead of a mother demonstrating how to tie a shoelace to her child, she can ask "what do you know about how to connect those two laces? How do you know when you have completed the first step completely? ..." in order to ease and share her child's demand of "meta-cognitively monitoring, evaluating and regulating the task processes" (p.247). That is, co-regulation in ZPD combines self-regulation and social and cultural components.

Recently, another concept emphasizing the social aspect of SRL has emerged, which is Socially Shared Regulation of Learning (SSRL) occurring as groups regulate collectively when they work on a shared task or have shared goals (Panadero & Järvelä, 2015). The meaning of SSRL is ascribed to the processes by which members of the group regulate mutual activities (Järvelä, Järvenoja, Malmberg & Hadwin, 2013). Panadero and Järvelä (2015) review the studies concerning the SSRL in order to determine features of it since it's a new and growing field. The most salient features of the SSRL have been identified as "joint cognitive and metacognitive

regulatory strategies (e.g. planning) and group motivational efforts and emotion regulation" (p.193). The level of social regulation is addressed differently. According to the results of a review conducted by Panadero and Järvelä in 2015 on 17 articles, co-regulated refers to an unbalanced regulation form "in which one or more group members regulate other member's activity; SSRL refers to a "more balanced approach to collaborative learning in which the group members jointly regulate their activity" (p.199). Hadwin, Järvelä and Miller (2011) state that "learners self-regulate, co-regulate and share their regulation of learning" as working on shared tasks (p.199). Hadwin, Järvelä, and Miller, (2011) contrasted SRL, CRL, and SSRL in terms of definition, task contexts, goal, pedagogical mechanisms, and research techniques as seen in Table 2.3. Panadero and Järvelä (2015) state that SR, CR, and SSRL should be considered as building up each other.

Table 2.3 Self-Regulated, Co-Regulated, and Shared Regulation of Learning

	SRL	**CRL**	**SSRL**
Definition	Strategically planning, monitoring, and regulating cognition, behavior, and motivation	Emergent interaction mediating regulatory work. Regulatory expertise is distributed amongst people and activity systems	Interdependent or collectively shared regulatory processes orchestrated in the service of shared outcome
*Task contexts**	Solo or collaborative	Solo or collaborative	Collaborative
Goal	Personal adaptation or independence in regulatory activity	Mediation of individual adaptation and regulatory competence (Instrumental for SRL)	Collective adaptation and regulation of collaborative processes. May not enhance SRL.
Pedagogical mechanism	Requires a more capable other to provide modelling, feedback and instrumental support	Requires distribution of expertise used to influence SRL (including situational affordance & constraints)	Requires equity and emergent co-construction among team members. Teams share monitoring, evaluation and adaptation processes
Research Techniques	Data about individuals and contexts; Self-report, observation, and trace data	Data about interaction and mediation processes; Micro-analytics discourse analysis techniques Analysis of activity systems and socio-cultural influences	Group level data Micro-analytic discourse analysis contextualized by macro level regulatory episodes; Calibration of individual goals, perceptions, and evaluations

**Solo tasks refer to those where an individual product or outcome is the primary goal. Students can work together on solo tasks. In collaborative tasks, a joint product or outcome is required (Hadwin, Järvelä, Miller, 2011, p.67).*

2.6.1 Recent studies about Shared Metacognition

A systematic literature review was conducted on the construct of shared metacognition through peer-reviewed journals from 1979 to 2019. A total of 33 studies were reviewed so as to form a valid coding scheme, explained in the Methodology Chapter, and to reveal ongoing research on the shared metacognition construct (See Appendix B for a list of the studies).

2.6.1.1 Conceptualization of Shared-Metacognition

According to ongoing research, the conceptualization of metacognition construct from a social perspective varies in terms of terminology. Social metacognition, socially shared metacognitive regulation, and socially shared metacognition terms are the most used terms. Panadero & Järvelä (2015) present a literature review socially shared regulation of learning. In total, 17 articles were reviewed through a narrative review. The review showed that socially shared regulation of learning exists in comparison with other types of social regulation like Co-regulation. This construct is studied through mixed methods. The articles also manifested SSRL as collective regulation of cognition, emotion, motivation, behavior, and metacognition (stated by Zheng (2017a) and Zheng (2017b) as well. They discussed SSRL with socially shared metacognition and argued that SSRL is a broader term including motivation and emotions in addition to cognition and metacognition aspects. Concerning practical implications, they stated that there is a lack of research on pedagogical and environmental factors that might trigger SSRL. Chiu and Kuo (2009) published a conceptual paper on social metacognition. They defined social metacognition as “group members’ monitoring and control of one another’s knowledge, emotions and actions” (p.321). Social metacognition construct was compared with metacognitive construct, and social metacognition was stated as enabling reciprocal scaffolding instead of self-scaffolding, enabling reciprocal motivation, distributing metacognitive demands by dividing duties, and with more

brain sources, increasing metacognitive visibility through social expressions, and improving individual cognition. Lastly, four categories of difficulties were stated on social metacognition. Scaffolding mismatch due to mis-scheduled time and resources and choosing unsuitable strategies; shared management problems dues to disagreement and emotional statements; status effect due to distorting evaluations and reduced participation; communication problems and cultural differences. Chan (2012) discussed the concept of co-regulation in computer-supported collaborative learning environments. Chan (2012) examined two research papers of Saab et al.'s (2012) and Janssen et al.'s (2012) on kind of regulation activities. In Saab et al's (2012) paper, regulation is stated as task regulation and co-regulation, In Janssen et al.'s (2012) paper, four types of collaboration activities were stated: "task-related activities, regulation of task-related activities, social activities and regulation of social activities. (p.66). Chan (2012) suggest conducting collective regulation and social metacognition studies by conducting instructional experiments.

2.6.1.2 Domains of Study on Shared-Metacognition

Across the body of empirical research, it is explicitly shown that Shared Metacognition enhances/supports the learning process in many subject domains in a variety of contexts. In one of the early studies, Larson & Gerber (1978) studied the effect of social metacognitive training for supporting behavior in learning disabled versus low achieving delinquents between the age of 16 to 19. The results indicated that social metacognition improved behaviors in both groups. Social metacognition was stated as a mechanism for both treatment and mediating overt behaviors in novel contexts. SSMR, for short, is mostly investigated in problem-solving settings. Goos & Galbraith (1996), for example, studied monitoring behaviors of 2 secondary school students in collaborative problem-solving. Verbal protocols of students were analyzed and results showed that even though students benefited from using metacognitive roles, useless social interactions blocked the progress. Metacognitive decisions were categorized as implementation, transition, exploration, planning,

verification. Type of decisions was also coded as a local assessment, new information, or new procedure. The roles followed were idea generator, checker, procedural assessor. They discussed their results based on the Zone of Proximal Development theory and stressed the need for mutual respect, equal distribution of knowledge, equal distribution of power for effective collaboration. In another study, Goos, Galbraith, and Renshaw (2002) investigated socially shared metacognition in small group mathematical problem-solving. They used the coding scheme developed in their previous study (Goos & Galbraith,1996). The episodes were parsed into "Reading, Understanding, Analysis, Exploration, Planning, Implementation and Verification". The metacognitive function of the episodes was coded as "new idea, assessment of a strategy, assessment of a result, assessment of knowledge or understanding" (pp.198-199). The coding scheme is further modified as grouping codes according to the definition of collaboration. Thus, the orientation of action was coded as self-disclosure to explain, evaluate, justify self-thinking; feedback request to ask a person to criticize self-thinking, and other monitoring statements to understand others' views. Results revealed that students' lack of critical thinking and poor metacognitive decisions were related to unsuccessful problem solving, whereas fruitful results were favored in case of students challenged and disposed of unhelpful thoughts and effectively supported valuable techniques. In another problem-solving related study, Iiskala, Vauras & Lehtinen (2004) aimed to present how metacognition is exerted in collaborative problem solving on mathematical word problems. In this qualitative study, two ten-years of high achieving students' verbal and nonverbal communication. The results revealed that the metacognition construct has both individualistic and interpersonal conception. The individualistic metacognition conceptions like awareness, monitoring, and regulatory skills should be investigated on the inter-individual level as well, and these processes can be called as socially-shared metacognition, but it is further argued that the terminology on that construct is scattered. The terms like socially mediated metacognition, social metacognition, collective metacognition lack the mutuality, sharing of metacognition, and simultaneity. Similarly, Iskala, Vauras, Lehtinen, & Salonen (2011) explored how

socially shared metacognition emerges in collaborative problem-solving processes on the mathematical subject domain with pairs of high-achieving students. The results showed that the frequency and length of the socially shared metacognition episodes were statistically more in relatively difficult problems than in easy problems. Metacognitive experiences seemed to trigger socially shared metacognition. The function of socially shared metacognition episodes was coded as either Facilitate, Activate, Confirm, Inhibit, Slow, Change, or Stop. Episodes were also coded as metacognitive experiences if they referred to feelings, judgments/predictions, and task knowledge. Statements concerning feelings on task difficulty, estimating time, or knowledge on task features were stated as examples of metacognitive experiences. Chen, Chiu, & Wang (2012) argued that when students agree/disagree or make correct evaluations, their action affects the direction of the discussion. In the study, 894 messages on mathematical problem solving were analyzed via statistical discourse analysis. The results indicated that social metacognition, justification, and correct-new ideas in the messages increased the probability of correct new ideas. It was suggested that teachers support the correct new idea creation by encouraging students to support their ideas with a rationale, evaluate others' ideas, and ask questions. De Backer, Van Keer & Valcke (2015b) examined SSMR in reciprocal peer tutoring groups. Video recordings of randomly selected groups were analyzed through a literature-based coding scheme. The results indicated that groups' engagement in SSMR was significantly increased by both cognitively and metacognitively oriented transactive (interactive/operational) discussions. Iiskala, Volet, Lehtinen & Vauras (2015) investigated how SSMR is manifested in asynchronous computer-supported collaborative learning. 640 notes from a group discussion were analyzed. The results indicated that SSMR has different functions, mainly intervening with the unsuitable direction of continuing cognitive acts, and SSMR was visible in all parts of the process. Hurme, Merenluoto, & Järvelä (2009) examined how shared metacognition emerges regarding an individual's feeling of difficulty. The study was conducted with 2 groups of 3 pre-service primary teachers who were taking a computer-supported mathematics

course. The results revealed that as the socially shared metacognition occurs, the feeling of difficulty decreases, and as an important point, those students having adequate meta(cognitive) skills start the activity, and then others comment on them. As a coding procedure, cognitive, metacognitive, and social statements were separated from each other. Metacognition regulation statements were determined if it is related to the discussion, having a rationale, and have an intention to "interrupt, change or promote" the collaborative process (p.509).

Shared metacognition was studied in other subject-domains as well. In one of the studies, Hurme, Järvelä & Palonen (2006) aimed to examine the metacognition construct in joint discussion in a computer-supported collaborative problem-solving environment in the geometry field. Computer notes of 16 students were categorized as either metacognitive knowledge, metacognitive skills, or not metacognitive. While metacognitive knowledge sub-categorized as a person, task, and strategy, metacognitive skills were coded as planning, monitoring, and evaluation. According to the results, planning skills were never attained. When the student pairs monitored and evaluated the continuing discussion, they were in a favorable position. Larkin (2009) referred to regulatory processes as planning before acting, monitoring during the action, and the evaluation of progress and learning outcomes. 5-7 years old children's peer construction of metacognition was investigated in writing tasks. Though the qualitative analysis of observation data, field notes, the results showed that those children are capable of employing metacognitive talks and construct written text collaboratively and intentionally. However, the teacher's questions did not always promote metacognitive dialogs. Khosa & Volet (2014) developed and used a three-stage coding scheme including the social regulation and content processing constructs. They examined the role of metacognitive regulation in controlling the cognitive activities' flow during collaborative learning of two groups working on a science subject. According to results, high-level engagement with the content was related to better understanding. The study also demonstrated how to apply a coding scheme on data to explore the nature and function of SSMR. De Backer, Van Kerr, & Valcke (2015b) mentioned orienting, planning, monitoring, and

evaluation as key components of metacognitive regulation. They discussed monitoring components as collaboration monitoring and comprehension monitoring. Additionally, they separated metacognitive regulation as deep-level learning and low-level learning. For example, if a participant just comments on process or learning, her/his comments are low-level evaluation statements, but if both are judged, it is called a high-level evaluation. They studied with 64 first-year Educational Science students. They chose five peer tutoring groups to investigate whether low-level /deep-level regulation is related to socially shared regulation. The results revealed that reciprocal peer tutoring groups' SSMR and tutee-prompted co-regulation increased significantly, but tutor-prompted co-regulation evolved negatively. Rapchak (2018a) examined and compared students' metacognitive awareness and social metacognitive awareness scores in a face to face and online information literacy course. A Metacognitive Awareness Inventory and a Social Metacognitive Awareness Inventory were used for data collection. Independent samples t-test results revealed no significant mean difference ($p = .491$) on metacognitive awareness scores between face to face and online group. The ANCOVA was conducted by taking metacognitive awareness as a covariate, enrollment to face to face and online sessions as an independent variable, and social metacognition scores as the dependent variable. Thus, in spite of similar metacognition scores, students in online sessions had significantly lower values than those in the face-to-face sessions. Students in both sessions were required to work collaboratively. They were suggested to determine roles by themselves. In the online session, students used the discussion board to collaborate. In face-to-face sessions, they worked in class on the same assignment.

2.6.1.3 Shared-Metacognition in Community of Inquiry

The shared-metacognition construct is studied through the Community of Inquiry Framework since the CoI Framework's complex and dynamics components provide a comprehensive perspective. Akyol & Garrison published a series of studies on

metacognition in 2011, 2013, and 2015. In 2011, they aimed to develop a metacognition construct to be used to measure metacognition in an online community of inquiry. Akyol & Garrison (2011) hypothesized metacognition construct having three dimensions, which are knowledge of cognition, monitoring of cognition, and regulation of cognition theoretically. Garrison & Akyol (2013) tested the hypothesized metacognition construct for the community of inquiry. However, factor analysis did not confirm the hypothesized model, and they argued that this construct needs revision by considering individual and shared components of the metacognition. Thus, in 2015, they developed a shared metacognition construct for collaborative learning environments. They discussed that there is a shift from individualistic models to social models, further stated that metacognition is not a just a self-regulated activity anymore, but regard Co-regulation and shared regulation issue, and stated that these two components as interdependent. They explored monitoring and managing factors for self and Co-regulation, but these constructs did not resolve through Varimax rotation. They explained this as the inter-dependence of these constructs, latent structure of shared-metacognition, or due to the nature of quantitative studies, which is not an ideal way of measuring metacognition, but discourse is thought as the best way of measuring metacognition. In addition to the developing and offering shared-metacognition construct, they pointed out that the community of inquiry framework offers methodological and theoretical tools to study the sophistication of metacognition construct in a collaborative environment. How to enhance shared-metacognition in collaborative settings, the types of instruction/instructional tools to promote shared-metacognition, time how shared metacognition changes over are suggested as research considerations (Garrison & Akyol, 2015).

2.6.1.4 Frameworks and Design Principles on Shared-Metacognition

Kim & Lim (2018) proposed 5 principles and a framework to be used in collaborative project-based learning environments to promote socially shared metacognition. The

principles are: “1) provide sufficient opportunities to monitor team progress, 2) have students identify potential issues, 3) encourage students to discuss possible solutions, 4) promote the efficient use of team resources through task prioritization, and 5) have students assign each team member to specific task” (pp.196-198). Based on the offered literature-based principles, they illustrated a Framework showing the three phases of the metacognitive process as Planning, Monitoring, and Evaluating. Inside that cycle of metacognitive phases, four main steps to be followed for coordination of teamwork were listed. Through following collaboration scripts, group members are required to “identify potential issues”, “discuss possible solutions”, “prioritize tasks”, and “assign roles”, respectively (p.199). Collaboration scripts are prepared according to the framework and followed continually until the group members achieve the goal. Based on these framework and design principles, they developed collaboration scripts and implemented them in an educational psychology course with 32 university students. Results indicated that collaboration scripts enhance SSMR in terms of knowledge construction and team planning.

Borge & White (2016) proposed a framework to be followed in a co-regulated collaborative learning environment to enhance learners’ socio-metacognitive expertise. The Framework includes two main phases, as Before Collaboration, at which the systemic support is required to be established. This step includes the main preparation such as organizational change consisting of change at norms, values, preparation of new tools, etc.; models of competence include the prototypes or representations of planned collaboration process for students; and preparing rules and aligning them with cognitive tools and distribution of workload. At the During the Collaboration step, similar to Kim & Lim (2018)’s framework planning, the practice of activity and reflection phases are listed and stressed with the keyword joint for planning and reflection parts. Joint process planning is detailed with determining group goals, deciding problems, offering strategies, and distributing roles. At the practice phase, students are required to repeatedly practice the activity. Some structured guidance or visual clues are suggested to enhance this phase. Lastly,

at the reflection phase, learners should compare, evaluate their status with the desired one.

2.6.1.5 Collaboration Roles

Although there is not a unified classification/definition of roles to regulate shared metacognition or collaboration in OCL, there are plenty of studies examining the observed roles or assigned roles, some of which are focused on group regulation, whereas others stress task-related roles.

Chiu (2000) classified collaboration roles as Facilitator, Proposer, Supporter, Critic, and Recorder. Each role is defined with strategies and individual actions. The Facilitator invites others to participate via questions and comments; monitor group process through supportive critical evaluation; softens criticism through critical questions, and balances support and criticism via adjacent supportive and critical evaluations. The Proposer offers new ideas; the Supporter shows advantages and elaborates on the ideas; The Critic shows drawbacks and offers alternatives, and the Recorder summarizes the group ideas and progress.

Borge & White (2016) proposed the collaborative roles/responsibilities be assigned at the joint planning phase in their aforementioned framework. The four roles are "Collaboration Manager (joint planning), Communication Manager (collective information synthesis), Mediation Manager (collective knowledge negotiation), and Productivity Manager (collective productivity)" (p.329). Each responsible lead his/her responsibility in an interdependent way with other group members. Collaboration Manager and Productivity Manager, which are responsible for planning and reflection parts respectively, regulate the group together. On the other hand, Communication and Medication Manager are required to monitor and regulate the discourse. The naming of these roles was arranged according to 10 years old learners.

Volet, Vauras, Salo, & Khosa (2017) developed a coding scheme based on Benne & Sheats' (2007) role categorization. The roles are categorized as content focused (Information seeker, Information giver, Knowledge seeker, and Knowledge seeker); performance-focused (Opinion seeker, Opinion giver), Evaluation focused (Follower, Supporter, Challenger), and social role (Harmonizer) (p.84). Content-focused and evaluation focused roles were task-oriented roles. The performance role has the characteristics of the coordinator role (Belbin 1993).

Benne and Sheats (2007) classified these roles under three broad categories, which are "Group task roles, group building and maintenance roles, and Individual roles." (p.31). Group task roles (The Initiator-Contributor, The Information Seeker, The Opinion Seeker, The Information Giver, The Opinion Giver, The Elaborator, The Coordinator, The Orienteer, The Evaluator-Critic, The Energizer, The procedural Technician, The Recorder) function for facilitating and coordinating group to solve the problem and related solution; Group building and maintenance roles' (The Encourager, The Harmonizer, The Compromiser, The Gate-Keeper-Expediter, The Standard Setter, Ego Ideal, The Group-Observer-Commentator, The Follower) orientation is toward to regulating group as a group, and Individual roles (The Aggressor, The Blocker, The Recognition-Seeker, The Self-Confessor, The Playboy, The Dominator, The Help-Seeker, The Special Interest Pleader) is about the member's specified needs and satisfactions (pp.31-33). Benne and Sheats (2007) assumed that group members can handle/be assigned more than one role, the load is distributed among leaders and members. The goal is to choose to define and solve the group problem. This classification is based on studies done in 1947 at the First National Training Laboratory in Group Development.

2.6.1.6 Technology Supported Regulation Systems, Scripting, and Metacognitive Scaffolding

The CREATE is a computer-supported online regulation system developed to promote socio-metacognitive expertise (Borge, Ong, & Rose, 2018; Borge &

Shimoda, 2019). The chat module of the system includes two main parts, which are Discussion and a Workspace. While students communicate at the discussion part, tabs at the Workspace part are opened at a time. These tabs are "Plan, Chat, Reflect and Monitor" (Borge, Ong, & Rose 2018, p.73; Borge & Shimoda, 2019, p.167). Plan orients student to do their future discussion meetings and the regarding objectives, reminders; At the Chat tab, topic, its length description of parts, and description for the time of using Reflect and Monitor tabs are written. In the Reflection part, an interactive list of criteria is given to make students rate their performance. The items are "Verbal Equity, Joint Idea Building, Develop Joint Understanding, Contributing Alternative Ideas, Quality of Claims, Norms of Evaluation and Affect" (Borge & Shimoda, 2019, p.169). The average score of each item is shown at the Monitoring part, and members use this information to determine/evaluate their strengths and weaknesses, the well-working strategies, and to create their group strategy.

Collaboration scripts are a kind of scaffold explicitly orienting students to structuring the group activity in small groups. Scripts include guidance about the order of tasks, share the learning activities or roles among the members (Kollar, Fischer, & Hesse, 2006). CASSIS is another learning environment integrated with scripts/scaffolds on roles. Two roles, analysts and critics, were prompted to learners. The analyst was required to conclude analyses of the given case and answer his/her peer's critiques. The Critic was required to criticize his/her partners' analyses. To execute the roles, some exemplary prompts were sent such as "constructive critic" or "Regarding your suggestions for modifications" (Wang, Kollar, & Stegmann, 2017, p.160). The scripts were sent through the CASSIS, and it is named as adaptive scripting, which is defined as scripts sent via an intelligent system measuring/monitoring group members' levels and adjust scripts based on that data. The adaptative feature of that system was to allow the learners to choose which role they want to play. The CASSIS online system includes a description of a task, timer, orientation map, discussion map, and, a case text (Wang, Kollar, & Stegmann, 2017, p.160).

Metacognitive scaffolding is a similar technique used to foster metacognitive regulation skills. Existing research on the role of metacognitive prompts at the intraindividual level has revealed that such prompts enhance monitoring and planning metacognitive skills (Berthold et al., 2012). De Backer, Van Kerr, and Valcke (2015b) implemented Reciprocal Peer Tutoring (RPT) in their study. RPT means the exchange of tutor roles between peers. The tutor is responsible to scaffold the other through questioning and explanations. The results of the study revealed a significant positive change in socially shared metacognitive regulation, which is correlated with "orientation, planning, monitoring, and deep-level regulation" (p.63). Molenaar, Chiu, Sleegers, and van Boxtel (2011) investigated the effect of scaffolding on the metacognitive activities of students in a small group. Students were provided with metacognitive scaffolds by an avatar in a virtual learning environment, called Ontdeknet. Two versions of computerized scaffolds, structuring or problematizing, were provided to learners. An exemplary structuring scaffold was "Here you introduce yourself, for example, I am David, 15 years old and like playing games and listening to music!"; whereas, a problematizing scaffold was like "How are going to introduce yourself?" (p.794). Molenaar, Sleegers, and van Boxtel (2014) also explored that groups provided with problematizing scaffolds demonstrated significantly more co-constructed social metacognitive interaction in comparison with groups received structured scaffolds (p.309). Jafarigohar & Mortazavi (2016) explored the effect of motivational scaffolds on individual and socially-shared metacognition of English as foreign language learners. The Mann-Whitney U test results showed that motivational scaffolds significantly enhanced metacognition strategies, which are planning, monitoring, and evaluation, in both inter and intra-individual levels. The researchers conducted another study in 2017 on the effect of structuring and problematizing scaffolds on learners' individual and socially shared metacognition levels in English writing tasks. Socially shared metacognition was measured through coding think-aloud protocols. The researchers' followed Iiskala's studies in 2004 and 2011 to determine the episodes of shared metacognition. Thus, considering mutually each other, and trying to regulate and monitor other's cognitive

processes are determined as criteria for shared metacognition episodes. The results showed that both structured and problematizing scaffolds statistically increased individual and shared metacognition levels. When these two scaffold types were provided together, they contributed individual and shared metacognition more effectively. Learners' proficiency levels did not a moderate effect of two scaffold types (Jafarigohar & Mortazavi, 2017).

To sum up, the literature review shows that the shared metacognition construct is supported by Vygotsky's socio-cultural theory, distributed cognition theory, and the CoI framework, which aligns with Dewey's perspective. The collaborative, constructivist philosophy of CoI argues that personal meaning is constructed through a transactional and collaborative effort. Metacognition is seen a crucial construct that is not just a self-regulated ability but also a shared aspect. Recent studies on shared metacognition deal with embedding metacognitive scaffolding, use of collaboration scripts, developing design principles, frameworks, and developing technology-enhanced regulation systems. However, the existing studies don't draw a holistic methodological and theoretical picture of how to distinguish different types of collaboration episodes, and to define the terminology, which is still lack congruence. Deciding on the episode types, defining the nature of shared-metacognition, and using shared-metacognition as a leverage through the iterative nature of instructional design have been decided to be investigated based on the results of the existing studies.

CHAPTER 3

METHODOLOGY

In this chapter; research questions, research design, participants of the study, data collection tools, data analyses procedure, instructional design, researcher's role, validity, reliability, credibility, consistency, transferability and ethics are presented

3.1 Research Questions

The purpose of this study was to investigate the components of CoI, which are cognitive, social, teaching presence, and the components of SM, which are individual monitoring, individual regulation, group regulation; and to develop instructional design principles with respect to these components in synchronous OCL environments. Additionally, the possible systemic factors/group dynamics affecting student's cognitive, social, teaching presence and shared metacognitive regulation were explored in order to provide an integrated perspective of interdependent shared regulatory mechanisms and components of community of inquiry.

The research questions categorized under five categories are listed below:

1. *Community of Inquiry*
    - 1.1. What are the students' perceived community of inquiry levels (Cognitive presence, Teaching Presence, Social Presence) in synchronous OCL environments?
    - 1.2. Is there any significant difference on perceived community of inquiry levels of students by Design 1, 2 and/or 3?

2. *Shared Metacognition*
    2.1. What are the students' perceived shared metacognition levels in synchronous OCL environments?
    2.2. Is there any significant difference on shared metacognition levels of students by Design 1, 2 and/or 3?
3. *Group Utterances*
    3.1. What kind of community of inquiry utterances are visible/observed in synchronous OCL environments?
    3.2. What kind of shared regulative utterances are visible/observed in synchronous OCL environments?
4. *Group Dynamics*
    4.1. What are the students' perception levels on group dynamics (perceived learning, individual performance, group performance, task difficulty, role distribution, evaluation phase, planning phase) in synchronous OCL environments?
    4.2. Is there any significant difference on perceived group dynamics levels of students by Design 1, 2 and/or 3?
5. *Design Principles*
    5.1. How should synchronous OCL environments be designed by considering shared metacognitive regulation?

3.2 Research Design

In the study, Design Based Research (DBR) (Baumgartner et al., 2003), introduced as Design Experiments by Ann Brown in 1992, approach was used. DBR is one of the research paradigms advancing design, research and practice simultaneously (Wang & Hannafin, 2005, p.5). DBR, as a both systematic and flexible method, focuses on improving educational processes by following instructional design steps through collaboration among researchers and instructors in the real instructional setting (Anderson & Shattuck, 2012).

DBR studies as *being situated in a real educational setting* contribute to the validity of the research, and help to improve and evaluate the educational practice at least in the studied and also similar contexts (Anderson & Shattuck, 2012; Wang & Hannafin, 2005). In such a pragmatic way, the gathered refinements affect both the theory of investigated subject and the practice in which the research is situated (Wang & Hannafin, 2005). In this study, the construct of shared metacognition and components of online community of practice is examined both to explore the observed indicators to improve the theory of the constructs, and provide instructional design principles to contribute instructional practice.

DBR is also a collaborative, iterative and a flexible methodology. Researchers participate in the instructional design process and educational practice, and works collaboratively with the practitioners through an iterative design process (Reeves, Herrington & Oliver, 2005; Wang & Hannafin, 2005). The creation of the base design starts with the examination of the local context and enriched by related literature, theory and practice from other contexts to solve some problem or improve the local practice. In this study, a pilot study was conducted to investigate the appropriateness of the online instructional settings for examining shared metacognitive regulation construct. The base design was refined according to experience gathered from this local context and enriched by existing literature. The researcher and the practitioners worked collaboratively to refine the multiple designs. The partnership between practitioner and the researcher was developed through negotiations on defining learning outcomes and objectives and ground them into rigorous research design instead of following a pure functional a-theoretical sense.

DBR is a pragmatic and grounded methodology. That is, the results contribute both the theory and the practice (Wang & Hannafin, 2005). In this study, in tandem with investigation of the shared metacognition construct in online collaborative settings through community of inquiry framework, design principles were suggested to be used in such educational practices. Thus, both theoretical and practical benefits were considered. While considering embedding design into real setting, the design

refinements were driven/grounded from theory, research and practice. The base design in the first design was decided according to the pilot study results and existing literature.

DBR is an integrative methodology and mostly agnostic in terms of selecting research tools and techniques (Anderson & Shattuck, 2012; Wang & Hannafin, 2005). In order to increase the credibility of research, mixed research methods are used (Wang & Hannafin, 2005). In this study, both quantitative and qualitative research techniques were converged over two cases. After first and second designs, focus group interviews and at the end of third design one to one interview were conducted. The researcher participated in instructions as a practitioner to observe the instructional design process for planning of any refinement for the next design. At the end of the third design, one to one interview was done. Immediately after each design, Likert questions to assess student perceptions on design dynamics, shared metacognition and community of inquiry questionnaires were administered. The synchronous activity posts were read and archived for content analysis.

3.3 Participants of the Study

3.3.1 Selection of Cases

The participants of the study were determined purposefully based on specific criteria, called as a purposive sampling method under nonrandom sampling methods (Creswell, 2012). Two groups/cases of university students were chosen on specific criteria. The limiters of these cases were being fully online courses at higher education level, being volunteer for the instructional design implementation. Sample size of the cases was another criterion so as to form groups to create collaborative activities. Instead of choosing one case of study, two cases were studied to increase the transferability of the design principles. The first case consisted of two sections of associate degree (two-year program under graduate level) Medical Terminology course. The other case was graduate level Quantitative Research Methods course

consisting two sections. The two sections of both Case were taught by the same instructor on the same topics. Only difference between the sections was one-hour delay on starting time of the weekly online group activities. Therefore, two sections of each course were evaluated/merged under the same case, named as Case I and Case II.

In Case I, there were 68 students *(F = 61, M = 7).* The age average of the case was about 23. Participants were the first-grade students at the department of Medical Documentation and Secretarial program at a public university vocational school of health services in Turkey. The program is a two year fully online associate degree program, in which students are required to complete at minimum number of 30 credits at a term (See Table 3.1. and Table 3.2.).

Table 3.1 Gender of participants in Case I

	Frequency	***Percent***	***Valid Percent***	***Cumulative Percent***
Female	61	89.7	89.7	89.7
Male	7	10.3	10.3	100.0
Total	68	100.0	100.0	

Table 3.2 Age of participants in Case I

	N	***Min.***	***Max.***	***M***	***SD***
Age	68	17	37	22.94	5.32

Participants Online Learning Readiness were also measured at the beginning of the study. Descriptive values for OR: Online Readiness, CISE: Computer Internet Self Efficacy, SDL: Self-Directed Learning, LC: Learner Control, MFL: Motivation for Learning, OCSE: Online Communication Self-Efficacy were reported on Table 3.3 below:

Table 3.3 Online Learning Readiness Scores of participants in Case I

	N	*Min.*	*Max.*	*M*	*SD*
CISE	65	2.33	5.00	4.00	.65
SDL	65	2.40	5.00	3.96	.57
LC	65	2.00	5.00	3.68	.68
MFL	65	2.50	5.00	3.92	.59
OCSE	65	1.67	5.00	3.88	.69
OR_Total	65	2.00	5.00	3.88	.53

CISE: Computer Internet Self Efficacy, SDL: Self-Directed Learning, LC: Learner Control, MFL: Motivation for Learning, OCSE: Online Communication Self-Efficacy

In Case II, there were 15 students (*F = 5, M = 10*). The age average of the case was about 29 (See Table 3.4. and Table 3.5). Participants were the second-grade students at the department of Instructional Technology Graduate Program and Elementary Education at a public university in Turkey. These programs were a two-year fully online graduate degree program, in which students are required to complete 30 credits at a term. Quantitative Research Methods course was compulsory for both programs, and given by the same instructor.

Table 3.4 Gender of participants in Case II

		Frequency	***Percent***	***Valid Percent***	***Cumulative Percent***
Valid	Female	5	33.3	33.3	33.3
	Male	10	66.7	66.7	100.0
	Total	15	100.0	100.0	

Table 3.5 Age of participants in Case II

	N	***Min.***	***Max.***	***M***	***SD***
Age	15	24	37	29.87	4.78

Descriptive values for OR: Online Readiness, CISE: Computer Internet Self Efficacy, SDL: Self-Directed Learning, LC: Learner Control, MFL: Motivation for Learning, OCSE: Online Communication Self-Efficacy were reported on Table 3.6 below:

Table 3.6 Online Learning Readiness Scores of participants in Case II

	N	*Min.*	*Max.*	*M*	*SD*
CISE	15	3.00	5.00	4.40	.62
SDL	15	3.00	5.00	4.16	.62
LC	15	3.00	5.00	3.91	.67
MFL	15	3.25	5.00	4.38	.54
CSE	15	2.33	5.00	4.11	.75
Total	15	3.39	4.94	4.20	.51

CISE: Computer Internet Self Efficacy, SDL: Self-Directed Learning, LC: Learner Control, MFL: Motivation for Learning, OCSE: Online Communication Self-Efficacy

3.3.2 Selection of participants for descriptive statistics and non-parametric tests

From 68 students in Case I, 26 students were chosen in order to answer statistical change on CoI, SM, and group dynamics levels. These 26 students *(F* = 25, *M* = 1) were those who participate all three designs in order not to include missing values for the Friedman Tests. The age average of the case was about 22.85 (See Table 3.7. and Table 3.8).

Table 3.7 Gender of Nonparametric Test Participants in Case I

	Frequency	***Percent***	***Valid Percent***	***Cumulative Percent***
Female	25	96.2	96.2	96.2
Male	1	3.8	3.8	100.0
Total	26	100,0	100.0	

Table 3.8 Age of Nonparametric Test Participants in Case I

	N	***Min.***	***Max.***	***M***	***SD***
Age	26	18	36	22.85	5.51

Similarly, from 15 students of Case II, 9 students (*F = 4, M = 5*). were chosen according to same criteria. The age average of the case was about 29.89 (See Table 3.9. and Table 3.10).

Table 3.9 Gender of Nonparametric Test Participants in Case II

	Frequency	***Percent***	***Valid Percent***	***Cumulative Percent***
Female	4	44.4	44.4	44.4
Male	5	55.6	55.6	100.0
Total	9	100.0	100.0	

Table 3.10 Age of Nonparametric Test Participants in Case II

	N	***Min.***	***Max.***	***M***	***SD***
Age	9	24	37	29.89	5.04
Valid N (listwise)	9				

3.3.3 Selection of sub-activity groups for content analysis

Two sub-activity groups were chosen purposefully for the content analysis. Due to the irregular participants, members of the sub-activity groups had to be changed through the designs (See Appendix C for group lists). Therefore, a stable sub group was chosen among the groups to control possible internal validity threat that might occur due to the irregular participation or due to participant characteristics. The demographics (gender, age, working status and online readiness scores' mean value) of the content analysis sub-groups for two cases are given below on Table 3.11. and Table 3.12):

Table 3.11 Content Analysis Group Participants in Case I

Participant	*Gender*	*Age*	*Working status*	*Readiness*
C1AyK	Female	20	No	3.83
C1AsK	Female	23	No	4.39
C1BA	Female	22	No	3.76
C1SBEC	Male	20	Yes *(Medical secretary)*	3.83

Table 3.12 Content Analysis Group Participants in Case II

Participant	*Gender*	*Age*	*Working status*	*Readiness*
C2EK	Female	27	Teacher	3.94
C2Tİ	Female	24	Teacher	4.72
C2MVO	Female	35	Teacher	4.00
C2SAE	Female	35	Teacher	4.17
C2FK	Male	27	Teacher	4.28

3.3.4 Selection of interviewees

Additionally, one-to-one interviews were conducted at the end of the design process. Though the aim was to get as much as opinions, interviewees were chosen purposefully from those who attended activities poorly and relatively highly in order

to deep rich and deep data. All volunteer participants were interviewed to reach data saturation. Fifteen students from Case I *(N=15)* and 13 students *(N= 5, M=8)* from Case II participated into interviews (See Appendix Q and R for interviewee information).

To sum up, firstly, two cases (I and II) were determined purposefully, which consisted of 68 students and 15 students, respectively. Those participants were the source for the observational field notes and the focus group interviews. For CoI, SM, group dynamics' descriptive statistics and non-parametric tests, 26 from Case I and 9 students from Case II were chosen. For content analysis of group posts, two stable sub-activity groups were chosen from each case. Lastly, for one-to-one interviews 15 students from Case I and 13 students form Case II were chosen (See Table 13).

Table 3.13 Summary of Participants

Selection of participants	**Case I**	**Case II**	**Data Analyses**
Cases	68 students *(F = 67, M =1)*	15 students *(F = 5, M =10)*	Observational field notes, focus group interviews
Sample for descriptive statistics and non-parametric tests, focus group interviews	26 students *(F = 25, M =1)*	9 students *(F = 4, M =5)*	Descriptive of CoI, SM and group dynamics, Friedman and Wilcoxon Tests
Sample for group utterances	4 students-1 group *(F = 3, M =1)*	5 students-1 group *(F = 4, M =1)*	Content analysis of discussion posts
Sample for one-to one Interviews	15 students *(F=15)*	13 students *(F= 5, M=8)*	One-to-one interviews

3.4 Data Collection Instruments

The qualitative and quantitative data collection instruments are elaborated under this heading. For measuring Online Readiness and Community of Inquiry, adapted version of questionnaires were used. For measuring Shared Metacognition, Shared-Metacognition Questionnaire was adapted in Turkish for this study. In order to

analyze student posts, a literature-based coding scheme was formed. Focus group and one-to-one interview questions were prepared according to components of CoI and SM and based on the design refinements (adding planning, evaluation phases, role and etc.) through the designs. Single-item Likert type questions were also used through the designs to measure group dynamics.

3.4.1 Demographics Survey

Demographics were taken through a survey at the beginning of the study. Age, gender, working status, online education experience was asked by single-item questions.

3.4.2 Online Learning Readiness Questionnaire (OLRS)

Adapted version of OLRS (İlhan & Çetin, 2013) was asked with demographics survey at the beginning of the design. The same scale was adapted and confirmed with the same factor structure by Yurdugül Alsancak and Sarıkaya (2013) as well.

The original scale was developed by Hung, Chou, Chen and Own in 2010 with 1051 university students. Through confirmatory factor analysis, the scale was validated on five sub dimensions. The construct validity (discriminant and convergent validity) and average variance extraction and reliability analysis results were statistically acceptable. The five factors of the scale with 18 items are reported as CISE: Computer/Internet self-Efficacy (item 1-3), SDL: Self-directed learning (item 4-8), LC: Learner control (item 9-11), MFL: Motivation for learning (item 12-15), and OCSE: Online communication self-efficacy (item16-18).

İlhan and Çetin (2013) adapted OLRS with 405 university students having online education experience. They reported that adapted OLRS is a valid and reliable instrument, with $\chi 2/sd=3.61$, RMSEA=.050, SRMR=.043, GFI=.95 and CFI=.99

model fit indices. Composite reliability coefficients are reported as .74 for CISE; .87 for SDL; .73 for LC;.84 for MFL, and .87 for OCSE.

Yurdugül and Alsancak Sırakaya (2013) also adapted the same scale in the same year. The data were collected from 724 university students. The model fit indices are reported as X^2 /sd = 4.63, RMSEA = 0.074, GFI = 0.94, CFI = 0.94, and NFI = 0.92. The alpha reliability (CISE = 0.92, SDL = 0.84, LC = 0.85, MFL =0.80, CSE = 0.91), composite reliability (CISE = 0.92, SDL = 0.84, LC = 0.85, MFL =0.81, CSE = 0.91), and AVE values (CISE = 0.80 SDL = 0.52, LC = 0.66, MFL =0.52, CSE = 0.78), are reported as acceptable for each factor (pp.397-399). Based on the consistent results of two confirmatory analyses, OLRS was decided to be used in that study.

3.4.3 Community of Inquiry Questionnaire

The adapted version of CoI questionnaire was originally developed by Arbaugh, Cleveland-Innes, Diaz, Garrison, Ice, Richardson, & Swan in 2008. The CoI instrument is aimed to operationalize Garrison, Anderson and Archer's CoI Framework. The results show that the developed questionnaire is valid and reliable to measure the dimensions of Social Presence (9 items), Cognitive Presence (12 items) and Teaching Presence (13 items).

Original CoI questionnaire, with three factors and 34 questions, was adapted in Turkish by Öztürk in 2012. The scale was administered to 140 university students who experienced online or blended learning. Three factor-questionnaire were analyzed through Confirmatory Factor Analysis. The model fit indices are reported as X^2 /sd = 1.90, RMSEA = 0.081, GFI = 0.70, CFI = 0.81, NNFI = 0.80, ECVI = 8.19, ECVI saturated model= 8.56, ECVI independent model = 23.45. Cronbach's alpha reliability value for factors were reported between .79 and .91.

3.4.4 Adaptation of the Shared-Metacognition Questionnaire (SMQ)

The SMQ was developed to better understand structure and dynamics of metacognition in collaborative learning environments regarding individual and shared regulation dimensions. Although researchers, Garrison & Akyol developed metacognition questionnaire in 2013 with three dimensions, knowledge of cognition, monitoring of cognition and regulation of cognition, they state in 2015 that metacognition is not just a self-regulated ability but also a shared ability. Considering the shared perspective of metacognition, they developed shared metacognition questionnaire by collecting data from 192 graduate students, three of whom were undergraduate students. In order to explore self and co-regulation's structures, exploratory factor analysis was conducted; they administered a principal component factor analysis by using Oblimin rotations. To explore monitoring and managing sub-elements of self and co-regulation, exploratory factor analysis was conducted with four factors by using Varimax rotation, but they state there is not clear separation of monitoring and managing functions of self and co-regulation. That is, the results of exploratory study reveal evidence to support hypothesized elements of self (13 items) and co-regulation (13 items) as parts of shared metacognition construct.

The original Shared Metacognition Questionnaire was adapted into Turkish by following the guidelines offered by Hambleton and Patsula (1999), and Hambleton and De Jong (2003). At first, it was ensured that shared-metacognition construct can be investigated in Turkish culture as if a social learning environment is created. After ensuring construct equivalence, it was decided to adapt the existing scale instead of developing a new test due to the lack of researcher' proficiency on the subject. The next step was to get permission from the author. As the next step, translation process was followed. Three researchers, having English proficiency, translated the original scale from English to Turkish. Then, an English language expert checked the three version of Turkish translations and the original scale, and formed the last Turkish version of the scale. Another English language expert translated the version back from Turkish to English. The back-translation version, original scale and Turkish

version of the scale were checked for any errors by two experts studying on metacognition and regulation construct. The final version was constituted and confirmed by the author of the scale for any error. After translation process was completed, cognitive interviews were done with two researchers having online education experience in order to ensure plausibility, clarity, fluency of the translated version.

After completing forward and backward translation process, a pilot tryout was planned to check the validity and the reliability of the test. After getting ethical consent, the translated version of the scale was transferred to Google Forms to be sent through e-mail to students having online learning experience. Representative online learners who interact/collaborative/engage with other learners in an online learning environment were included into a field test for validity. The translated scale was administered to 679 online learners. Those who did not remember their experiences in online learning environment or were not involved in social interaction with other learners are excluded and data from 364 students *(F = 178, M = 170)* with an age average of 29, are included in the analysis.

Confirmatory Factor Analysis (CFA) was implemented by using IBM SPSS AMOS Version 21.0.0 program. The assumptions of CFA were checked before conducting the analysis. The sample size meets the requirements indicated as a minimum of 200 by Guilford (1954) and Hair et al, (2010); 300 by Gie Yong and Pearce (2013). Univariate normality assumption was checked through Skewness and Kurtosis values. Skewness values range between -1.375 and .095, while Kurtosis values were between -1.177 and 1.252. The values are moderately skewed (Bulmer, 1979; Hair et al, 2010), and the kurtosis values range between +3 and -3 are acceptable (Hair et al, 2010). Multivariate normality was assessed through MVN Package in R Studio version 1.1.463. The Multivariate Normality assumption is rejected by The Mardia's MVN Test, Henze-Zirkler's MVN test, Royston's MVN test, Doornik-Hansen's MVN test, and Energy test (Table 3.14.).

Table 3.14 MVN Test Results

Test		Test statistic	P value
Mardia			
	Skewness	9391.67	0.000
	Kurtosis	67.70	0.000
Henze-Zirkler		1.27	0.000
Royston		1744.94	0.000
Doornik Hansen		448.73	0.000
Energy		8.68	0.000

See Multivariate normality test codes and outputs at Appendix D

Though multivariate normality is an assumption of Maximum Likelihood (ML) estimation, and is based on the relatively large-sample size, in practice mostly small samples from non-normal distributions are reached by the researchers (Micceri, 1989). According to concerning research conducted by "Anderson & Gerbing, (1984), West & Finch (1996), Finch, West, & MacKinnon (1997), Harlow (1985), Hu, Bentler, & Kano (1992)", non-normality appears to have little impact on model parameters estimated via ML (as cited in Nevitt & Hancock, 2001, p.354). Though the ML estimation method is somewhat insensitive to departure from normality of the dimension for large samples (Fuller & Hemmerle, 1966), there are alternative estimation methods with no multivariate normality assumptions. Brown (2006) states that if at least one of the factor indicators is categorical or the data is extremely non-normal, Weighted Least Squares, robust Weighted Least Squares (WLSMV), and Unweighted Least Squares (ULS) are more suitable (p.76). ULS is defined as "a factor extraction method minimizing the sum of squared differences between the observed and reproduced correlation matrices" (IBM, Factor Analysis Extraction, para. 3). Thus, data's confirmation on model was checked by conducting both ULS and ML estimations as seen on Table 3.13. Both ML and ULS estimations generate acceptable model fit indices and support construct validity.

The item factor loadings (standardized regression weights), indicating the correlation between observed indicator and the common dimension, are given on the path diagram shown on Figure 3.1. Field (2005) and Guadagnoli and Velicer (1988)

suggest to have at least .60 loading, while Tabachnick and Fidell (2007) and Comrey and Lee (1992) suggest cut-off values as .32 (poor), .45 (fair), .55 (good), .63 (very good) or .71 (excellent). The factor loading values range from .62 to .88, indicating very good to excellent loadings, as verifying the statistically satisfactory **indicator reliability.**

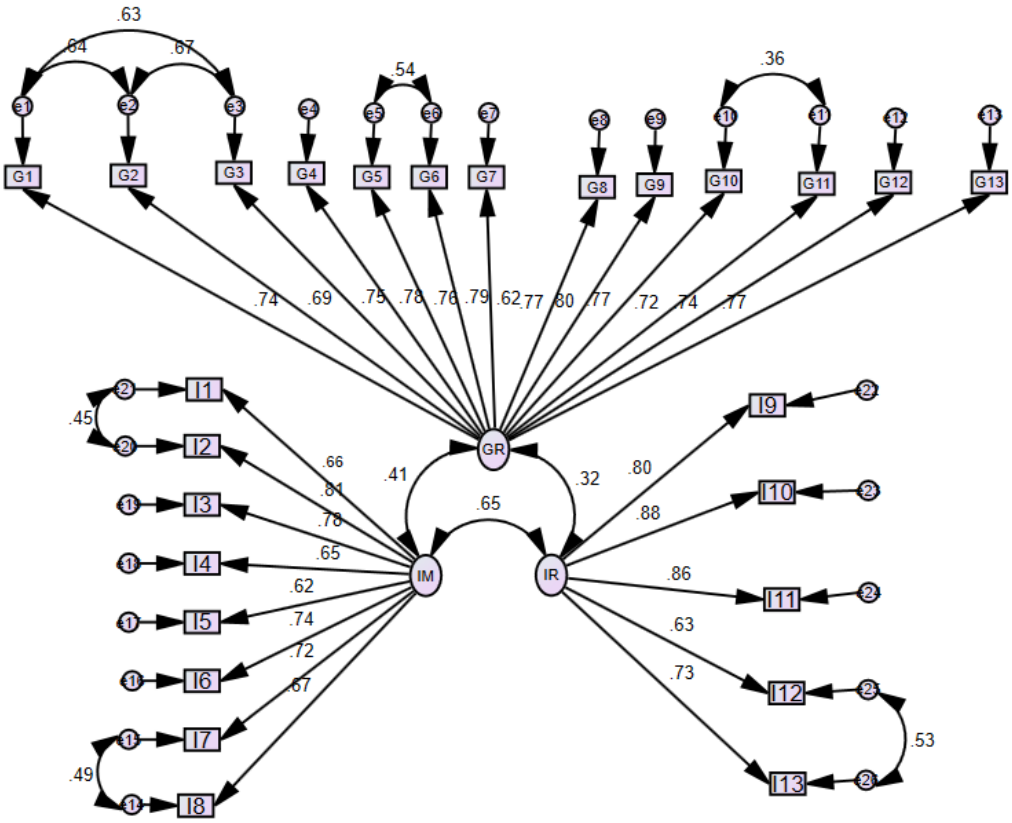


Figure 3.1. Item Factor Structure of translated SMQ

CFA was conducted to check factor model based on two factors model as in original scale and on three factors model based on item structure and theory. Model fit value of Chi-square (χ^2/sd)- Chi- Square/Degree of Freedom)- with 3.197, smaller than 3.0 is acceptable (Hair et al, 2010). Since the Chi-square is a non-parametric measurement and is sensitive to sample size, Goodness of Fit Index (GFI), CFI

(Comparative Fit Index), Normed Fit Index (NFI), IFI (Incremental Fit Index), and also Root Mean Square Error of Approximation (RMSEA) and, Standardized Root Mean Square Residual (SRMR) were checked. The original scale offers two factor model as co-regulation and self-regulation. At first, the offered model was checked for confirmation of the model. Although the chi-square (4.161) and SMMR (.0633) values are acceptable, model fit indices were below the cut off values with GFI = .783, CFI = .869, NFI = .835, IFI = .870, RMSEA = .093.

The theory of original scale hypothesize metacognition having three dimensions as knowledge of cognition (KC), monitoring of cognition (MC), and regulation of cognition (RC) (Akyol & Garrison, 2011; Garrison & Akyol, 2015). KC is defined as introductory metacognitive capacity reflecting knowledge and motivation regarding the set of inquiry actions, MC is defined "on action" reflection and evaluation of progress in terms of aim and expectations. The RC is execution and control of the learning process through use of learning strategies, which is referred to "in action" enactments (Garrison & Akyol, 2015, p.67). Although in the original study, there is not a clear separation of monitoring and managing functions of the construct, the regulative items concerning strategy selection and use in action under self-regulation dimension were tested as a separate dimension. These items were; "I9: I change my strategy when I need to", "I10: I search for new strategies when needed", "I11: I apply strategies", "I12: I assess how I approach the problem.", and "I13: I assess my strategies". Flavell's (1979) categorizes metacognition under two dimensions, namely monitoring and control. The metacognitive knowledge and metacognitive experiences belong to monitoring, while metacognitive skills belong to Control dimension. This typical two-dimensional categorization is conceptualized by Efklides (2006), Garrison (2003), Hacker (1998), and Murphy (2008). Schraw (1998; 2001) states that metacognition includes "knowledge" and "regulatory skills" in order to be used to control cognition (p.116). This typical categorization of the metacognition stresses the static and dynamic nature of the construct (Akyol & Garrison, 2011, p.184). Based on the metacognition theory from an individualistic perspective, the regulative statements are categorized as a different dimension and

hypothesized a three-factor model for CFA. The findings for three factor model (Individual-Monitoring (8 items), Individual-Regulation (5 items) and Group Regulation (13 items) are confirmed, with RMSEA = .078, GFI = .835, CFI = .910, NFI = .874, IFI = .910, SRMR = .0659. According to Kline (2005), at least the model chi-square, RMSEA, SRMR and CFI should be reported. The acceptable model fit indices presented on Table 3.15. below indicates that the data confirms the three-dimensional model. The model fit indices (three factors model) support the construct validity.

Table 3.15 Model Fit Indices

Model	**χ^2/sd** *<3.0)*	**RMSEA** *(<.08)*	**GFI** *(>.80)*	**CFI** *(>.90)*	**NFI** *(>.80)*	**IFI** *(>.90)*	**SRMR** *(>0,05)*
Two-factors	4.161	.093	.783	.869	.835	.870	.0633
Three-factors (ML)	3.197	.078	.835	.910	.874	.910	.0659
Three-factors (ULS)	3.714	-	.979 **AGFI** .974	-	.973	-	.0616

CMIN/df (Hair et al, 2010), CFI (Awang, 2012b), RMSEA (MacCallum, Browne & Sugawara, 1996), GFI (Greenspoon & Saklofske,1998), NFI (Forza & Flippini,, 1998; Awang, 2012), IFI (Bollen, 1989), SMMR (Hu & Bentler, 1999)

Convergent validity deals with measuring the correlation level of multiple indicators of the common construct which agree (Ab Hamid, Sami, & Mohmad Sidek, 2017). The value of AVE for each dimension, which are GR = .559, IM = .502 and IR = .618, are higher than 0.5, as verifying the convergent validity (Fornell & Larcker, 1981). (See Table 3.16.). The factor loadings and composite reliability also support the convergent validity (Ab Hamid, Sami, & Mohmad Sidek, 2017).

Table 3.16 Convergent validity

Factors	***Items***	***AVE (>.50)***
GR	13	.559
IM	8	.502
IR	5	.618

AVE (Fornel & Larcher, 1981)

Discriminant validity ensures that variance in observed variable is due to the latent variable rather than due to measurement error, other constructs in the model or any other external effect (Farrell, 2009; Fornell & Larcker, 1981). For verifying **discriminant validity**, the AVE estimates of free factors (GR, IM and IR) were compared with the square of correlation (shared variance) among the factors (Hair et al., 2010, p.605). As seen on Table 3.17., the bold AVE values are higher than related row and column values, indicating the shared variance.

Table 3.17 The Discriminant Validity Index Summary

SMQ	*GR*	*IM*	*IR*
GR	**0.559**		
IR	0.168	**0.502**	
IM	0.102	0.423	**0.618**

For internal consistency, composite (construct) reliability and alpha reliability were calculated and found as satisfactory (See Table 3.18). The internal reliability for each factor exceeds the 0.7 (Cronbach, 1951). For composite reliability, the alpha value and omega value should be greater than .70 (Fornell & Larkher, 1981; McDonald, 1985).

Table 3.18 Internal Consistency Values

Factors	*Items*	*Alpha Reliability (>.70)*	*Composite Reliability (>.60* >.70**)*
GR	13	.944	.943
IM	8	.893	.889
IR	5	.895	.606

*Alpha reliability (Cronbach, 1951), Composite Reliability (*Awang, 2012a; **McDonald, 1985; **Fornell & Larkher, 1981)*

To sum up, CFA based on 26 items of three dimensions (Individual Monitoring, Individual Regulation and Group Regulation) was applied to the data. The factor loadings were statistically significant. The model fit indices, AVE values, and

reliability coefficient are satisfactory. Thus, the results indicate that Turkish version of the Shared Metacognition is a reliable and valid measurement tool (See exemplary items on Appendix E).

3.4.5 Coding Scheme Development

The verbal transactions of the groups in two cases through three designs were recorded (six set of data) synchronously by the Adobe Connect system. All the statements were then transferred to Microsoft Excel by including the student/author's information row by row for ease of coding. The student information is hided for anonymity and ethics.

The coding scheme was constructed through as systematic literature review to enhance the validity of measurement. Although there are partial coding instruments, a multi-layered instrument was developed to include cognitive, teaching and social presence statements and metacognitive regulation statements. Additionally, existing instruments mostly do not refer to previous/existing categorization of the construct. Therefore, a holistic systematic review is needed to ensure having a verified instrument. The procedure of the review is explained step by step and visualized (See Figure 3.2) for clarity.

3.4.5.1 Eligibility Criteria

A systematic literature review was conducted to determine observable categories of shared metacognition. The construct of shared/social metacognition was searched through peer reviewed journals from 1979 to 2018, and English was defined as a language limiter.

3.4.5.2 Information Source

The review was done by using EBSCOhost Research Platform since including a variety of content providers (Scopus, SSCI, ERIC, Education Source, PsycINFO, SCI, ScienceDirect, Teacher Reference Center and etc.), and based on limiter options on date, language, phrase, subject and source type.

3.4.5.3 Inclusion/Exclusion of Studies

Step I: The first search was done by determining "shared metacognition" as a search phrase, "peer reviewed" as a journal type criterion, "1979 to 2018" as a year interval, and "English" as a language criterion. In total, 13 articles were reached. Preliminary abstract reviews were done to decide on inclusion or exclusion of the studies. Seven studies (Garrison & Akyol, 2015; Hurme, Merenluoto & Järvelä, 2009; liskala, Vauras, Lehtinen, 2004; Iiskala, Vauras, Lehtinen, & Salonen, 2011; Jafarigohar & Mortazavi, 2016; Jafarigohar & Mortazavi, 2017; Panadero & Järvelä, 2015) on use of shared metacognition in educational contexts were included, while six studies (Bahrami, Olsen, Bang, Roepstorff, Rees, & Frith, 2012; Biasutti, 2012; Choi, 2010; Faivre, Filevich, Solovey, Kühn, & Blanke, 2018; Tarchi, 2015; Timpano, Rasmussen, Exner, Rief, & Wilhelm, 2014) were excluded since they were not on educational context and/or they focused metacognition construct from an individual perspective.

Step II: The references of included 7 studies were snowballed to decide further related studies that couldn't appear in review due to the use of different terminology. Fourteen studies were decided to be related. After abstract review, 11 of 14 studies (Akyol & Garrison, 2011; Chen, Chiu, & Wang, 2012; De Backer, Van Keer, & Valcke, 2015b; Hurme, Järvelä, & Palonen, 2006; Larkin, 2009; Molenaar, Chiu, Sleegers, & van Boxtel, 2011; Molenaar, Sleegers, & van Boxtel, 2014; Goos & Galbraith, 1996; Chiu & Kuo, 2009; Goos, Galbraith, & Renshaw, 2002; Salonen,

Vauras, & Efklides, 2005) were included, while 3 (Efklides, 2006; Hadwin & Oshige, 2011; Yarrow & Topping, 2001) were excluded.

Step III: The second search was conducted by entering the "social metacognition" as keyword due to the use of this keyword in previous review. The rest of the criteria stayed constant. Seventeen articles were reached. Three (Chan, 2012; Larson & Gerber, 1978; Rapchak, 2018a) of 17 studies were included, while the rest 13 studies were excluded since they were duplicate (Chen, Chiu, & Wang, 2012; Chiu & Kuo, 2009), not in educational context (viz. Brüne, 2000; Gould, Semaan, & Trabold, 2013; Hains & Ryan, 1983; Jaccard, Dodge, & Ramos, 2005; Jost, Kruglanski, & Nelson, 1998; Luftig, 1988; Markova & Legerstee, 2013; Rocca, 2016; Fletcher-Flinn & Snelson, 1997; Fletcher-Flinn & Suddendorf, 1997).

Step IV: The all-search references were snowballed to see any other related studies based on reference lists and authors as a final check. Lastly, four (Borge & White, 2016; Wang, Kollar & Stegmann, 2017; Zheng, 2017a, 2017b) more studies were included to the review. In total, 25 studies were reviewed.

Step V: "Socially Shared Metacognitive Regulation" keyword was searched according to same limiters. 6 articles were found after eliminating duplicate results. One of the studies (De Backer et al.,2015b) was excluded since it was already included in previous results. Thus, five studies (Kim & Lim, 2018; Iiskala, Volet, Lehtinen, & Salonen, 2015; De Backer et al., 2015a; Volet, Vauras, Salo, & Khosa, 2017; Khosa & Volet, 2014) were included. The whole review process is shown on Figure 3.2.

3.4.5.4 The Multi-Layered Coding Scheme

The developed coding instrument includes four layers, as main categorization (Table 3.18.), socially shared metacognitive regulation (Table 3.19), level of regulation (Table 3.20), and function of regulation (Table 3.21). **At the first layer,** the main categorization is constructed based on dimension of community of inquiry

framework (Garrison & Akyol, 2011). The episodes of students would be metacognitive as well cognitive, teaching, social presence or off-task. Molenaar, Chiu, Sleegers and van Boxtel (2011) offered the main categories as metacognitive, cognitive, relational, procedural, teacher/researcher related, off task and non-codable based on Veldhuis-Diermanse's (2002) research. Though the categorization looks like components of CoI, they are not specified with sub-categories as in the CoI and the "procedural activity" category might converge with relational or teacher/researcher categories. Procedural activity category is described as the procedures in order to interact with the learning environment. However, the procedural utterances might be coded as relational since it might require social interaction as well. Hurme, Merenluoto and Järvelä (2009) distinguished between cognitive, social, metacognitive regulation statements. This scheme lacks of teacher statements and indicators/sub-dimensions of the given categories. Thus, the CoI as a valid and reliable framework is integrated into the main categorization step.

At the second layer, metacognitive regulation statements sorted from the utterances at the first layer can be coded into sub-dimensions of the metacognitive regulation skills for a deeper specification. The metacognitive regulation is mostly categorized as planning, monitoring and evaluation (Brown, 1987; Jafarigohar & Mortazavi, 2016); De Backer, Van Keer & Valcke (2015b) add orientation skill to this list. Metacognitive regulation or metacognitive skills as executive processes on learning include planning, determining learning demands, revising strategies on problem-solving, monitoring the evolving task, evaluating and reflecting on the learning material (Iskala, Vaurus, Lehtinen & Salonen, 2011). Molenaar, Chiu, & Sleegers (2011;2014) furthermore categorize metacognitive activities as orientation, planning, monitoring, evaluation and a new sub dimension, reflection based on Meijer, Veenman and van Hou-Wolters' 2006 categorization. The recent studies (Akyol & Garrison, 2011; Garrison & Akyol, 2013) on measuring metacognition construct in online community of inquiries categorizes the construct into three dimensions as knowledge of cognition, monitoring of cognition and regulation of cognition. The knowledge of cognition, however, is elaborated as an internal state

such as “knowledge of the inquiry process, knowledge of critical thinking and problem solving, knowledge of self as a learner” and etc (Akyol & Garrison, 2011, p.185). Monitoring of cognition and regulation of cognition, on the other hand, comprises reflection on action and in action. That is, judging, assessing the task, asking questions for confirmation belongs to monitoring category, while the procedural planning, applying strategies, challenging self and others belongs to regulation of cognition category (Akyol & Garrison, 2011, p.185). While metacognition construct is categorized as a three-dimensional construct for a self-report scale, shared-metacognition construct is explored as having two dimensions as self-regulation and group regulation for collaborative learning settings (Garrison & Akyol, 2015). The self-report measurement tools and observational tools focus on different components of the construct. Based on that, the shared metacognition skills as orientation, planning, monitoring, evaluation and reflection are determined as second level of coding scheme.

At the third layer, levels of shared metacognition are categorized as at the team/group related or task related. Chan (2012) reported the study of Saab et al and Jansen et al. as they examine two components of regulation activities as “task regulation” and “team regulation”, which are called as social regulation (p.65). De Backer et al. (2015b) distinguish types of monitoring, as monitoring of progress, monitoring of comprehension, and monitoring of collaboration. This specification is offered for evaluation as evaluation of earning outcomes, evaluation of learning process and evaluation of collaboration. Considering the intra-personal nature of the shared-metacognition, all the phases of shared metacognitive regulation skills can be specified under task (learning and learning process) and team (regarding collaborative group work) regulation sub-categories.

At the fourth step, the direction/function of shared metacognitive skills are considered. Chen, Chi and Wang (2012) coded social metacognition statements as “agreement”, disagreement, correct evaluation, incorrect evaluation, question and command” (p.872). Iskala, Vauras, Lehtinen and Salonen (2011) categorized the

function of socially shared metacognition as “facilitate” and “inhibit”. While statements concerning activating and confirming are placed under facilitate category, those related slowing, changing and stopping are assorted under inhibit (p.384). However, in practice it is not such clear-cut to decide whether an utterance contributes or inhibits shared metacognition. An incorrect statement of a student might contribute other student’s metacognition in a positive way. Due to the fact that the utterances might be coded as negative if a student try to break the flow of the inquiry. To specify, if a student states “let’s finish the task at the middle”, it is more inhibiting, but if it is stated at the end of the task, it a proper and can bring positive contribution. Thus, the function of statement should be decided by considering flow of the collaboration. (See Table 3.19., Table 3.20., and Table 3.21. and Table 3.22. sequentially).

Figure 3.2. Systematic Literature Review Process

Table 3.19 Step I: Main Categorization

Category	*Explanation*	*Reference*
Cognitive Presence (CP)	**Triggering event**: Sense of puzzlement	
	Exploration: Information exchange	
	Integration: Connecting ideas	
	Resolution: Apply new ideas	
*****Social Presence (SP)***	**Emotional Expression:** Emotions	
	Open Communication: Risk-free expression	
	Group Cohesion: Encouraging collaboration	
Teaching Presence (TP)	**Instructional Management:** Defining & initiating discussion topics	*(Garrison, Anderson, & Archer, 1999)*
	Building Understanding: Sharing personal meaning	
	Direct Instruction: Focusing discussion	
***** Regulative Statements (RS)***	Consensual planning, monitoring, evaluation and reflection of joint cognitive processes in demanding collaborative tasks	*Chen, Chiu, & Wang, 2012; liskala, T., Vauras, M., & Lehtinen, 2004;* *Iiskala, Vauras, Lehtinen, & Salonen, 2011; Molenaar, Sleegers, & van Boxtel, 2014)*
Off-task statements (OTS)	Messages irrelevant to the discussion task and collaboration	*(Molenaar, Chiu, Sleegers & van Boxtel, 2011; Zheng, 2017a, 2017b)*

Table 3.20 Step II: Shared Metacognitive Regulation Skills

Category	*Explanation*	*Reference*
ORIENTATION (O)	Task analysis, setting goals, activating prior knowledge, awareness of task perceptions, feelings about the task	*(De Backer, Van Keer & Valcke, 2015; Molenaar, Chiu, Sleegers & van Boxtel, 2011; Molenaar, Sleegers & van Boxtel, 2014; Zheng, 2017a, 2017b)*
PLANNING(P)	Selecting and sequencing problem-solving strategies, developing action plans, strategic planning in terms of task coordination	*(Akyol & Garrison, 2011; Chan, 2012; De Backer, Van Keer, & Valcke, 2015b; Goos & Galbraith, 1996; Iiskala, Vauras, Lehtinen, & Salonen, 2011; Panadero & Järvelä, 2015; Jafarigohar & Mortazavi, 2017; Zheng, 2017a, 2017b)*
MONITORING & CONTROLLING (M&C)	Assessing learning, quality control of learning or problem solving, identifying inconsistencies, optimizing task execution, checking progress and comprehension of the task, pointing out a group problem or attempt to correct group behavior using language, strategies, or responsibilities, claiming (partial) understanding or comprehension failure, detecting errors or checking plausibility, control activities focusing on the correctness of one's understanding, Comprehension monitoring: control activities focusing on the correctness of understanding; Monitoring of progress: focuses on the adequateness of problem solving strategies or the quality of perceived progress; monitoring of collaboration: directed at individuals' participation or role taking and the collaboration in the group)	*(Akyol & Garrison, 2011; Borge & White, 2016; Chan, 2012; (Chen, Chiu & Wang, 2012; De Backer, Van Keer, & Valcke, 2015; Garrison & Akyol, 2013; Garrison & Akyol, 2015; Goos & Galbraith, 1996; Iiskala, Vauras, Lehtinen, & Salonen, 2011; liskala, Vauras, & Lehtinen, 2004)* *(Jafarigohar & Mortazavi, 2017; Larson & Gerber, 1987; Molenaar, Sleegers, & van Boxtel, 2014; Wang, ,Kollar, & Stegmann, 2017; Zheng, 2017a, 2017b)*
EVALUATION (E)	Evaluating learning outcomes, evaluating learning process, evaluating collaboration, checking of the content of the learning activities, assessing the quality of role-use behaviors, evaluating current solutions	*(Akyol & Garrison, 2011; Borge, & White, 2016; Chen, Chiu & Wang, 2012; De Backer, Van Keer, & Valcke, 2015; Goos, Galbraith, & Renshaw, 2002; Goos & Galbraith, 1996; Iiskala, Vauras, Lehtinen, & Salonen, 2011; Jafarigohar & Mortazavi, 2017; Jafarigohar & Mortazavi, 2016; Molenaar, Sleegers, & van Boxtel, 2014; Zheng, 2017a, 2017b)*
REFLECTION (R)	Reflecting on the group goals and progress, reflecting on their collaborating experience, reflecting on the learning strategies followed by the group, Reflection on the learning process and strategies through elaboration on the learning process	*(Goos, Galbraith & Renshaw, 2002; Wang, Kollar & Stegmann, 2017; Zheng, 2017a, 2017b)*

Table 3.21 Step III: Level of Shared Metacognitive Regulation Skills

Category	*Explanation*	*Reference*
Task Regulation (TR)	Cognitive activities concerning regulation of task, orientation on the task, monitoring of the team process	*(as cited in Chan, 2012, pp.65-66)* *(Saab, 2012)*
Team (Group) Regulation (GR)	Planning of the activities and monitoring of group process, coordination of the student collaboration	*(De Backer et al, 2015)*

Table 3.22 Step IV: Function of Shared Metacognitive Regulation Skills

Category	*Explanation*	*Reference*
Facilitate/Promote/Support (Activate, Confirm, Engaging) (+)	Positive utterances on metacognitive regulation	*(Hurme, Merenluoto, & Järvelä, 2009)*
Inhibit/Interrupt/Reject (Slow, Change, Stop) (-)	Negative utterances on metacognitive regulation	

3.4.6 Interview protocol

Focus group interviews were arranged in Case I. Students were separated into sub-groups and required to discuss the questions and write their answers for each one. Focus group questions were prepared according to the structure of each design. Thus, once a refinement was made in a design, regarding interview question was asked in focus groups. Focus-group interview technique was chosen as a data collection method for getting deeper and richer responses through the potential of group synergy (Stewart & Shamdasani, 1990). In Case II, due to intensity of course load, it was not possible to use class time for doing focus group interviews, Thus, the same interview questions were sent to students who participated to related design. The focus-group interviews were arranged in Case I after Design I, Design II, the same open -ended questions were sent to the participants of Case II after design I and design II (See 3 set of focus-group interview questions in Appendix F).

At the end of the Design III, one-to-one interviews were done with 15 participants from Case I, and with 13 students from Case II. Interviewees were chosen purposefully according to their participation frequency to get richer evaluations. The interviewees' participation frequency ranges from 3 to 11 in Case I, and from 4 to 12 in Case II over 13 week-semester time. Questions regarding refinements made in Design III were asked in one-to-one interviews.

Focus-Group Interview I consisted of 8 questions, Focus Group II included 5 questions, and in One-to-One Interviews protocol, there were 19 questions. Focus group interview questions were constructed according to structure instructional design such as what they thought about roles, script structure, evaluation phase and etc. One-to-one interview questions were formed to understand/explore other possible variables affecting their experiences for example how they prepared for the course, they define success in that context. Additionally, their perceptions on factors affecting group performance, role distribution, planning, evaluation, script structure were asked. In order to understand the dimensions of community of inquiry in that

context, motivational factors, their learning experience, teacher's role, teaching style engagement with group members, communication experiences were asked. For, exploring their perceptions on shared metacognition, their experiences on how group members learn, their gathered way of collaboration, how s/he perceived his/her contribution on group members were asked (See Appendix G for interview questions).

3.4.7 Survey Questions

Likert type questions were asked on Task Difficulty, Individual Performance, Group Performance, Perceived Learning (Richmond, Gorham, & Mccroskey, 1987) on a scale of 0 to 9. Additionally, Likert type questions were asked on the perceived effect of refinements made in each design. That is, two new questions were added at Design II regarding Role Distribution and Evaluation, and one more question was added at Design II concerning Planning Phase (The list of questions are given in Appendix H).

Though single item measurement captures low content validity (McIver & Carmines, 1981), for simple constructs single item measurement are adequate, yet might be used considering more points such as 7, 9, and 11 (Sauro, 2018). In this study, Likert items were asked on a scale of 0-9.

3.4.8 Observational Field Notes

Researcher took field notes during and immediately after the implementations of both cases. Number of the students participated in each design, activity documents, discussion posts of groups were archived after each design. Researcher and instructor met and discuss their observations.

3.5 Data Collection Procedure

Data collection instruments were implemented at the beginning, during and at the end of the study.

At the beginning of the study; demographics and OLRS were shared with students of both cases. Questions were formed in a Google Form document. Students were informed about the study, and the link was shared with the students. Students were requested to fill the forms and then leave the system.

During the study, observational field notes were taken, questionnaires were implemented, and focus-group interviews were done. After each Design, CoI, SM questionnaires and Likert-Type single item questions concerning group dynamics were asked. A Google Form link was shared with the students. Students were asked to answer the questions according to completed group activity. Students filled the forms in 5-10 minutes. Google Form documents was checked continuously by researcher to ensure each student's answer was collected.

During each group-activity, both instructor and researcher observed the groups to interfere with in case of any problem. Researcher took notes during and immediately after each Design. Groups, participating students, technical problems and unexpected problem were noted. Group posts of each sub-activity groups, activity documents were all checked and archived by the instructor.

In the next sessions after the Design I and Design II were completed, students in Case I were formed in sub-groups for focus-group interviews. Focus-group questions were shared as in group-activity format, and students were informed to discuss the questions and write their answers. In Case II, the interview questions were shared with students in Google Form documents. Students were asked to complete the questions in a week period.

At the end of study, in the last course session, students were invited to participate a one-to-one interview. An appointment was set with each volunteer student. Each

volunteer interviewee was called at the decided time, informed about the interview, asked for call recording. Each interview record was archived after the interview was completed (See Figure 3.3).

3.6 Data Analyses Procedure

Data analyses were done through descriptive analysis, non-parametric analysis, though it was first planned to conduct parametric analysis but the stable number of participants was not reached due to the irregular participation to iterations, and through content analysis. The research questions below were answered descriptively, by giving frequency, mean, and standard deviation.

1. What are the students' perceived community of inquiry levels (Cognitive presence, Teaching Presence, Social Presence) in synchronous OCL environments?
2. What are the students' perceived shared metacognition levels in synchronous OCL environments?
3. What are the students' perception levels on group dynamics (perceived learning, individual performance, group performance, task difficulty, role distribution, evaluation phase, planning phase) in sync-OCL environments?

For the research questions below, The Friedman Test, non-parametric alternative of repeated-measures ANOVA, was conducted. The dependent variables were measured ordinal level, which were done through Likert-scales as ranking the level of measurement. The dependent variable for the first research question was Community of Inquiry levels, for second, it was Shared Metacognition levels and for the third one it was group dynamics including Individual Performance, Group Performance, Perceived Learning, Role Distribution, Evaluation Phase, and Task Difficulty. The three measurements were done on three occasions after each design.

1. Is there any significant difference on perceived community of inquiry levels of students by Design 1, 2 and/or 3?

2. Is there any significant difference on shared metacognition levels of students by Design 1, 2 and/or 3?
3. Is there any significant difference on perceived group dynamics levels of students by Design 1, 2 and/or 3?

For the research questions below, content of group activity utterances was analyzed selectively according to developed coding scheme. For the first research question, the frequency and percentage of cognitive presence, teaching presence and social presence were reported. For the second research question, the utterances were coded as orientation, planning, monitoring, evaluation or reflection statements. Again, the frequency and percentage of each code was reported. The phases of shared metacognition (orientation, planning, monitoring, evaluation or reflection) were also coded as task and team regulation.

1. What kind of community of inquiry utterances are visible/observed in synchronous OCL environments?
2. What kind of shared regulative utterances are visible/observed in synchronous OCL environments?

For the last research question below, focus group and one-to one interview data were open-coded. The observational field-notes and analyses from the all the research questions were considered together with qualitative data to offer design principles.

How should synchronous OCL environments be designed by considering shared metacognitive regulation? (See Table 3.23).

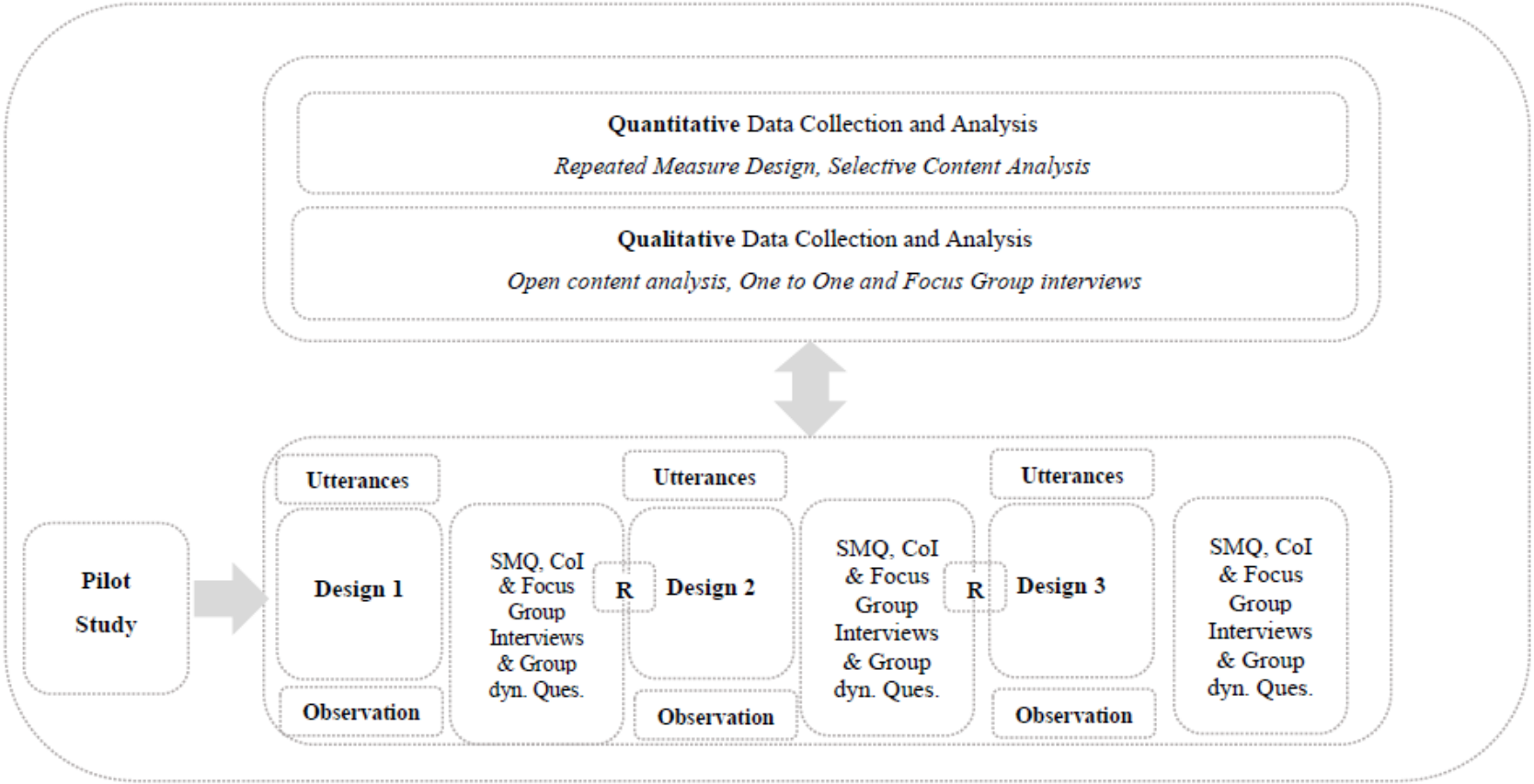


Figure 3.3. Research Design

Table 3.23 Research Questions, Data Collection Instruments and Data Analysis Methods

	Research Questions	*Data Collection Instruments*	*Data Analysis Methods*
CoI	What are the students' perceived community of inquiry levels (Cognitive presence, Teaching Presence, Social Presence) in sync-OCL environments?	Community of inquiry (CoI) questionnaire	Descriptive analysis (Mean, SD, Min. Max)
	Is there any significant difference on perceived community of inquiry levels of students by Design 1, 2 and/or 3?		Non-parametric analysis *(Friedman Test, Wilcoxon Sign Test)*
SM	What are the students' perceived shared metacognition levels in synchronous OCL environments?	Shared Metacognition Questionnaire (SMQ)	Descriptive analysis (Mean, SD, Min. Max)
	Is there any significant difference on shared metacognition levels of students by Design 1, 2 and/or 3?		Non-parametric analysis *(Friedman Test, Wilcoxon Sign Test)*
Group Utterances	What kind of community of inquiry utterances are visible/observed in synchronous OCL environments?	Sub-group activity posts	Content analysis via a coding scheme *(Selective coding)*
	What kind of shared regulative utterances are visible/observed in synchronous OCL environments?		
Group Dynamics	What are the students' perception levels on group dynamics (perceived learning, individual performance, group performance, task difficulty, time adequacy, role distribution, evaluation phase, planning phase) in sync-OCL environments?	Survey questions	Descriptive analysis (Mean, SD, Min. Max)
	Is there any significant difference on perceived group dynamics levels of students by Design 1, 2 and/or 3?		Non-parametric analysis *(Friedman Test, Wilcoxon Sign Test)*
Design Principles	How should synchronous OCL environments be designed by considering shared metacognitive regulation?	Focus group interviews One-to-one interviews Observational field notes	Content analysis *(Open and selective coding)*

3.7 Instructional Design

DBR research design was conducted in two cases. There were three instructional design phases in both cases. The word "Design" refers to the iteration/phase of the research. The refinements were decided and implemented after Design I and Design II of both cases based on formative evaluation of students' perceptions obtained through focus-group interviews and observations. The instructional design of in each design are elaborated below and the summary is given on Figure 3.10:

3.7.1 Design I

The base instructional design was determined according to research and literature. In the pilot study, a synchronous lecture-based course was observed. Predetermined discussion questions were asked through the lectures in order to create a community of inquiry in which shared metacognition and cognitive, teaching and social presence could be investigated. The course was also supported with an asynchronous discussion forum. However, in discussion forum students rarely commented each other's answers and saw the forum as a mandatory task to be completed rather than as a collaborative platform to learn in. On the other hand, in the synchronous part, instructor was seen as authority to confirm the answers or respond the questions. Additionally, once the whole group were required to answer the questions, a few of students participated, whereas the rest did not participate. Some of the students stated that they preferred to listen and watch the instructor as doing their daily works like eating something. Thus, the whole group discussion without a collaborative focus did not make it possible to observe the utterances of shared metacognition and dimensions of community of inquiry since the rich group discourse was not achieved.

Akyol & Garrison (2011) argue that metacognition is a mediate between internal state of mind and collaborative actions, and added that discourse is necessary to reveal the what the learners know, their misconceptions and learning strategies. In

this regard, the community of inquiry framework presents a collaborative approach to support the discourse, so to enhance and observe the metacognition in online learning. Furthermore, it is stated that the essence of metacognition is at the intersection of cognitive and social presence. Thus, the guidelines provided under teaching presence dimension were mainly followed in the base design. The discourse of students was facilitated by dividing students into randomly generated sub-groups. The duration of the activity was determined with partnership of researcher and instructor by considering the learning outcomes and regarding activity questions to be answered by group members, and also limited course time determined by the administration. The group study was designed by preparing discussion questions. At the end of the discussion, instructor summarized the activity and responded students' questions. Thus, in the first design, the discussion scripts were not strictly structured, which means that the scripts included discussion questions and places for shared answers, but not guidelines directing how to discuss the questions. Students were only informed to submit their shared (group) responses at the end of the activity, so they chose one of their group members to submit their answers.

Case I: In the first design of Case I, the Adobe Connect system interface was divided into three parts. The left part was arranged for scripts including the activity explanation, questions, places for noting shared answers. The second part at the middle was used for activity visual. Each part of the skeleton system was assigned a letter to be used while writing regarding name of the body part. The third part at the right was separated for group conversation. At the beginning of the chat screen, the link of the submission document was shared (See Figure 3.4.).

The subject of the course was skeleton system of human body. Students were required to remember the parts of a skeleton system and function of these parts. Thus, the learning outcomes were at remembering and comprehension level of cognitive domain (Bloom, 1956). The duration of the activity was 30 minutes.

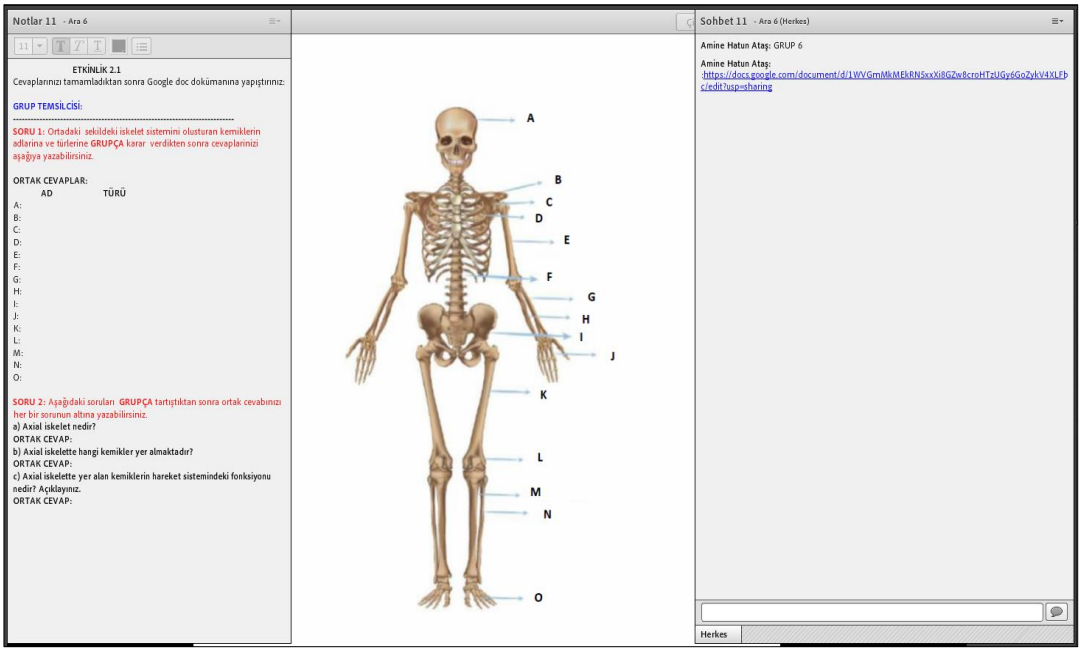


Figure 3.4. Case I Design I Activity Interface Design

Students were required to discuss given questions and decide on a shared group answer. The shared answers were then required being pasted to a given Google Document for uploading into the LMS (Learning Management System). Before beginning group activity, the structure of the interface, expectations from students were shared and groups were formed in that first 10 minutes. After a 30-minute activity, feedback was provided by the instructor, and all sub-activity groups were turned off in order to inform all group members. Then, 10 minutes were left for the feedback part, and a research questionnaire link was shared to get instant evaluation from each participant.

Group activities were administered in two sections of the course, one of which started immediately after another. There were 6 sub-activity groups in section I and 6 sub-activity groups in section II. At least 3 students were assigned to each activity group. In total, 20 students participated in in section I, whereas 23 students participated in section II.

Case II: The same interface design was administered in Case II. The interface was divided into three sections, as for activity guidelines, activity visual and group chat, from left to right as seen on Figure 3.5. The subject of the course on quantitative research designs. Students were required to discriminate type of quantitative designs (experimental, correlational, casual-comparative and etc.), explain the rationale for the differentiations. Thus, the learning outcomes were at analyzing and evaluating level of cognitive domain (Bloom, 1956). The duration of the course was 25 minutes. As in Case I, students were informed and groups were formed in first 10 minutes of the course, and the last10 minutes were devoted for feedback and activity evaluation. There were again two section of the course following each other. There were two activity groups in section I and one activity group in section II. In total, 8 students participated in section I and 5 students participated in section II.

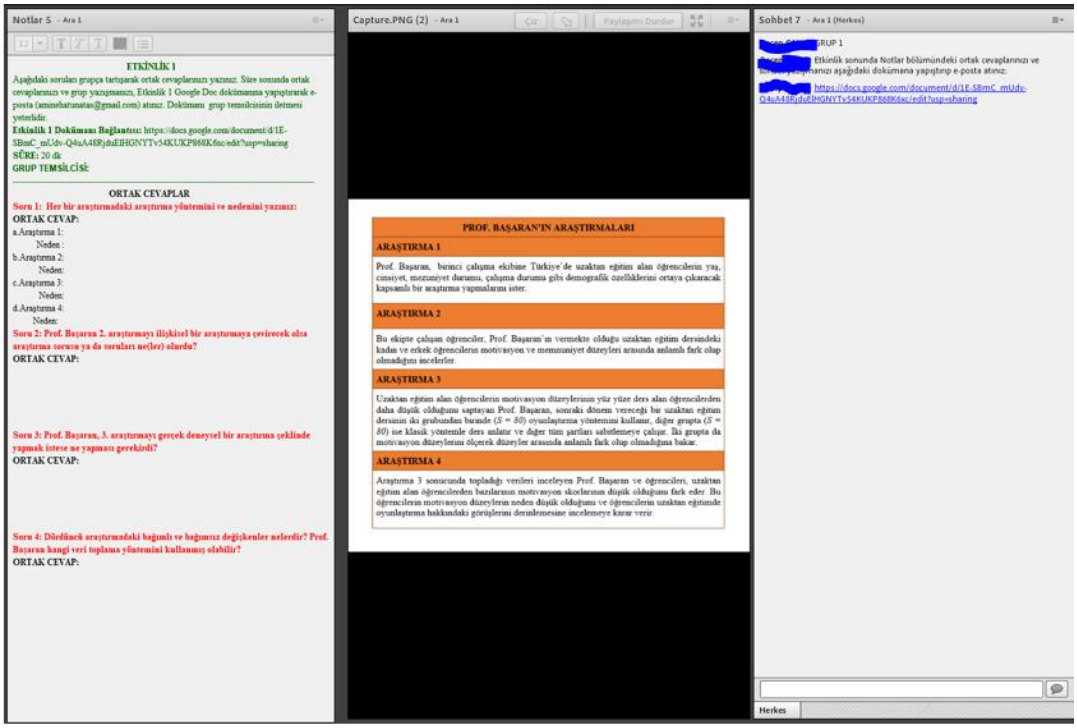


Figure 3.5. Case II Design I Activity Interface Design

3.7.2 Design II

Case I: Based on the focus-group interview data obtained after design I and observational data, the Adobe Connect interface for Case I was redesigned as in Figure 3.6. The screen was divided into three parts again. The left was arranged for activity scripts. As opposed the instructional design in design I, Evaluation phase was added to the process. Students were informed about the sharing of answer key. The new roles (Technology, Communication and Evaluation) and responsibilities for each role were explained before the activity in 10-minute orientation. The roles were visualized on activity screen at top right corner for clarity. Again, chat screen was added at the left corner of the screen. Students were required to remember the terminology and describe the meaning of them. The total activity time was 45 minutes, 30 for discussion and 15 for evaluation. After 45 minutes, instructor was again asked for any question and research questionnaire link was shared with the participants for instant evaluation of the activity. There were 5 sub-activity groups in Section I and 5 sub-activity groups in Section II. At least 3 students were assigned to each activity group. In total, 19 students participated in in section I, whereas 18 students participated in section II.

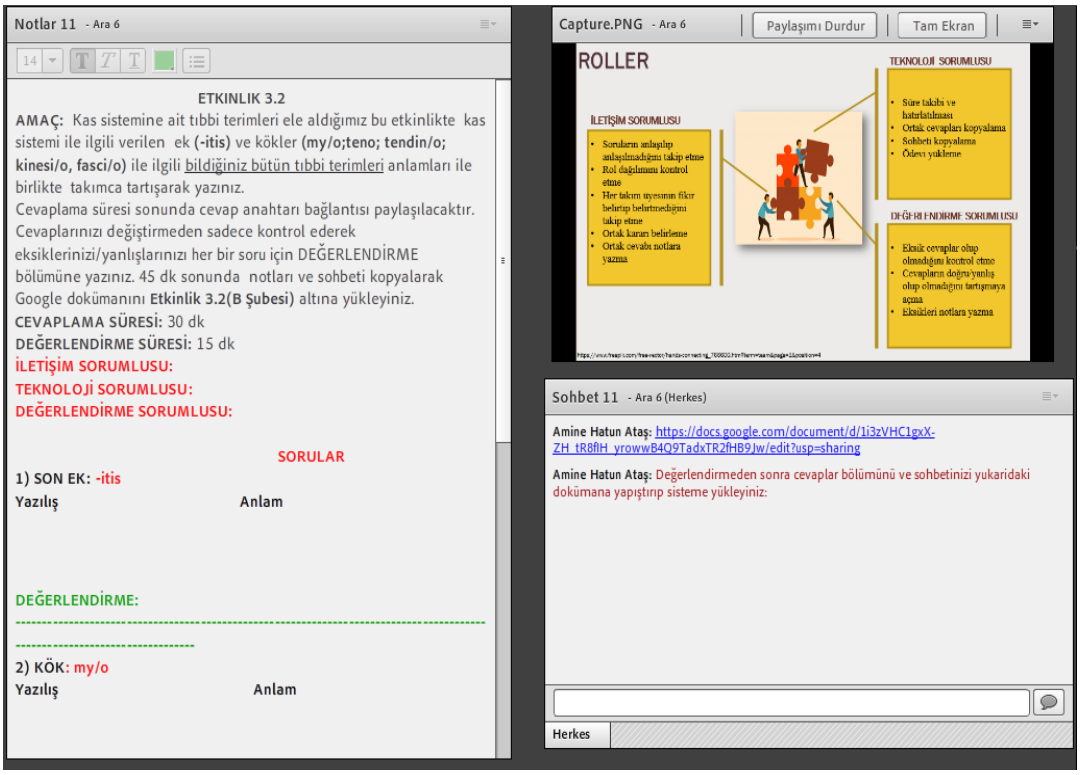


Figure 3.6. Case I Design II Activity Interface Design

Case II: The same interface structure was implemented in Case II (See Figure 3.7). Students were required to evaluate the given cases and make decision about the reliability and validity of them. 20 minutes were separated for activity and 15 minutes for evaluation. There were 2 sub-activity groups in Section I and 1 sub-activity group in Section II. In total, 7 students participated in in section I, whereas 5 students in section II.

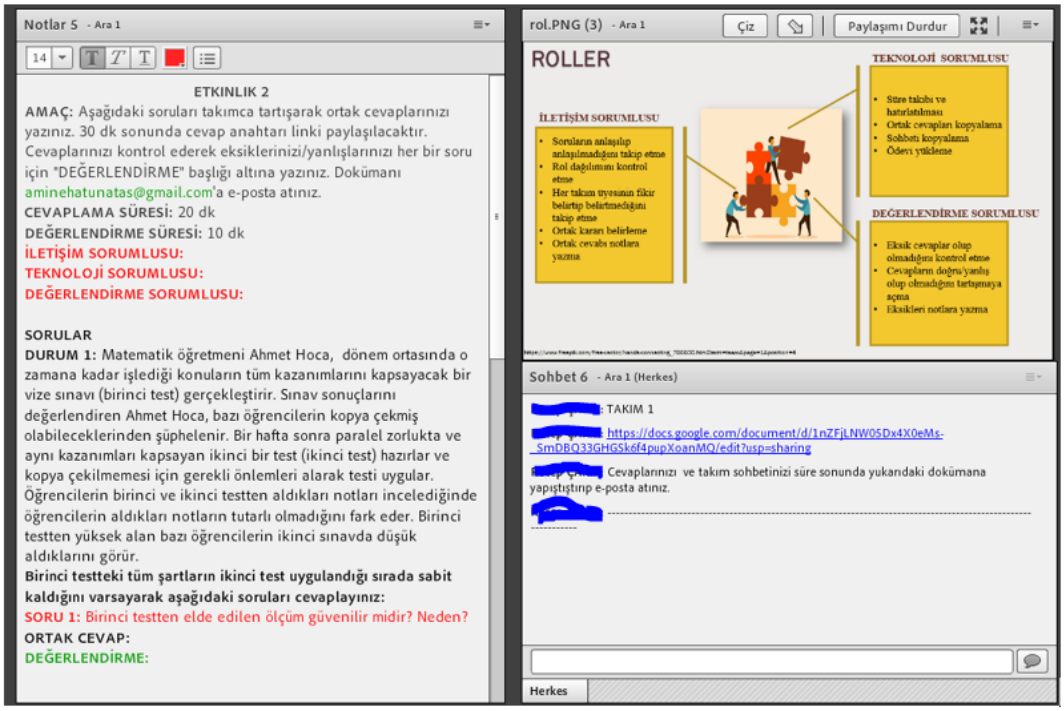


Figure 3.7. Case II Design II Activity Interface Design

3.7.3 Design III

Case I: Based on the focus-group interview II data and observation data, Planning phase was added to scripts. In that way, there became 3 main phases of group works, which are Planning, Discussion and Evaluation. Since the participants presented positive opinions on the effect of role distribution and state it as preliminary step, role distribution and skimming the discussion questions were moved under Planning phase and additional time was assigned for completing it. The keyword “shared” was used under role explanations. Similar to Design II, role explanations were visualized for clarity. The Adobe Connect interface for Case I was designed as in Figure 3.8. The screen was divided into three parts. The left was arranged for activity scripts. Students were informed about the sharing of answer key. The roles (Technology, Communication and Evaluation) and regarding role duties were explained before the activity in 10 minutes. Chat screen was added at the bottom of the screen. Students were required to understand a patient report formed with terminological words, and

to define the meaning of used terminology in that report. The total activity time was 45 minutes, 5 minutes for planning, 30 for discussion and 10 for evaluation. After 45 minutes, instructor asked to students for any question and a research questionnaire link was shared with the participants for instant evaluation of the activity. There were 5 sub-activity groups in section I and 5 sub-activity groups in section II. At least 3 students were assigned to each activity group. In total, 18 students participated in in section I, whereas 16 students in section II.

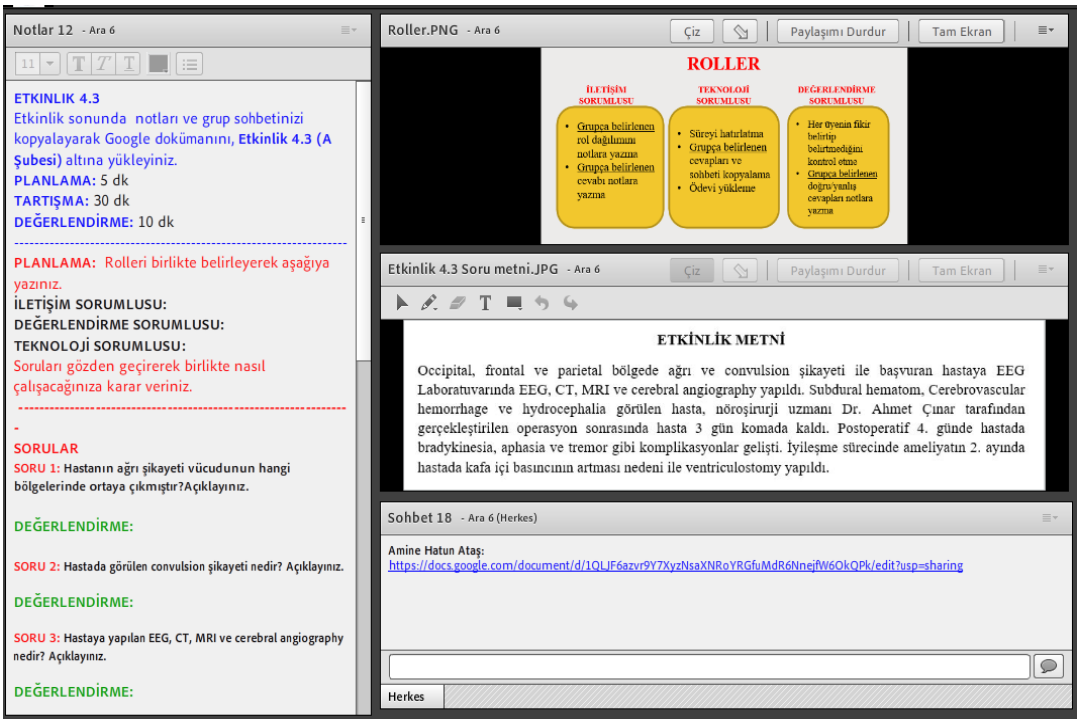


Figure 3.8. Case I Design III Activity Interface Design

Case II: The same structure was followed in Case II as seen in Figure 3.9. Students were informed about the sharing of answer key. The roles (technology, communication and evaluation) and responsibilities for each role were explained in 10 minutes before the activity started. Chat screen was added at the bottom of the screen. Students were required to choose and justify appropriate statistical method for the given case, and interpret a statistical analysis output with justification. The total activity time was 35 minutes, 5 minutes for planning, 20 for discussion and 10 for evaluation. After 35 minutes, instructor was again asked for any question and

research questionnaire link was shared with the participants for instant evaluation of the activity. There were 2 sub-activity groups in Section I and 5 sub-activity groups in Section II. At least 3 students were assigned to each activity group. In total, 8 students participated in in section I, whereas 5 students in section II.

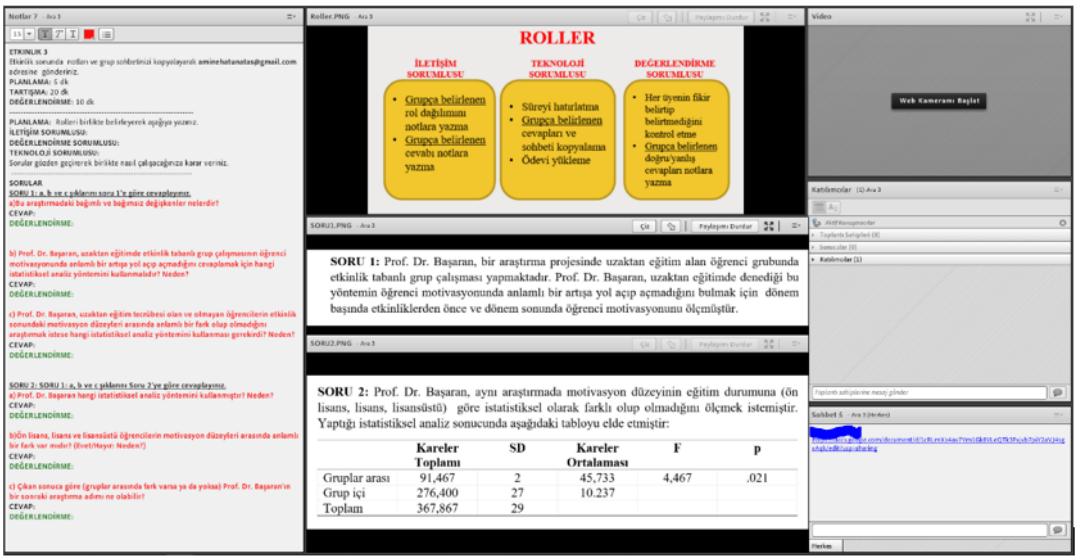


Figure 3.9. Case II Design III Activity Interface Design

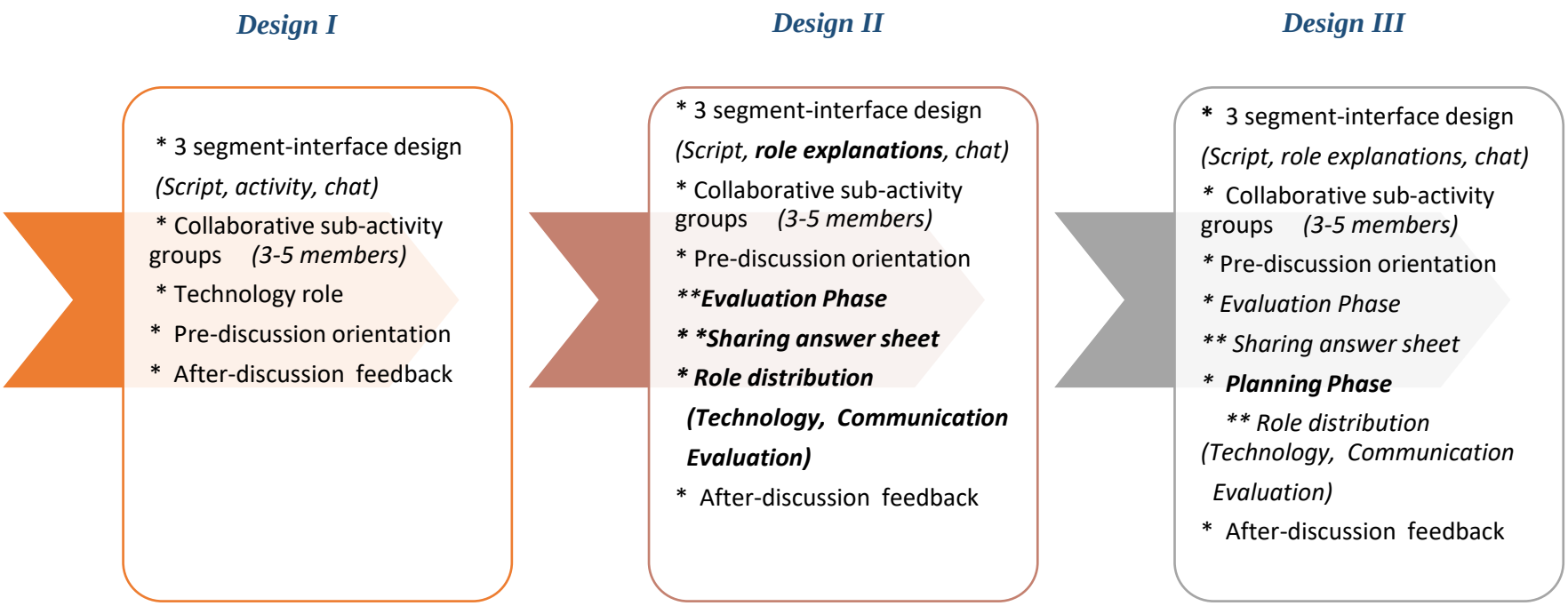


Figure 3.10. Summary of Instructional Design Process

3.8 Reliability and Validity

Validity is defined as "appropriateness, meaningfulness, correctness, and usefulness" of the results made by the researchers, while reliability is defined as the "consistency of the scores" (Fraenkel, Wallen & Hyun, 2012, p.147).

Content-related evidence is a way of interpretation to support the validity. The comprehensiveness of the items, whether the items measure the intended theoretical content, sample of the instruments to be administered and the format of the instruments were all checked for CoI, OR, and SMQ instruments.

For **construct-related evidence** refers how clearly the construct is defined, how the instrument is scaled, whether the instrument is logically and empirically tested based on underlying theory. The model-fit indices of the previously adapted OR and CoI were checked to ensure construct –related evidence. The SMQ, on the other hand, was adapted into Turkish culture by implementing CFA. The obtained model fit indices, discriminant validity, construct validity, internal consistency values were all found as acceptable.

In addition to use and adaptation of scales, a coding scheme was developed for the research. The four-layered coding scheme was constructed based on a systematic literature review to ensure that each category and related codes refer to intended theoretical meaning. For reliability of coding of groups utterances/discussion posts, **interrater reliability** was checked by calculating kappa statistics and percent agreement. The 30% of the (2 set of 6 set synchronous course posts) were coded by another researcher. The researcher, who is an expert of online education, was trained on SM, and provided with an Excel sheet including utterances and a coding scheme guideline. The researcher was informed how to use the guideline and some exemplary codes were shared.

Although a four-step coding scheme was developed, the group utterances were coded on the first three steps of the coding scheme since it was not always possible to ensure

an utterance is facilitating or inhibiting. For example, a wrong answer might activate another person to find the correct answer. Thus, in such a situation while the statement is negative from a side, it is positive from other side. Accordingly, each set of data from Case I and Case II were coded in three stages (Step I, Step II, and Step II) by two researchers. Percent agreements of two coding sets were between 79.1% and 94.9%. Kappa values ranged from .62 to .92, while .61 -80 is substantial, and .81-1.00 is perfect agreement (McHugh, 2012). Thus, the kappa values indicate that there is substantial to perfect agreement between two coding sets (See Table 3.24).

Table 3.24 Interrater Reliability for Group Utterances

	F	***%***	***Kappa Value***	***Asymptotic SE***	***Appr. T[b]***	***Appr. Significance***
Case I Step I *(N=99)*	94	94,9	.924	.033	13.503	.000
Case II Step I (*N=112)*	99	88.4	.693	.076	10.529	.000
Case I Step II *(N= 43)*	32	74.4	.615	.093	6.585	.000
Case II Step II *(N=91)*	79	86.8	.789	.054	11.600	.000
Case I Step III *(N=43)*	34	79.1	.617	.100	4.832	.000
Case II Step III (N=93)	80	86.0	.751	.057	8.624	.000

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Interviews were also coded by another researcher (See Table 3.25). Percent agreements of two coding sets were between 70% and 100%, ranging from indicating substantial to perfect agreement.

Table 3.25 Interrater Reliability for Interviews

Categories	**Case I**			**Case II**		
	n	***T***	***%***	***n***	***T***	***%***
Planning	6	8	75,0	5	7	71,0
Role Distribution	10	11	91,0	8	10	80,0
Monitoring-Knowledge	7	8	88,0	9	9	100,0
Monitoring-Collaboration	10	14	71,0	10	13	75,0
Monitoring-Scripts	10	13	77,0	6	8	75,0
Evaluation	10	13	77,0	9	9	100,0
Cognitive Presence	4	6	67,0	6	6	100,0
Social Presence-Communication	9	12	75,0	6	8	75,0
Social Presence-Motivation	11	13	85,0	7	10	70,0
Teaching Presence	8	10	80,0	8	10	80,0

n: Number of agreements T: Total number of statements

The possible validity threats (subject characteristic, mortality, location, instrumentation, testing, history, maturation, subject attitude, regression, and implementation) were tried to be controlled for ensuring internal validity (Fraenkel, Wallen & Hyun, 2012).

Subject characteristics (selection bias) is a threat affecting the validity. However, in the study multi *(N = 2)* cases were studied intentionally to see the possible impact of instructional design.

Mortality was another internal validity due to the loss of subjects. At the beginning of the research, the number of registered students in Case I, there were 68, and in Case II, there were 15 students. Due to the irregular participation, 26 students from Case I and 9 students from Case II were included into the parametric analyses. In

one-to-one interviews, drop-out students were excluded since they did not have experience in group studies, so could not answer the related interview questions.

Location is another internal validity threat since particular locations might affect interpretation of results. However, in both cases, the same online course system (Adobe Connect) was used to eliminate any possible impact of location.

Internal validity threat due to instrument use is called **Instrumentation** threat. Any change in instrument, how the instrument is implemented, researcher bias or characteristics may also affect internal validity. Due to the fact that the in each design of two cases, the same scales (CoI and SMQ) without any format change; order or questions, font type, color and etc.) were distributed through Google Forms immediately after each implementation with only the students who participated in the activities. However, since the same CoI and SMQ instruments were administered through three designs, there is possibility of **practice (testing)** effect. This threat was controlled by putting time interval among the designs.

Maturation threat, change or development due to passing of time rather than due to intervention, was controlled by limiting the research period to one term, yet there might be any possible change due to time pass.

Hawthorne effect (subject characteristics) is another threat to internal validity since the subject might think that their behaviors might affect the results of the study, thus they intend to behave in that way. This threat was controlled by sharing the purpose of the study with subject and stressing the any positive or negative reaction would be considered as having the same importance to re-design the designs.

Implementation threat, lastly, like instrumentation effect, might occur due to any treatment difference between the groups. However, the instructional design was administered by the same way in both cases to control the impact of implementation (See Appendix I for implementation process).

3.9 Credibility, Consistency and Transferability

Through DBR design, qualitative data collection tools were also used. Focus group interviews and one-to-one interviews were done to get deeper and richer interpretations from the students. Additionally, field notes were taken by observing group activities. In qualitative approach, reliability and validity of data are discussed with a different perspective and terminology.

Internal validity of data refers to how much the results reflect the measured reality in quantitative paradigm. However, in qualitative approach "reality is holistic, multidimensional, and ever-changing" (Merriam & Tisdell, 2016, p.242). Thus, there must be a different way of assessing validity, which is called as the **credibility** of data (Lincoln & Guba, 1985).

Triangulation is stated as the best-known strategy to build up credibility (Merriam & Tisdell, 2016). Denzin, Norman (1978) provides four way of triangulation, which are triangulation of data sources, data collection methods, perspectives and observers. Triangulation of data sources pushes researcher to see as many concrete contexts as possible to obtain an observational mean. In that study, the instructional design principles were implemented in two cases to measure and observe the effect of implementation. Triangulation of multiple methods refers to use of research techniques to explain the research questions. In that study, in addition to quantitative measurement tools, one-to-one, focus group interviews and unobtrusive observation notes were combined. Use of multiple observers means to include as many different perspectives as possible. Collaboration of researcher and instructor enabled to get different insights and perspective through the research. Researcher negotiated with instructor about her/his observations after each design. Additionally, the interview data reports were checked by another researcher to support credibility. For the content analysis data, %30 of the discussion posts were coded by another volunteer trained researcher to increase the likelihood of credibility.

Member Check, or respondent validation, was another strategy for establishing credibility by getting feedback from the interviewees to abstain from misinterpretation (Merriam & Tisdell, 2016). Since this study included multiple designs, participants experienced the refined designs, which were formed by considering interview data based on their evaluations.

Adequate engagement in data collection is another strategy to look for different views on the investigated phenomena (Merriam & Tisdell, 2016). Focus-group interview sessions were done with all participants. One-to-one interviews were conducted with all volunteer students, 15 from Case I and 13 from Case II.

Researcher' position or reflexivity is another strategy for supporting credibility. It deals with how researcher affect and is affected by the research process (Probst & Berenson, 2014). Researcher of the study favors a self-paced way of learning, indeed thinks that in group-based learning high achievers carry out the process. Thus, she critically examined whether the instructional design really works. Researcher's role through the study is described in detail under a specific section.

Another strategy is **peer examination** method through which a colleague checks the plausibility of the findings (Merriam & Tisdell, 2016). In both dissertation committee meetings and throughout the process, colleagues and researchers were involved in plausibility of research design, data collection tool, data analysis and reporting process.

Consistency (Dependability) is another consideration in qualitative approach. Strategies for ensuring consistency are triangulation, peer examination, researcher's position and audit trial. The first three have already been explained above. **Audit trial** (Lincoln & Guba, 1985) means that an auditor follows the researcher' s trial to ensure results are consistent with the data (Merriam & Tisdell, 2016). In order to ease this process; data collection, instructional design, data analysis processes were explained in detail. Through the instructional design, researcher took the screen captures of the activity interface and noted all the refinements.

Transferability, which called as external validity in quantitative research, deals with how much the findings of a research can be administered in other contexts (Merriam & Tisdell, 2016). Instead of generalizations, Patton (2015) uses another word, extrapolation which refers to applicability of findings on similar, but not identical contexts. To enable other researchers to decide whether findings of a study can be applied in another situation, the context of the investigated study should be described in detail. Thus, giving rich and thick descriptions is a way of enhancing transferability. Additionally, maximum variation, including different samples/ cases/ sites, helps to promote transferability of data (Merriam & Tisdell, 2016). In that study, two different cases were investigated to answer the research questions. In each case, a number of participants were interviewed to get variation on the dimensions of investigations.

3.10 Researcher's Role

In DBR, the partnership of researcher and instructor assumes that teachers are pretty busy and not enough knowledge to conduct research, while researchers do not have adequate knowledge about the components of educational system such as technology, objectives, politics in order to evaluate the effect of intervention. Therefore, the collaboration between researcher and instructor is constituted through problem identification, literature review, intervention planning, implementation, evaluation and reporting the design principles (Anderson & Shattuck, 2012). In this study, the subject domain was medical terminology in Case I, and statistical methods in Case II. At the beginning of the semester, researcher and instructors negotiated the existing structure of the course, course objectives, course capacity, and features of the online education system. In both Cases, the same online education system was used. The system features were tested by forming groups with test accounts. An orientation group session was administered in both cases in order to inform students about the course structure, and foresee/handle any problem that might occur during the real implementation. In order to design group activities, researcher and instructor

met and discuss the learning outcomes and activity procedure. Group activity tasks were prepared by considering the total course time. Thus, 20-30-minute activities were prepared according to learning outcomes. Before each activity, instructor prepared the discussion questions, whereas researcher prepared the activity screens on the system, wrote the activity scripts, prepared the evaluation links, formed the group lists, and prepared an informative presentation. During the group activity, instructor introduced the group work, and explained the student responsibilities. Researcher formed the groups and started the session. During the group activities, both instructor and researcher observed the groups and intervened in case of technical problem. For example, if a group member left the group due to internet connection problem and came back, s/he was assigned the same group by the researcher. After the activities, sessions were ended by the researcher. Instructor asked students for any questions. Researcher shared the evaluation forms and archived the group posts. After each activity, researcher and instructor discussed the structure of the activity and negotiated on refinements. So, documentation of group posts and research data, analysis of the implementation, reflection on the process, collaborating with the instructor on a regular basis were the responsibility of the researcher. Researcher got her bachelor and master degree on instructional technology; thus, she had taken courses on online education. She had experience on online education by involving research projects and coordinating online courses in her workplace (See regarding Curriculum Vitae at the end of the dissertation).

3.11 Ethics

Moral concerns were taken into consideration through all stages of the study. Before starting to the research, ethical consent was taken from the Ethical Committee of Middle East Technical University (See Appendix J). A copy of the consent form was sent to two administrations of the universities where the data would be collected. The purpose of the study and instructional design considerations were negotiated with two course instructors, and design plans were optimized according to course

goals and objectives. The role of the researcher and instructor were discussed to inform instructor about possible load. Introductory sessions were arranged in both cases to inform students about the purpose of the research and instructional design process. Students were informed that a number of scales would be shared and interviews would be done with volunteers. This information was shared again in following orientation sessions for missing students. At the beginning of each data collection session, the purpose of the study and voluntariness condition were reminded. Since a repeated design was applied, students' name and surnames were asked, but coded and reported with a random nickname for anonymity. Interviews were done with volunteer students, and recorded after taking permission from each interviewee. For scale use and adaptations, necessary permissions were taken from the authors (See Appendix K).

3.12 Limitations

Although this study contributes to the emerging shared-metacognition research, it has some limitations. First of all, the study affirmed that the proposed SM-ID Model and instructional design principles worked on enhancing dimensions of community of inquiry and shared-metacognition in two CSCL settings; however, the results were limited with the nature of investigated cases. Besides, small sample size precluded doing parametric statistical analysis. That is, sample size of the Case II was very small, which might have impacted non-parametric test results. Furthermore, due to the irregular participants, only the consistent sub-activity groups' discussion episodes were coded. Aiming to do repetitive measurements not only with a small sub-group but with entire class comprising many sub-groups in order to conduct non-parametric tests brought with this methodological challenge. Additionally, shared-metacognition construct was studied by exclusively relying on text-based discussion episodes, self-reported questionnaire and interview data. However, students' nonverbal behaviors were not recorded/considered. Although participants demographics, online readiness levels were collected, their beliefs, motivations,

communication skills and backgrounds might have affected their group interaction patterns and their reflections. This study lacks these mediating variables. Concerning to the demographics, the participants in Case I were mostly female, while Case II was male-dominant. Although the aim was not to measure gender effect, gender-homogenous cases might be considered as a limitation.

CHAPTER 4

RESULTS

The results of the study are given under this section. The section is organized under five main headings, which are Community of Inquiry, Shared Metacognition, Group Dynamics, Utterances in Group Posts and Design Principles. For descriptive values (Mean (*M*), Standard Deviation (*SD*), Minimum (*Min.)* and Maximum (*Max*.)) were reported. The levels of change in CoI, SM and group dynamics over the three design were tested with a Friedman Test, and conducting a Wilcoxon Signed-Rank test. The effect sizes were also calculated with the Z / sqrt (N), where N is the number of observations (Tomczak & Tomczak, 2014). Utterances (discussion episodes) of the collaborative activity were coded according to the developed coding scheme, and lastly under design principles heading, qualitative data gathered from interviews and field notes were analyzed and reported.

4.1 Community of Inquiry

Community of Inquiry, teaching, social and cognitive presence levels of students were measured in two cases through three designs/designs. Descriptive statistics including minimum (Min.), maximum (Max.), mean (M) and standard deviation (SD) were calculated for each item, dimension.

The research question, “What are the students’ perceived community of inquiry levels (Cognitive presence, Teaching Presence, Social Presence) in sync-OCL environments?”, was answered through calculating descriptive statistics in Case I and Case II, respectively.

4.1.1 Community of Inquiry in Case I

Descriptive statistics for each dimension of community of inquiry, which are teaching presence, social presence, cognitive presence, and for total score of community of inquiry were calculated respectively for Case I.

4.1.1.1 Teaching Presence

Teaching presence levels of students in Case I are shown on Table 4.1. There were 13 items measuring Teaching Presence. Min., Max., M and SD value of each item were calculated for each design. Mean values ranged from 4.04 to 4.81 in Design I, from 4.38 to 4.65 in Design II, and from 4.38 to 4.69 in Design III.

Table 4.1 Item Based Descriptive Statistics of Teaching Presence in Case I

	Design1				Design2				Design3			
Items	Min.	Max.	M	SD	Min.	Max.	M	SD	Min.	Max.	M	SD
TP1	3	5	4.73	.53	2	5	4.42	.90	3	5	4.62	.64
TP2	3	5	4.62	.57	2	5	4.38	.85	3	5	4.65	.63
TP3	3	5	4.77	.51	3	5	4.58	.64	3	5	4.65	.56
TP4	4	5	4.81	.40	3	5	4.65	.63	3	5	4.69	.55
TP5	3	5	4.65	.56	2	5	4.58	.76	3	5	4.50	.65
TP6	3	5	4.65	.56	2	5	4.50	.86	3	5	4.54	.65
TP7	3	5	4.69	.55	3	5	4.65	.69	3	5	4.58	.58
TP8	3	5	4.69	.55	1	5	4.58	.95	3	5	4.65	.56
TP9	3	5	4.54	.58	2	5	4.50	.86	3	5	4.62	.57
TP10	4	5	4.65	.49	2	5	4.46	.86	3	5	4.58	.58
TP11	3	5	4.65	.56	1	5	4.50	.95	3	5	4.54	.65
TP12	1	5	4.04	1.18	1	5	4.38	1.02	1	5	4.38	.94
TP13	4	5	4.65	.49	2	5	4.54	.81	3	5	4.58	.58

Mean value of the teaching presence factor was calculated for each design as well. Mean value was 4.63 in Design I; 4.52 in Design II, and 4.58 in Design III (See Table 4.2).

Table 4.2 Factor Based Descriptive Statistics of Teaching Presence in Case I

	Mean	SD
Teaching Presence 1	4.63	0.44
Teaching Presence 2	4.52	0.73
Teaching Presence 3	4.58	0.53

4.1.1.2 Social Presence

Social presence of students was measured with 9 items. Items' mean values range from 4.00 to 4.42 in design1; from 4.27 to 4.62 in Design II, and from 4.35 to 4.77 in Design III (See Table 4.3).

Table 4.3 Item Based Descriptive Statistics of Social Presence in Case I

	Design1				Design2				Design3			
Items	Min.	Max.	M	SD	Min.	Max.	M	SD	Min.	Max.	M	SD
SP1	2	5	4.42	.86	1	5	4.62	.90	1	5	4.58	.86
SP2	2	5	4.04	.96	2	5	4.31	.88	1	5	4.35	1.02
SP3	2	5	4.12	.95	1	5	4.27	1.00	3	5	4.54	.65
SP4	1	5	4.12	1.07	1	5	4.38	1.02	3	5	4.50	.76
SP5	1	5	4.27	1.00	1	5	4.46	.86	1	5	4.42	.90
SP6	2	5	4.38	.85	4	5	4.62	.50	2	5	4.58	.76
SP7	1	5	4.00	1.13	1	5	4.31	.88	2	5	4.50	.81
SP8	1	5	4.35	.94	3	5	4.58	.58	4	5	4.77	.43
SP9	1	5	4.31	1.01	1	5	4.38	.90	4	5	4.69	.47

Mean value of the social presence factor/component was calculated for each design as well. Mean value was 4.22 in Design I; 4.44 in Design II, and 4.55 in Design III (See Table 4.4).

Table 4.4 Factor Based Descriptive Statistic of Social Presence in Case I

	Mean	SD
Social Presence 1	4.22	0.70
Social Presence 2	4.44	0.60
Social Presence 3	4.55	0.56

4.1.1.3 Cognitive Presence

Cognitive presence of students was measured with 11 items. Items' mean value ranged from 4.00 to 4.42 in design1; from 3.77 to 4.50 in Design II, and from 4.23 to 4.69 in Design III (See Table 4.5).

Table 4.5 Item Based Descriptive Statistics of Cognitive Presence in Case I

	Design1				Design2				Design3			
Items	Min.	Max.	M	SD	Min.	Max.	M	SD	Min.	Max.	M	SD
CP1	2	5	4.42	.81	1	5	4.27	.92	4	5	4.62	.50
CP2	2	5	4.31	.93	1	5	4.38	.98	4	5	4.69	.47
CP3	2	5	4.38	.94	1	5	4.50	.91	3	5	4.62	.57
CP4	1	5	3.92	1.13	1	5	3.77	1.34	1	5	4.23	1.24
CP5	3	5	4.35	.69	2	5	4.46	.76	3	5	4.50	.65
CP6	3	5	4.27	.78	1	5	4.35	.94	4	5	4.58	.50
CP7	2	5	4.15	.88	1	5	4.35	.94	4	5	4.65	.49
CP8	3	5	4.15	.83	1	5	4.35	.98	4	5	4.65	.49
CP9	3	5	4.27	.72	1	5	4.27	1.00	4	5	4.62	.50
CP10	3	5	4.23	.77	3	5	4.35	.69	3	5	4.54	.58
CP11	2	5	4.00	.89	3	5	4.27	.88	4	5	4.54	.51
CP12	2	5	4.27	.83	3	5	4.27	.79	3	5	4.50	.58

Mean value of the social presence factor/component was calculated for each design as well. Mean value was 4.23 in Design I; 4.30 in Design II, and 4.56 in Design III (See Table 4.6).

Table 4.6 Factor Based Descriptive Statistics of Cognitive Presence in Case I

Factors	Mean	SD
Cognitive Presence 1	4.23	0.66
Cognitive Presence 2	4.30	0.79
Cognitive Presence 3	4.56	0.46

4.1.1.4 Community of Inquiry

Total Community of Inquiry levels of students was calculated as well. Items' mean value increased from 4.38 to 4.57, from Design I to Design3 (See Table 4.7).

Table 4.7 Descriptive Statistics of Community of Inquiry in Case I

Factors	Mean	SD
CoI 1	4.38	0.54
CoI 2	4.42	0.65
CoI 3	4.57	0.43

4.1.2 Community of Inquiry in Case II

Descriptive statistics for each dimension of community of inquiry, which are teaching presence, social presence, cognitive presence, and for total score of community of inquiry were calculated respectively for Case II.

4.1.2.1 Teaching Presence

Teaching presence levels of students in Case II are shown on Table 4.8. Mean value ranged from 4.33 to 4.89 in Design I, from 4.00 to 5.00 in Design II, and from 4.56 to 5.00 in Design III.

Table 4.8 Item Based Descriptive Statistics of Teaching Presence in Case II

	Design1				Design2				Design3			
Items	Min.	Max.	M	SD	Min.	Max.	M	SD	Min.	Max.	M	SD
TP1	3	5	4.33	.71	3	5	4.44	.88	4	5	4.78	.44
TP2	3	5	4.67	.71	4	5	4.67	.50	4	5	4.78	.44
TP3	4	5	4.78	.44	4	5	4.89	.33	5	5	5.00	.00
TP4	3	5	4.56	.73	5	5	5.00	.00	4	5	4.89	.33
TP5	3	5	4.44	.73	4	5	4.78	.44	4	5	4.89	.33
TP6	4	5	4.67	.50	4	5	4.56	.53	4	5	4.78	.44
TP7	4	5	4.78	.44	4	5	4.67	.50	4	5	4.89	.33
TP8	4	5	4.67	.50	4	5	4.89	.33	4	5	4.67	.50
TP9	4	5	4.67	.50	3	5	4.44	.88	4	5	4.56	.53
TP10	4	5	4.67	.50	3	5	4.33	.87	5	5	5.00	.00
TP11	4	5	4.89	.33	3	5	4.33	.87	5	5	5.00	.00
TP12	3	5	4.44	.73	1	5	4.00	1.73	4	5	4.89	.33
TP13	4	5	4.67	.50	2	5	4.11	1.27	4	5	4.89	.33

Mean value of the teaching presence factor/component was calculated for each design. Mean value was 4.63 in Design I; 4.55 in Design II, and 4.85 in Design III (See Table 4.9).

Table 4.9 Factor Based Descriptive Statistics of Teaching Presence in Case II

	Mean	SD
Teaching Presence 1	4.63	0.42
Teaching Presence 2	4.55	0.57
Teaching Presence 3	4.85	0.25

4.1.2.2 Social Presence

Social presence of students was measured with 9 items. Items' mean value ranged from 4.11 to 4.67 in Design1; from 4.33 to 4.78 in Design II, and from 4.78 to 5.00 in Design III (See Table 4.10).

Table 4.10 Item Based Descriptive Statistics of Social Presence in Case II

	Design1				Design2				Design3			
Items	Min.	Max.	M	SD	Min.	Max.	M	SD	Min.	Max.	M	SD
SP1	4	5	4.67	.50	2	5	4.44	1.01	5	5	5.00	.00
SP2	4	5	4.56	.53	4	5	4.56	.53	4	5	4.89	.33
SP3	4	5	4.56	.53	4	5	4.56	.53	4	5	4.89	.33
SP4	1	5	4.11	1.36	4	5	4.78	.44	4	5	4.89	.33
SP5	2	5	4.44	1.01	4	5	4.67	.50	5	5	5.00	.00
SP6	2	5	4.44	1.01	4	5	4.67	.50	4	5	4.89	.33
SP7	1	5	4.22	1.30	4	5	4.56	.58	4	5	4.78	.44
SP8	3	5	4.56	.73	3	5	4.33	.78	4	5	4.78	.44
SP9	4	5	4.56	.53	4	5	4.56	.53	4	5	4.78	.44

Mean value of the social presence factor/component was calculated for each design as well. Mean value was 4.46 in Design I; 4.57 in Design II, and 4.88 in Design III (See Table 4.11).

Table 4.11 Factor Based Descriptive Statistics of Social Presence in Case II

	Mean	SD
Social Presence 1	4.46	0.59
Social Presence 2	4.57	0.36
Social Presence 3	4.88	0.22

4.1.2.3 Cognitive Presence

Cognitive presence of students was measured with 11 items. Items' mean value ranged from 4.33 to 4.78 in design1; from 4.44 to 4.78 in Design II, and from 4.00 to 4.78 in Design III (See Table 4.12).

Table 4.12 Item Based Descriptive Statistics of Cognitive Presence in Case II

	Design1				Design2				Design3			
Items	Min.	Max.	M	SD	Min.	Max.	M	SD	Min.	Max.	M	SD
CP1	3	5	4.67	.71	4	5	4.56	.53	4	5	4.67	.50
CP2	4	5	4.56	.53	4	5	4.78	.44	4	5	4.56	.53
CP3	3	5	4.56	.77	4	5	4.78	.44	3	5	4.44	.88
CP4	2	5	4.33	1.00	2	5	4.44	1.01	1	5	4.00	1.32
CP5	4	5	4.67	.50	4	5	4.78	.44	3	5	4.56	.73
CP6	3	5	4.56	.73	4	5	4.67	.50	4	5	4.78	.44
CP7	4	5	4.67	.50	4	5	4.67	.50	4	5	4.44	.53
CP8	3	5	4.56	.77	4	5	4.56	.53	3	5	4.33	.71
CP9	4	5	4.78	.44	4	5	4.78	.44	4	5	4.56	.53
CP10	4	5	4.67	.50	4	5	4.56	.53	3	5	4.56	.73
CP11	3	5	4.33	.78	4	5	4.56	.53	3	5	4.22	.83
CP12	3	5	4.33	.71	4	5	4.67	.50	3	5	4.44	.73

Mean value of the social presence factor/component was calculated for each design as well. Mean value was 4.56 in Design I; 4.65 in Design II, and 4.46 in Design III (See Table 4.13).

Table 4.13 Factor Based Descriptive Statistics of Cognitive Presence in Case II

Factors	Mean	SD
Cognitive Presence 1	4.56	0.46
Cognitive Presence 2	4.65	0.35
Cognitive Presence 3	4.46	0.53

4.1.2.4 Community of Inquiry

Total Community of Inquiry levels of students was calculated. Items' mean value increased from 4.56 to 4.72 from Design I to design3 (See Table 4.14).

Table 4.14 Descriptive Statistics of Community of Inquiry in Case II

Factors	Mean	SD
CoI 1	4.56	0.37
CoI 2	4.59	0.21
CoI 3	4.72	0.25

4.1.3 Change on Levels of Community of Inquiry in Case I

Community of inquiry, teaching, social and cognitive levels of students were measured at the end of each design. The concerning research question was "*Is there any significant difference on perceived community of inquiry levels of students by Design 1, 2 and/or 3?*"

The Friedman test was conducted to test whether there was significant difference between CoI scores (CoI1, CoI2, and CoI3), and dimensions of CoI as TP, SP and CP through the three designs in Case I and Case II. The hypotheses were:

H_0: There is no statistical difference on CoI, CP, TP, SP levels by instructional design (Design I vs. Design II vs. Design III).

Ha: There is a statistical difference on CoI, CP, TP, SP levels by instructional design (Design I vs. Design II vs. Design III).

4.1.3.1 Community of Inquiry

According to Friedman test result, there was a statistically significant difference in total CoI scores (CoI1, CoI2, CoI3) of students, $\chi2(2) = 6.867$, $p = 0.032$. A post-hoc analysis was conducted with Wilcoxon signed-rank test with Bonferroni correction setting $p < 0.017$ (.05/3) in order to explore between which scores the difference occurs. The test results revealed that there was not a significant difference between CoI3 and CoI1 ($Z = -1.965$, $p = .049$), CoI3 and CoI2 ($Z = 2.052$, $p = .040$), and CoI1 and CoI2 ($Z = -.329$, $p = .742$) (See Table 15 and Table 4.16).

4.1.3.2 Teaching Presence

According to Friedman test result, there was not a statistically significant difference in teaching presence scores (TP1, TP2, TP3) of students, $\chi2(2) = .105$, $p = 0.949$ (See Table 4.15).

4.1.3.3 Social Presence

According to Friedman test result, there was not a statistically significant difference in social presence scores (SP1, SP2, SP3) of students, $\chi2(2) = 4.526$, $p = 0.104$ (See Table 4.15).

4.1.3.4 Cognitive Presence

According to a Friedman test result, there was a statistically significant difference in cognitive presence scores; CP1 (*Mdn* = 1.83), CP2 (*Mdn* = 1.79), CP3 (*Mdn* = 2.38) of the students ($N = 21$), $\chi2(2) = 7.718$, $p = 0.021$. A post-hoc analysis was conducted

with a Wilcoxon signed-rank test with Bonferroni correction by setting $p < 0.017$ (.05/3) in order to explore between which scores this difference occurred. There was not a significant difference between CP2 and CP1 *(T= 116.00, Z = -.411, p = .681*); however, there was a significant difference between CP3 and CP1 (*T= 158.50, Z = -2.560, p = .010*) with a moderate effect size value r = .36 (2.560/ sqrt (52)), and between CP3 and CP2 (*T= 133.00, Z = -2.686, p = .007)* with a moderate effect size value r = .37 (2.686/ sqrt (52)), which indicated that Design 3 elicits an moderate improvement in Cognitive Presence scores of the participants. (See Table 4.15 and Table 4.16).

Table 4.15 Friedman Test Statistics of Community of Inquiry in Case I

	CoI	***TP***	***SP***	***CP***
N	26	26	26	26
Chi-Square	6.87	.11	4.53	7.79
df	2	2	2	2
Asymp. Sig.	.03	.95	.10	.021

a. Friedman Test

Table 4.16 Wilcoxon Test Statistics of Community of Inquiry in Case I

	CoI2 - CoI1	CoI3 - CoI1	CoI3 - CoI2
Z	-.33[a]	-2.00[a]	-2.05[a]
Sig. [b]	.742	.049	.040
	CP2 – CP1	CP3 – CP1	CP3 – CP2
Z	-.41[a]	-2.56[a]	-2.69[a]
Sig. [b]	.68	.010	.007

a. Based on negative ranks.
b. Asymp. Sig. (2-tailed)

4.1.4 Change on Levels of Community of Inquiry in Case II

The Friedman test was conducted to test whether there was significant difference between CoI scores (CoI1, CoI2, and CoI3), and dimensions of CoI as TP, SP and CP through the three designs in Case II.

4.1.4.1 Community of Inquiry

According to Friedman test result, there was not a statistically significant difference in total CoI scores (CoI1, CoI2, CoI3) of students, $\chi2(2) = .222$, $p = 0.895$ (See Table 4.17).

4.1.4.2 Teaching Presence

According to Friedman test result, there was not a statistically significant difference in teaching presence scores (TP1, TP2, TP3) of students, $\chi2(2) = 1.556$, $p = 0.459$ (See Table 4.17).

4.1.4.3 Social Presence

According to Friedman test result, there was not a statistically significant difference in social presence scores (SP1, SP2, SP3) of students, $\chi2(2) = 5.33$, $p = 0.069$ (See Table 4.17).

4.1.4.4 Cognitive Presence

According to Friedman test result, there was not a statistically significant difference in cognitive presence scores (CP1, CP2, CP3) of students, $\chi2(2) = .235$ $p = .889$ (See Table 4.17).

Table 4.17 Friedman Test Statistics of Community of Inquiry in Case II

	CoI	TP	SP	CP
N	9	9	9	9
Chi-Square	.22	1.56	5.33	.235
df	2	2	2	2
Asymp. Sig.	.895	.459	.069	.889

a. Friedman Test

As a summary, while there was a significant difference on CoI and CP levels of students in Case I, there was not such a statistical difference in Case II. For, TP and SP, there was not significant difference in both cases (See Table 4.18).

Table 4.18 Summary of Change on Community of Inquiry, Teaching, Social and Cognitive Presence Levels in Case I and Case II

	Case I	Case2
CoI	There was **not** a significant difference between CoI3 and CoI1 (Z = -1.965, p = .049), CoI3 and CoI2 (Z = 2.052, p = .040).	There was **not** a statistically significant difference in total CoI scores (CoI1, CoI2, CoI3) of students, $\chi2(2) = .222$, p = 0.895.
TP	There was **not** a statistically significant difference in teaching presence scores (TP1, TP2, TP3) of students, $\chi2(2) = .105$, p = 0.949	There was **not** a statistically significant difference in teaching presence scores (TP1, TP2, TP3) of students, $\chi2(2) = 1.556$, p = 0.949.
SP	There was a **not** statistically significant difference in social presence scores (SP1, SP2, SP3) of students, $\chi2(2) = 4.526$, p = 0.104	There was **not** a statistically significant difference in social presence scores (SP1, SP2, SP3) of students, $\chi2(2) = 5.233$, p = 0.069.
CP*	There was **not** a significant difference between CP2 and CP1, (Z = -.411, p = .681), **but** there was a significant difference between CP3 and CP1 (Z = -2.560, p = .010); between CP3 and CP2 (Z = -2.686, p = .007).	There was **not** a statistically significant difference in cognitive presence scores (CP1, CP2, CP3) of students, $\chi2(2) = .235$, p = 0.889.

**Statistically significant difference*

4.2 Shared Metacognition

Shared Metacognition (SM), Individual Monitoring (IM), Individual Regulation (IR) and Group Regulation (GR) levels of students were measured in both cases through the three designs/designs. Descriptive statistics including minimum (Min.), maximum (Max.), mean (M) and standard deviation (SD) were calculated for each dimension.

The research questions, *"What are the students' shared metacognition levels in synchronous OCL environments?*", is answered through calculating descriptive statistics in Case I and Case II, respectively.

4.2.1 Shared Metacognition in Case I

4.2.1.1 Individual Monitoring

Individual Monitoring levels of students was measured with 8 items. Items' mean values range from 3.77 to 5.12 in Design1; from 4.96 to 5.62 in Design II, and from 4.58 to 5.77 in Design III (See Table 4.19).

Table 4.19 Item Based Descriptive Statistics of Individual Monitoring in Case I

	Design1				Design2				Design3			
Items	Min.	Max.	M	SD	Min.	Max.	M	SD	Min.	Max.	M	SD
IM1	2	6	5.12	1.28	4	6	5.62	.64	5	6	5.77	.43
IM2	2	6	5.00	1.13	3	6	5.31	.84	5	6	5.73	.45
IM3	2	6	5.12	1.07	4	6	5.54	.65	5	6	5.65	.49
IM4	1	6	4.81	1.47	2	6	4.96	.96	4	6	5.23	.82
IM5	1	6	3.77	1.53	1	6	4.35	1.47	1	6	4.58	1.58
IM6	1	6	4.92	1.26	4	6	5.46	.71	5	6	5.77	.43
IM7	2	6	5.15	1.01	3	6	5.42	.86	5	6	5.58	.50
IM8	2	6	5.15	1.12	4	6	5.38	.70	4	6	5.50	.65

Mean value of the IM factor/component was calculated for each design. Mean value was 4.88 in Design I; 5.26 in Design II, and 5.48 in Design III (See Table 4.20).

Table 4.20 Individual Monitoring Levels in Case I

	M	SD
IM1	4.88	.89
IM2	5.26	.59
IM3	5.48	.49

4.2.1.2 Individual Regulation

Individual Regulation levels of students was measured with 4 items. Items' mean values range from 4.62 to 4.81 in Design1; from 4.88 to 5.04 in Design II, and from 5.15 to 5.42 in Design III (See Table 4.21).

Table 4.21 Item Based Descriptive Statistics of Individual Regulation in Case I

	Design1				Design2				Design3			
Items	Min.	Max.	M	SD	Min.	Max.	M	SD	Min.	Max.	M	SD
IR1	3	6	4.81	.98	2	6	4.92	1.09	2	6	5.15	.97
IR2	1	6	4.65	1.29	3	6	5.00	.89	1	6	5.23	1.07
IR3	1	6	4.62	1.36	3	6	4.88	.95	1	6	5.23	1.07
IR4	1	6	4.81	1.30	4	6	5.04	.92	5	6	5.42	.50

Mean value of the individual regulation factor/component was calculated for each design. Mean value was 4.73 in Design I; 4.96 in Design II, and 5.27 in Design III (See Table 4.22).

Table 4.22 Individual Regulation Levels in Case I

	M	SD
IR1	4.73	1.13
IR2	4.96	.85
IR3	5.27	.75

4.2.1.3 Group Regulation

Group Regulation levels of students was measured with 13 items. Items' mean values range from 4.27 to 5.92 in Design1; from 4.85 to 5.73 in Design II, and from 4.77 to 5.81 in Design III (See Table 4.23).

Table 4.23 Item Based Descriptive Statistics of Group Regulation in Case I

	Design1				Design2				Design3			
Items	Min	Max.	M	SD	Min.	Max.	M	SD	Min.	Max.	M	SD
GR1	1	6	4.77	1.24	3	6	4.96	.96	3	6	5.31	.79
GR2	5	6	5.88	.37	4	6	5.46	.76	5	6	5.81	.40
GR3	5	6	5.92	.27	4	6	5.65	.56	5	6	5.81	.40
GR4	4	6	5.92	.39	4	6	5.73	.60	4	6	5.73	.53
GR5	1	6	4.92	1.26	3	6	5.19	.94	2	6	5.15	1.05
GR6	2	6	4.62	1.27	2	6	5.08	1.09	3	6	5.19	.94
GR7	3	6	5.04	.96	2	6	5.19	1.02	4	6	5.46	.65
GR8	1	6	4.35	1.65	1	6	5.00	1.33	2	6	5.38	.98
GR9	1	6	4.81	1.36	1	6	4.88	1.28	2	6	5.23	.99
GR10	1	6	5.27	1.08	3	6	5.27	.83	4	6	5.50	.58
GR11	1	6	4.27	1.43	3	6	4.85	1.12	1	6	4.77	1.31
GR12	1	6	4.35	1.50	2	6	4.96	1.28	2	6	5.04	1.11
GR13	1	6	4.92	1.20	3	6	5.12	.99	4	6	5.46	.58

Mean value of the group regulation factor/component was calculated for each design. Mean value was 5.00 in Design I; 5.18 in Design II, and 5.36 in Design III (See Table 4.24).

Table 4.24 Group Regulation Levels in Case I

	M	SD
GR1	5.00	.72
GR2	5.18	.83
GR3	5.36	.57

4.2.1.4 Shared-Metacognition

Total Shared-metacognition levels of students was calculated for three designs. Items' mean value increased from 4.91 to 5.38 from Design I to design3 (See Table 4.25).

Table 4.25 Shared Metacognition Levels in Case I

	M	SD
SM1	4.91	.75
SM2	5.16	.68
SM3	5.38	.54

4.2.2 Shared Metacognition in Case II

4.2.2.1 Individual Monitoring

Mean of items measuring Individual Monitoring levels of students range from 4.44 to 5.33 in Design1; from 4.89 to 5.67 in Design II, and from 4.78 to 5.33 in Design III (See Table 4.26).

Table 4.26 Item Based Descriptive Statistics of Individual Monitoring in Case II

	Design1				Design2				Design3			
Items	Min.	Max.	M	SD	Min.	Max.	M	SD	Min.	Max.	M	SD
IM1	3	6	4.67	.86	4	6	5.33	.71	3	6	5.00	1.00
IM2	4	6	5.11	.78	4	6	5.33	.71	4	6	5.00	.71
IM3	4	6	4.89	.78	4	6	5.11	.93	5	6	5.33	.50
IM4	5	6	5.33	.50	3	6	5.11	1.05	5	6	5.33	.50
IM5	1	6	4.44	1.51	4	6	5.00	.87	1	6	4.78	1.48
IM6	3	6	4.56	.88	4	6	4.89	.60	3	6	4.78	.97
IM7	4	6	5.22	.67	3	6	4.89	1.17	4	6	5.00	.71
IM8	4	6	5.33	.78	4	6	5.67	.71	4	6	5.22	.67

Mean value of the individual monitoring factor/component was calculated for each design. Mean value was 4.94 in Design I; 5.17 in Design II, and 5.06 in Design III (See Table 4.27).

Table 4.27 Individual Monitoring Levels in Case II

	M	SD
IM1	4.94	.54
IM2	5.17	.63
IM3	5.06	.57

4.2.2.2 Individual Regulation

Mean of items measuring Individual Regulation levels of students range from 4.78 to 5.00 in Design1; from 4.78 to 5.44 in Design II, and from 4.67 to 5.00 in Design III (See Table 4.28).

Table 4.28 Item Based Descriptive Statistics of Individual Regulation in Case II

	Design1				Design2				Design3			
Items	Min.	Max.	M	SD	Min.	Max.	M	SD	Min.	Max.	M	SD
IR1	1	6	4.11	1.45	4	6	5.44	.77	2	6	4.78	1.20
IR2	4	6	4.78	.83	4	6	5.22	.83	2	6	4.67	1.32
IR3	4	6	4.89	.78	3	6	4.78	.83	2	6	4.78	1.09
IR4	4	6	5.00	.50	3	6	4.78	.97	3	6	5.00	.87

Mean value of the individual regulation factor/component was calculated for each design. Mean value was 4.69 in Design I; 5.00 in Design II, and 4.80 in Design III (See Table 4.29).

Table 4.29 Individual Regulation Levels in Case II

	M	SD
IR1	4.69	.54
IR2	5.00	.77
IR3	4.80	1.06

4.2.2.3 Group Regulation

Mean of items measuring Group Regulation levels of students range from 4.56 to 5.78 in Design1; from 4.78 to 5.89 in Design II, and from 4.11 to 6.00 in Design III (See Table 4.30).

Table 4.30 Item Based Descriptive Statistics of Group Regulation in Case II

	Design1				Design2				Design3			
Items	Min	Max.	M	SD	Min.	Max.	M	SD	Min.	Max.	M	SD
GR1	4	6	4.89	.78	3	6	4.78	.83	2	6	4.78	1.09
GR2	5	6	5.56	.53	3	6	5.33	1.00	5	6	5.89	.33
GR3	5	6	5.78	.44	5	6	5.89	.33	5	6	5.89	.33
GR4	5	6	5.67	.50	5	6	5.89	.33	6	6	6.00	.00
GR5	1	6	4.78	1.48	5	6	5.78	.44	5	6	5.78	.44
GR6	3	6	4.56	1.24	4	6	5.44	.88	5	6	5.78	.44
GR7	5	6	5.33	.50	5	6	5.67	.50	5	6	5.67	.50
GR8	4	6	5.44	.73	1	6	5.11	1.62	3	6	5.44	1.01
GR9	5	6	5.67	.50	3	6	5.56	1.01	4	6	5.33	.87
GR10	5	6	5.78	.44	5	6	5.89	.33	3	6	4.89	1.05
GR11	2	6	4.56	1.33	5	6	5.56	.53	1	6	4.33	1.66
GR12	2	6	4.78	1.20	1	6	5.11	1.62	3	6	4.78	1.09
GR13	4	6	5.11	.60	1	6	5.11	1.62	2	6	4.11	1.17

Mean value of the group regulation factor/component was calculated for each design. Mean value was 5.22 in Design I; 5.51 in Design II, and 5.30 in Design III (See Table 4.31).

Table 4.31 Group Regulation Levels in Case II

	M	SD
GR1	5.22	.31
GR2	5.51	.59
GR3	5.30	.43

4.2.2.4 Shared-Metacognition

Total shared-metacognition levels of students were calculated as well. Items' mean value increased from 5.06 to 5.13 from Design I to design3 (See Table 4.32).

Table 4.32 Shared Metacognition Levels in Case II

	M	SD
SM1	5.06	.28
SM2	5.31	.59
SM3	5.13	.40

4.2.3 Change on Levels of Shared Metacognition in Case I

Shared metacognition, individual monitoring, individual regulation and group regulation levels of students were measured at the end of each design. The concerning research question was "*Is there any significant difference on shared metacognition levels of students by Design 1, 2 and/or 3?"*

This research question was answered by conducting non-parametric Friedman Test. Each case was measured in three designs. The dependent variables were SM, IM, IR and GR. The dependent variables were measured in ordinal scale from 1 (Certainly disagree) to 6 (Certainly agree). The Wilcoxon Sign Test was conducted as a post-hoc test to check the significant difference among any two designs. The hypotheses were:

***H_0**: There is no statistical difference on SM, IM, IR, GR levels by instructional design (Design I vs. Design II vs. Design III).*

***H_a**: There is a statistical difference on SM, IM, IR, GR levels by instructional design (Design I vs. Design II vs. Design III).*

The Friedman test was conducted to test whether there was significant difference between SM scores (SMQ1, SMQ2, and SMQ3), and dimensions of SMQ as IM, IR and GR through three designs in Case I. Accordingly;

4.2.3.1 Individual Monitoring

According to a Friedman test result, there was a statistically significant difference in total individual monitoring scores; IM1 (*Mdn* =1.52), IM2 (*Mdn* =2.08), IM3 (*Mdn* = 2.40) of students (N = 26), $\chi2(2)$ = 12.022, p = 0.002. A post-hoc analysis was conducted with a Wilcoxon signed-rank test with Bonferroni correction setting p < 0.017 (.05/3) in order to explore between which scores the difference occurred. There was not a significant difference between IM1 and IM2 (T = 167.50, Z = -2.338, p = .019); however, there was a significant difference IM2 and IM3 (T =175.00, Z = -2.632, p = .008) with a moderate effect size value r = .37 (2.632/sqrt (52)) and IM1 and IM3 (T =284.50, Z = -3.293, p = .001) with a moderate effect size value r = .47 (3.293/ sqrt (52)), which indicated that Design 3 elicits an moderate improvement in Individual Monitoring scores of participants (See Table 4.33 and Table 4.34).

4.2.3.2 Individual Regulation

According to Friedman test result, there was a statistically significant difference in total individual regulation scores IR1 (*Mdn* = 1.65), IR2 (*Mdn* = 1.92), IR3 (*Mdn* = 2.42), of students (N = 26), $\chi2(2)$ = 10.842, p = 0.004. A post-hoc analysis was conducted with Wilcoxon signed-rank test with Bonferroni correction setting p < 0.017 (.05/3) in order to explore between which scores the difference occurs. There was not a significant difference between IR1 and IR2 (T = 125.00 , Z = -1.213, p = .225), but there was a significant difference between IR2 and IR3 (T = 158.50 ,Z = -2.567, p = .010) with a moderate effect size value r = .36 (2.567 /sqrt (52)), and IR1 and IR3 (T = 133.00 , Z = -2.685, p = .007) with a moderate effect size value r = .37

(2.638/sqrt (52)), which indicated that Design 3 elicits a moderate improvement in Individual Monitoring scores of participants (See Table 4.33 and Table 4.34).

4.2.3.3 Group Regulation

According to Friedman test result, there was a statistically significant difference in total group regulation scores GR1 *(Mdn* = 1.7), GR2 *(Mdn* = 1.92), GR3 *(Mdn* = 2.37), of students (*N* = 26), $\chi 2(2) = 6.337$, p = 0.042. A post-hoc analysis was conducted with Wilcoxon signed-rank test with Bonferroni correction setting p < 0.017 (.05/3) in order to explore between which scores the difference occurs. There was not a significant difference between GR1 and GR2, (*T* = 125.00, *Z* = -1.188, p = .235), GR2 and GR3 (*T* = 158.50 , *Z* = -1.670, *p* = .095), but there was a significant difference between GR1 and GR3 (*T* =133.00, *Z* = -2.605, *p* = .009) with a moderate effect size value r = .37 (2.638/sqrt (52), which indicated that Design 3 elicits a moderate improvement in Group Regulation scores of participants (See Table 4.33 and Table 4.34).

4.2.3.4 Shared Metacognition

According to Friedman test result, there was a statistically significant difference in total shared metacognition scores; SMQ1 (*Mdn* = 1.46), SMQ2 *(Mdn* = 1.92), SMQ3 (*Mdn* = 2.62) of students (*N* = 26), $\chi 2(2) = 17.882$, p = 0.000. A post-hoc analysis was conducted with Wilcoxon signed-rank test with Bonferroni correction setting p < 0.017 (.05/3) in order to explore between which scores the difference occurs. There was not a significant difference between SMQ1 and SMQ2 (*T* = 254.50, Z = -2.008, p = .045, but there was a statistical difference between SMQ2 and SMQ3 (*T* = 248.00, Z = 2.805, p = .005) with a moderate effect size value r = .39 (2.805/ sqrt (52) and SMQ1 and SMQ3 (T = 315.50, Z = -3.560, p = .000) with a moderate effect size value r = .49 (3.560/sqrt (52),), which indicated that Design 3 elicits a moderate

improvement in Shared Metacognition levels of participants (See Table 4.33 and Table 4.34).

Table 4.33 Friedman Test Statistics of Shared Metacognition Factors in Case I

	SMQ	IM	IR	GR
N	26	26	26	26
Chi-Square	17.882	12.022	10.842	6.337
df	2	2	2	2
Asymp. Sig.	.000	.002	.004	.042

a. Friedman Test

Table 4.34 Wilcoxon Test Statistics of Shared Metacognition Factors in Case I

	SMQ2 - SMQ1	SMQ3 - SMQ2	SMQ3 –SMQ1
Z	-2.008[b]	-2.805[b]	-3.560[b]
Sig. [c]	.045	.005	.000
	IM2 – IM1	IM3 – IM2	IM3 – IM1
Z	-2.338[b]	-2.632[b]	-3.293[b]
Sig. [c]	.019	.008	.001
	IR2 – IR1	IR3- IR2	IR3 – IR1
Z	-1.213[b]	-2.567[b]	-2.685[b]
Sig. [c]	.225	.010	.007
	GR2 – GR1	GR3- GR2	GR3- GR1
Z	-1.188[b]	-1.670[b]	-2.605[b]
Sig. [c]	.235	.095	.009

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.
c. Asymp. Sig. (2-tailed)

4.2.4 Change on Level of Shared Metacognition in Case II

Friedman test was conducted to test whether there was significant difference between SMQ1, SMQ2, and SMQ3, and dimensions of SMQ as IM, IR and GR through three designs in Case II.

4.2.4.1 Individual Monitoring

According to Friedman test result, there was not a statistically significant difference in total individual monitoring scores (IM1, IM2, IM3) of students, $\chi^2(2) = 2.800$, $p = 0.247$ (See Table 4.35).

4.2.4.2 Individual Regulation

According to Friedman test result, there was not a statistically significant difference in total individual regulation scores (IR1, IR2, IR3) of students, $\chi^2(2) = 2.774$, $p = 0.250$ (See Table 4.35).

4.2.4.3 Group Regulation

According to Friedman test result, there was not a statistically significant difference in total group regulation scores (GR1, GR2, GR3) of students, $\chi^2(2) = 2.800$, $p = 0.247$ (See Table 4.35).

4.2.4.4 Shared Metacognition

According to Friedman test result, there was not a statistically significant difference in total shared metacognition scores (SMQ1, SMQ2, SMQ3) of students, $\chi2(2) = 3.486$, $p = 0.175$ (See Table 4.35).

Table 4.35 Friedman Test Statistics of Shared Metacognition Factors in Case II

	SMQ	IM	IR	GR
N	9	9	9	9
Chi-Square	3.486	2.800	2.774	2.800
df	2	2	2	2
Asymp. Sig.	.175	.247	.250	.247

a. Friedman Test

As a summary, the results show that while there is statistical difference in SM, IM, IR and GR scores depending on the three designs of the instruction in Case I, there is not any statistical difference in all measurements in Case II (See Table 4.36).

Table 4.36 Summary of Change on Shared Metacognition, Individual Monitoring, Individual Regulation and Group Regulation in Case I and Case II

	Case I	Case II
IM**	There was **not** a significant difference between IM1 and IM2 (Z = -2.338, p = .019), **but** there was significant difference between IM2 and IM3 (Z = -2.632, p = .008, and IM1 and IM3 (Z = -3.293, p = .001).	There was **not** a statistically significant difference in total individual monitoring scores (IM1, IM2, IM3) of students, $\chi2(2) = 2.800$, $p = 0.247$.
IR**	There was **not** a significant difference between IR1 and IR2 (Z = -1.213, p = .225), **but** there was a significant difference between IR2 and IR3 (Z = -2.567, p = .010), and IR1 and IR3 (Z = -2.685, p = .007).	There was **not** a statistically significant difference in total individual regulation scores (IR1, IR2, IR3) of students, $\chi2(2) = 2.774$, $p = 0.250$.
GR**	There was **not** a significant difference between GR1 and GR2, (Z = -1.188, p = .235), GR2 and GR3 (Z = -1.670, p = .095), **but** there was a significant difference between GR1 and GR3 (Z = -2.605, p = .009).	There was **not** a statistically significant difference in total group regulation scores (GR1, GR2, GR3) of students, $\chi2(2) = 2.800$, $p = 0.247$.
SM**	There was **not** a significant difference between SMQ1 and SMQ2 (Z = -2.008, p = .045, **but** there was a statistical difference between SMQ2 and SMQ3 (Z = 2.805, p = .005, and SMQ1 and SMQ3 (Z = -3.560, p = .000).	There was **no**t a statistically significant difference in total shared metacognition scores (SMQ1, SMQ2, SMQ3) of students, $\chi2(2) = 3.486$, $p = 0.175$

*** Statistically significant difference*

4.3 Group Dynamics

Components regarding group work process including perceptions of Learning (PL), Task Difficulty (TD), Individual Performance (IP), Group Performance (GP), Role

Distribution (RD), Evaluation (E), Planning phase (P) were measured with single-item Likert type questions. The research question, "*What are the students' perception levels on group dynamics in sync-OCL environments?"* was answered for both cases.

4.3.1 Group Dynamics in Case I

4.3.1.1 Perceived Learning

Mean value of the PL was calculated for each design. Mean value was 6.92 in Design I; 6.85 in Design II, and 7.81 in Design III (See Table X).

Table 4.37 Perceived Learning Levels in Case I

	N	Min.	Max.	M	SD
PL1	26	3	9	6.92	1.81
PL2	26	2	9	6.85	2.00
PL3	26	1	9	7.81	1.67

4.3.1.2 Task Difficulty

Mean value of the TD was calculated for each design. Mean value was 3.27 in Design I; 4.31 in Design II, and 4.38 in Design III (See Table 4.38).

Table 4.38 Task Difficulty Levels in Case I

	N	Min.	Max.	M	SD
TD1	26	1	8	3.27	1.88
TD2	26	1	8	4.31	1.78
TD3	26	1	9	4.38	2.47

4.3.1.3 Individual Performance

Mean value of the IP was calculated for each design. Mean value was 7.62 in Design I and Design II, and 8.12 in Design III (See Table 4.39).

Table 4.39 Individual Performance Levels in Case I

	N	Min.	Max.	M	SD
IP1	26	5	9	7.62	1.44
IP2	26	4	9	7.62	1.47
IP3	26	6	9	8.12	.91

4.3.1.4 Group Performance

Mean value of the GP was calculated for each design. Mean value was 7.62 in Design I; 6.65 in Design II, and 8.58 in Design III (See Table 4.40).

Table 4.40 Group Performance Levels in Case I

	N	Min.	Max.	M	SD
GP1	26	5	9	7.62	1.36
GP2	26	2	9	6.65	1.92
GP3	26	7	9	8.58	.64

4.3.1.5 Role Distribution

Mean value of the RD was calculated for each design. Mean value was 7.08 in Design I; 8.04 in Design II (See Table 4.41).

Table 4.41 Role Distribution Levels in Case I

	N	Min.	Max.	M	SD
RD2	26	1	9	7.08	1.92
RD3	26	1	9	8.04	1.69

4.3.1.6 Evaluation Phase

Mean value of the E phase was calculated for each design. Mean value was 6.73 in Design I; 8.19 in Design II (See Table 4.42).

Table 4.42 Evaluation Phase Levels in Case I

	N	Min.	Max.	M	SD
E2	26	1	9	6.73	2.31
E3	26	6	9	8.19	.90

4.3.1.7 Planning Phase

Mean value of the P phase was calculated at the end of Design III as 8.00 (See Table 4.43).

Table 4.43 Planning Phase Levels in Case I

	N	Min.	Max.	M	SD
P3	26	4	9	8.00	1.27

4.3.2 Group Dynamics in Case II

The research question, “What are the students’ perception levels on group dynamics in sync-OCL environments?” was answered for Case II as well.

4.3.2.1 Perceived Learning

Mean value of the PL was calculated for each design. Mean value was 7.89 in Design I; 8.22 in Design II, and 8.67 in Design III (See Table 4.44).

Table 4.44 Perceived Learning Levels in Case II

	N	Min.	Max.	M	SD
PL1	9	7	9	7.89	.78
PL2	9	5	9	8.22	1.39
PL3	9	8	9	8.67	.50

4.3.2.2 Task Difficulty

Mean value of the TD was calculated for each design. Mean value was 6.67 in Design I; 5.56 in Design II, and 6.56 in Design III (See Table 4.45).

Table 4.45 Task Difficulty Levels in Case II

	N	Min.	Max.	M	SD
TD1	9	6	8	6.67	.87
TD2	9	4	8	5.56	1.33
TD3	9	3	9	6.56	1.74

4.3.2.3 Individual Performance

Mean value of the IP was calculated for each design. Mean value was 6.11 in Design I; 7.56 in Design II, and 6.44 in Design III (See Table 4.46).

Table 4.46 Individual Performance Levels in Case II

	N	Min.	Max.	M	SD
IP1	9	3	8	6.11	1.62
IP2	9	7	9	7.56	.73
IP3	9	2	9	6.44	2.79

4.3.2.4 Group Performance

Mean value of the GP was calculated for each design. Mean value was 7.56 in Design I; 7.11 in Design II, and 8.56 in Design III (See Table 4.47).

Table 4.47 Group Performance Levels in Case II

	N	Min.	Max.	M	SD
GP1	9	6	9	7.56	1.24
GP2	9	4	9	7.11	1.97
GP3	9	7	9	8.56	.73

4.3.2.5 Role Distribution

Mean value of the IP was calculated after second and third designs. Mean value was 7.00 in Design II; 7.89 in Design III (See Table 4.48).

Table 4.48 Role Distribution Levels in Case II

	N	Min.	Max.	M	SD
RD2	9	4	9	7.00	1.87
RD3	9	4	9	7.89	1.69

4.3.2.6 Evaluation Phase

Mean value of the E was calculated after second and third designs. Mean value was 7.56 in Design II; 8.67 in Design III (See Table 4.49).

Table 4.49 Evaluation Phase Levels in Case II

	N	Min.	Max.	M	SD
EP2	9	4	9	7.56	1.67
EP3	9	8	9	8.67	.50

4.3.2.7 Planning Phase

Mean value of the P phase was calculated at the end of Design III as 8.56 (See Table 4.50).

Table 4.50 Planning Levels in Case II

	N	Min.	Max.	M	SD
P3	9	7	9	8.56	.73

4.3.3 Change on Levels of Group Dynamics in Case I

Perception of group dynamics were measured at the end of each design. The concerning research question was "*Is there any significant difference on perceived group dynamics levels of students by Design 1, 2 and/or 3?"*

The dependent variables are Perceived Learning (PL), Task Difficulty (TD), Individual Performance (IP), Group Performance (GP), Role Distribution (RD) and Evaluation Phase (EP). The research question is answered by conducting non-parametric Friedman Test and The Wilcoxon Sign Test. The hypotheses were:

H_0: There is no statistical difference on PL, TD, IP, GP, RD, E levels by instructional design (Design I vs. Design II vs. Design III).

H_a: There is a statistical difference on PL, TD, IP, GP, RD, E levels by instructional design (Design I vs. Design II vs. Design III).

In Case I, Friedman Tests were conducted to test whether there was significant difference between PL, TD, IP, GP, RD, EP scores through designs. Wilcoxon signed-rank test was conducted to test whether there was significant difference between perceived RD and between RP scores.

4.3.3.1 Perceived Learning

A Friedman test was conducted to test whether there was significant difference between perceived learning scores (PL1, PL2, and PL3) measured in three designs. According to Friedman test result, there was a statistically significant difference in PL scores $\chi^2(2) = 9.270$, $p = 0.010$. A post-hoc analysis was conducted with Wilcoxon signed-rank test with Bonferroni correction setting $p < 0.017$ (.05/3) in order to explore between which scores the difference occurs. According to Wilcoxon signed-test results, there was not a significant difference between PL1 and PL2 (Z = -.491, p = .624), PL2 and PL3 (Z = -2.291, p = .022) and PL1 and PL3 (Z = -2.358, p = .018) (See Table 4.51).

Table 4.51 Wilcoxon Signed Ranks Test on Perceived Learning Levels in Case I

	PL2-PL1	PL3-PL1	PL3-PL2
Z	-.491[b]	-2.358[c]	-2.291[c]
Asymp. Sig. (2-tailed)	.624	.018	.022

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

c. Based on negative ranks.

4.3.3.2 Task Difficulty

A Friedman test was conducted to test whether there was significant difference between perceived task difficulty scores; TD1 (*Mdn* = 1.62), TD2 (*Mdn* = 2.13), and TD3 (*Mdn* = 2.25) measured in three designs. According to Friedman test result, there was a statistically significant difference in task difficulty, $\chi^2(2) = 7.357$, p = 0.025. A post-hoc analysis was conducted with Wilcoxon signed-rank test with Bonferroni correction setting $p < 0.017$ in order to explore between which scores the difference occurs. Bonferroni correction was applied to correct significance level as $p < 0.017$ (.05/3). There was no significant difference between TD1 and TD3 (*T* = 176.50, *Z* = -2.135, p = .033) and TD2 and TD3 *(T* = 111.50, *Z* = -.245, p = .806). However, there was a significant difference between TD1 and TD2 (*T* = 157.00, Z = -2.541, p = .011), which indicated that the second task was perceived as a harder activity than the first task. (See Table 4.52).

Table 4.52 Wilcoxon Signed Ranks Test on Task Difficulty in Case I

	TD2-TD1	TD3-TD1	TD3-TD2
Z	-2.541[b]	-2.135[b]	-.245[b]
Asymp. Sig. (2-tailed)	.011	.033	.806

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

4.3.3.3 Individual Performance

A Friedman test was conducted to test whether there was significant difference between perceived individual performance scores (IP1, IP2, and IP3) measured in three designs. According to Friedman test result, there was not a statistically significant difference in perceived IPs, $\chi2(2) = 3.893$, p = 0.143. Median task difficulty levels for IP1, IP2 and IP3 are 8.00 (6.00 to 9.00), 8.00 (7.00 to 9.00) and 8.00 (7.00 to 9.00), respectively (See Table 4.53).

Table 4.53 Friedman Test on Individual Performance Levels in Case I

N	26
Chi-Square	3.893
df	2
Asymp. Sig.	.143

a. Friedman Test

4.3.3.4 Group Performance

A Friedman test was conducted to test whether there was significant difference between perceived group performance scores; GP1 (*Mdn* = 1.88), GP2 (*Mdn* = 1.54), and GP3 (*Mdn* = 2.58) measured within three designs. According to Friedman test result, there was a statistically significant difference in task difficulty scores, $\chi^2(2) = 18.900$, p = 0.000. A post-hoc analysis was conducted through a Wilcoxon signed-rank test with Bonferroni correction setting p < 0.017 (.05/ 3) in order to explore between which scores the difference occurred. Bonferroni correction was applied to correct significance level as p < 0.017 (.05/3). There was a significant difference between GP1 and GP3 (*T* = 110.50, *Z* = -2.908, p = .004) with a moderate effect size value r = .40 (2.908/sqrt (52)), GP2 and GP3 (*T* = 224.00, *Z* = -3.796, p = .000)) with a large effect size value r = .53 (3.796/ sqrt (52)), and there was not a statistical difference between GP1 and GP2 (*T* = 47.50, *Z* = -2.394, p = .017) Thus, the analysis revealed that the Design III created a significantly large effect on perceived group performance of the participants in Case I (See Table 4.54).

Table 4.54 Wilcoxon Signed Ranks Test on Group Performance in Case I

	GP2-GP1	GP3-GP1	GP3-GP2
Z	-2.394[b]	-2.908[c]	-3.796[c]
Asymp. Sig. (2-tailed)	.017	.004	.000

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

c. Based on negative ranks.

4.3.3.5 Role Distribution

A Wilcoxon signed-rank test was conducted to test whether there was significant difference between perceived role distribution scores; RD2 (*Mdn* = 7.00), RD3 (*Mdn* = 9.00) measured in second and third designs. The results showed that the Design III elicited a statistically significant change in RD scores (*T* = 102.50, *Z* = -2.447, p = .014)) with a moderate effect size value r = .34 (2.447/sqrt (52)), which indicated that doing role distribution at the Planning phase created a significantly moderate improvement on students' perceived group performance in comparison with Design II, where role distribution was not assigned to any phase of discussion.

Table 4.55 Wilcoxon Signed Ranks Test on Role Distribution in Case I

	RD3-RD2
Z	-2.447[b]
Asymp. Sig. (2-tailed)	.014

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

4.3.3.6 Evaluation Phase

A Wilcoxon signed-rank test was conducted to test whether there was significant difference between perceived evaluation phase scores; EP2 (*Mdn* = 7.00), EP3 (*Mdn* = 8.00) measured in second and third designs. The results showed that the design in third design elicits a statistically significant change in EP scores (*T* = 165.50, Z = -2.904, p = .004) with a moderate effect size value r = .40 (2.904/sqrt (52)), which. indicated that doing Evaluation within Design III created a significantly moderate improvement on students' perceived learning in comparison with Design II (See Table 4.56).

Table 4.56 Wilcoxon Signed Ranks Test on Evaluation Phase in Case I

	EP2-EP3
Z	-2.904[b]
Asymp. Sig. (2-tailed)	.004

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

4.3.4 Change on Levels of Group Dynamics in Case II

In Case II, A Friedman Tests were conducted to test whether there was significant difference between PL, TD, IP, GP, RD and E scores through designs. Wilcoxon signed-rank test was conducted to test whether there was significant difference between perceived RD and between RP scores.

4.3.4.1 Perceived Learning

Friedman test was conducted to test whether there was significant difference between perceived learning scores (PL1, PL2, and PL3) measured in three designs. According to Friedman test result, there was not a statistically significant difference in PL scores $\chi^2(2) = 2.960$, $p = 0.228$. Median perceived learning levels for PL1, PL2 and PL3 are 8.00 (7.00 to 8.50), 9.00 (7.50 to 9.00) and 9.00 (8.00 to 9.00), respectively (See Table 4.57).

Table 4.57 Wilcoxon Signed Ranks Test on Perceived Learning Levels in Case II

N	9
Chi-Square	2.960
df	2
Asymp. Sig.	.228

a. Friedman Test

4.3.4.2 Task Difficulty

Friedman test was conducted to test whether there was significant difference between perceived task difficulty scores (TD1, TD2, and TD3) measured in three designs. According to Friedman test result, there was not a statistically significant difference in task difficulty, $\chi^2(2) = 2.214$, $p = 0.331$. Median task difficulty levels for TD1, TD2 and TD3 are 6.00 (6.00 to 7.50), 5.00 (4.50 to 6.50) and 6.00 (6.00 to 8.00), respectively (See Table 4.58).

Table 4.58 Friedman Test on Task Difficulty Levels in Case II

N	9
Chi-Square	2.214
df	2
Asymp. Sig.	.331

a. Friedman Test

4.3.4.3 Individual Performance

Friedman test was conducted to test whether there was significant difference between perceived individual performance scores (IP1, IP2, and IP3) measured in three designs. According to Friedman test result, there was not a statistically significant difference in perceived IPs, $\chi^2(2) = 2.606$, $p = 0.272$. Median task difficulty levels for IP1, IP2 and IP3 are 6.00 (5.00 to 7.50), 7.00 (7.00 to 8.00) and 7.00 (4.00 to 9.00), respectively (See Table 4.59).

Table 4.59 Friedman Test on Individual Performance Levels in Case II

N	9
Chi-Square	2.606
df	2
Asymp. Sig.	.272

a. Friedman Test

4.3.4.4 Group Performance

Friedman test was conducted to test whether there was significant difference between perceived task difficulty scores (GP1, GP2, and GP3) measured in three designs. According to Friedman test result, there was not a statistically significant difference in task difficulty, $\chi^2(2) = 4.522$, $p = 0.104$. Median task difficulty levels for GP1, GP2 and GP3 are 7.00 (6.50 to 9.00), 7.00 (5.50 to 9.00) and 9.00 (8.00 to 9.00), respectively (See Table 4.60).

Table 4.60 Friedman Test on Group Performance Levels in Case II

N	9
Chi-Square	4.522
df	2
Asymp. Sig.	.104

a. Friedman Test

4.3.4.5 Role Distribution

Wilcoxon signed-rank test was conducted to test whether there was significant difference between perceived role distribution scores (RD2, RD3) measured in second and third designs. The results showed that the design in third design doesn't elicit a statistically significant change in RD scores ($Z = -1.633$, $p = .102$). Median role distribution scores for RD2, RD3 are 7.00 (5.50 to 9.00), 9.00 (7.00 to 9.00), respectively (See Table 4.61).

Table 4.61 Wilcoxon Test on Role Distribution Levels in Case II

	RD3-RD2
Z	-1.633[b]
Asymp. Sig. (2-tailed)	.102

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

4.3.4.6 Evaluation Phase

Wilcoxon signed-rank test was conducted to test whether there was significant difference between perceived evaluation phase scores (EP2, EP3) measured in second and third designs. The results showed that the design in third design doesn't elicit a statistically significant change in EP scores (Z = -1.91, p = .056). Median role distribution scores for EP2, EP3 are 7.00 (7.00 to 9.00), 9.00 (8.00 to 9.00), respectively (See Table 4.62).

Table 4.62 Wilcoxon Test on Evaluation Phase in Case II

	EP3-EP2
Z	-1.913[b]
Asymp. Sig. (2-tailed)	.056

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

To sum up, there was not a significant difference in PL, TD, IP scores in both Cases, and there was not significant change in GP, RD and E in Case II. However, there was a significant change in GP, RD, and E scores in Case I (See Table 4.63).

Table 4.63 Summary of Group Dynamics in Case I and Case II.

	Case I	Case2
Perceived Learning	There was **not** a significant difference between PL1 and PL2 (Z = -.491, p = .624), between PL2 and PL3 (Z = -2.291, p = .022) and PL1 and PL3 (Z = -2.358, p = .018).	There was **not** a statistically significant difference in PL scores $\chi^2(2) = 2.960$, p = 0.228.
Task Difficulty**	There was **not** significant difference between TD1 and TD3 (Z = -2.135, p = .033) and TD2 and TD3 (Z = -.245, p = .806). However, there was a significant difference between TD1 and TD2 (Z = -2.541, p = .011).	There was **not** a statistically significant difference in task difficulty, $\chi^2(2) = 2.214$, p = 0.331.
Individual Performance	There was **not** a statistically significant difference in perceived IPs, $\chi^2(2) = 3.893$, p = 0.143.	There was **not** a statistically significant difference in perceived IPs, $\chi^2(2) = 2.606$, p = 0.272
Group Performance**	There was a significant difference between GP1 and GP3 (Z = -2.908, p = .004); GP2 and GP3 (Z = -3.796, p = .000); but there was **not** a statistical difference between GP1 and GP2 (Z = -2.394, p = .017).	There was **not** a statistically significant difference in perceived GPs, $\chi^2(2) = 4.522$, p = 0.104.
Role Distribution**	The results showed that the design in third design elicits a statistically significant change in RD scores (Z = -2.447, p = .014).	The results showed that the design in third design **doesn't** elicit a statistically significant change in RD scores (Z = -1.633, p = .102).
Evaluation Phase**	The results showed that the design in third design elicits a statistically significant change in EP scores (Z = -2.904, p = .004).	The results showed that the design in third design **doesn't** elicit a statistically significant change in EP scores (Z = -1.91, p = .056)

*** Statistically significant difference*

4.4 Utterances in Group Posts

The utterances of group posts were coded according to a developed coding scheme. Frequency and percentages of utterances were reported for three designs of two cases. The descriptive analyses are given through three steps, which are main categorization (CP, TP, SP, OTS, RS), shared-metacognitive regulation statements (O, P, M, E, R), and level of metacognitive regulation skills (TR, GR), respectively. The regarding research question was:

"What kinds of utterances are visible/observed in synchronous OCL environments?"

4.4.1 Utterances in Case I

It the main/first categorization step of **Design I**, 89 utterances were coded either as CP, TP, SP, OTS or RS. Accordingly, 49.44% (n=44) of these utterances are CP statements; 39.33% (n=35) are RS statements; 5,62% (n=5) are TP statements; 4.49% are SP statements, and 1.12% (n=1) is OTS statements. *In the second step*, 35 shared-metacognitive regulation statements obtained at the first step, were coded either O, P, M, E, and R. So, the majority of utterances, which are 74.29% (n=26) are M statements, while the rests are 14.29% (n=5) as P, 5,71% (n=2) as E, and %2.86 (n=1) as O and R for each. *In the third step*, 35 metacognitive regulation statements were coded either as TR or GR. The 51.43% (n=18) of these utterances are GR statements, while the rest %48.57% (n=17) are TR statements.

The 146 utterances obtained at the **Design II** were coded in the same way. *In the first step*, 41.78% (n=61) of the statements were coded as CP statements, 43.84% (n=64) as RS; 6.85% (n=10) as SP; 6.16% (n=9) as OTS; and 1.37% (n=2) as TP statements. *In the second step*, 64 regulative statements were coded in the same way. 68.75% (n=44) of are M statements; 18.75% (n=12) are E statements; 7.81% (n=5) are P; 4.69% (n=3) are R statements. *In the third step*, 64 RSs were coded either as TR or

GR statements, Accordingly, 57.81% (n=37) are GR statements, 42.19% (n=27) are TR statements.

99 utterances obtained in **Design III** were coded in the same way. %41.41 (n=41) of the utterances are RS; 36.11 (n=36) are CP statements; 19.19% (n=19), 1.03% (n=1) is TP statements, and 2.02% (n=2) is OTS. *In the second step,* 41 regulative statements were coded as O, P, M, E, and R. Again, the great majority of the utterances %58.54 (n=24) is M statements; %24.39 (n=10) is P statements; 9.76% (n=4) as E statements, 7.32% (n=3) as R statements, and 0.00% as O statements. *In the third step,* 41 regulative statements were coded either as TR or GR statements. Accordingly, 51.22% (n=21) are TR, while %48.78 (n=20) are GR statements (See Table 4.64).

Table 4.64 Utterances in Group Discussions in Case I

		Design I		Design II		Design III	
		F	***%***	***F***	***%***	***F***	***%***
Step I	**CP**	44	49.44	61	41.78	36	36.36
	SP	4	4.49	10	6.85	19	19.19
	TP	5	5.62	2	1.37	1	1.01
	OTS	1	1.12	9	6.16	2	2.02
	RS	35	39.33	64	43.84	41	41.41
	TOTAL	89	100.00	146	100,00	99	100,00
		F	***%***	***F***	***%***	***F***	***%***
Step II	**O**	1	2.86	0	0	0	0
	P	5	14.29	5	7.81	10	24.39
	M	26	74.29	44	68.75	24	58.54
	E	2	5.71	12	18.75	4	9.76
	R	1	2.86	3	4.69	3	7.32
	TOTAL	35	100,00	64	100,00	41	100,00
		F	***%***	***F***	***%***	***F***	***%***
Step III	**TR**	17	48.57	27	42.19	21	51.22
	GR	18	51.43	37	57.81	20	48.78
	TOTAL	35	100.00	64	100.00	41	100.00

The data obtained in second and third steps were merged in order to describe the percentage of TR and GR through O, P, M, E, and R. Accordingly, frequency and

percentage of utterances regarding **O-GR** (Orientation of Group Regulation), **O-TR** (Orientation of Task Regulation); **P-GR** (Planning of Group Regulation), **P-TR** (Planning of Task Regulation); **M-GR** (Monitoring of Group Regulation), **M-TR** (Monitoring of Task Regulation); **E-GR** (Evaluation of Group Regulation), **E-TR** (Evaluation of Task Regulation); and **R-GR** (Reflection on Group Regulation), **R-TR** (Reflection of Task Regulation) were reported.

As seen on Table 4.65, **O utterances** are distributed at Design I, as 2.86% (n=1) for P-GR. **P utterances** are distributed at Design I, as 11.43% (n=4) for P-GR, 2.86 (n=1) for P-TR; at Design II, 7.81% (n=5) for P-GR, at Design III, 24.39% (n=10) for P-GR. **M utterances** are distributed at Design I, as 34.29% (n=12) for M-GR, 40,00% (n=14) for M-TR; at Design II, 43.75% (n=28) for M-GR, 25.00 (n=15) for M-TR; at Design III, 21.95% (n=9) for M-GR, 36.59% (n=15) for M-TR.

E utterances are distributed at Design I, as 2.86% (n=1) for E-TR, at Design II, 3.13% (n=2) for E-GR, 15.63% (n=10) for E-TR; at Design III, 9.76% (n=4) for E-GR, 2.44% (n=1) for E-TR. **R utterances** are distributed at Design I, 2.86% (n=1) for R-GR; at Design II, 3.13% (n=2) for R-GR, 1.56% (n=1) for R-TR.

Table 4.65 Group and Task Regulation Utterances in Group Discussions in Case I

	Design I		**Design II**		**Design III**	
	f	***%***	***f***	***%***	***f***	***%***
O-GR	1	2.86	0	0.00	0	0.00
O-TR	0	0.00	0	0.00	0	0.00
P-GR	4	11.43	5	7.81	10	24.39
P-TR	1	2.86	0	0.00	0	0.00
M-GR	12	34.29	28	43.75	9	21.95
M-TR	14	40.00	16	25.00	15	36.59
E-GR	0	0.00	2	3.13	0	0.00
E-TR	2	5.71	10	15.63	4	9.76
R-GR	1	2.86	2	3.13	1	2.44
R-TR	0	0.00	1	1.56	2	4.88
TOTAL	**35**	**100.00**	**64**	**100.00**	**41**	**100.00**

4.4.2 Utterances in Case II

For Design I, *in the first step*; 105 utterances were coded as CP, SP, TP, RS or OTS. Accordingly, 51.43% (n=54) are CP statements; 43.81% (n=46) are RS; 4.76% (n=5) are SP statements, TP and OTS are 0.00%. *In the second step*, 46 RSs are were coded either O, P, M, E, or R. 84.78% (n=39) are M statements; 8.70% (n=4) are E statements; 4.35% (n=2) are P statements, 2.17% (n=1) is R statement, and 0.00% is O statement. *In the third design*, 46 utterances were coded either as TR or GR. Appropriately, 54.35% (n=25) are TR statements, while 46.65% (n=21) are GR statements.

For Design II, *in the first main categorization step*, 118 utterances were coded either as CP, TP, SP, OTS, or RS. 59.32% (n=70) are RS; 34.75% (n=41) are CP statements; 4.24% (n=5) are SP statements; 1.69% (n=2) are TP statements. *In the second step*, 70 RSs were coded either as O, P, M, E, or R. 54.29% (n=38) of RSs are M statements; 28.57% (n=20) are E statements; and 17.14% (n=12) are P statements. *In the third step*, level of 70 RSs were coded either as TR or GR. Accordingly, 58.57% (n=41) of the statements are TR statements, while 41.43% (n=29) are GR statements.

For Design III, 112 utterances were coded. *In the first step*, 81.25% (n=91) of the statements are RSs; 15.18% (n=17) are CP statements; 0.89% (n=1) is SP and .089 % (n=1) TP, and 1.79% (n=2) as OTS. *In the second step*, 91 RSs were coded as O, P, M, E or R statements. Accordingly, 59.34% (n=54) are M statements, 24.18% (n= 22) are P statements; 16.48% (n=15) are E statements. *In the third step*, 91 RSs were coded either as TR or GR statements. 52.75% (n=48) are TR statements, whereas 47.25% (n=43) are GR statements (See Table 4.66 for summary).

Table 4.66 Utterances in Group Discussions in Case II

		Design I		Design II		Design III	
		f	***%***	***f***	***%***	***f***	***%***
	CP	54	51.43	41	34.75	17	15.45
	SP	5	4.76	5	4.24	1	0.91
	TP	0	0.00	2	1.69	1	0.91
Step I	**OTS**	0	0.00	0	0.00	0	0.00
	RS	46	43.81	70	59.32	91	82.73
	TOTAL	105	100.00	118	100.00	110	100.00
		f	***%***	***f***	***%***	***f***	***%***
	O	0	0	0	0	0	0
	P	2	4.35	12	17.14	22	24.18
	M	39	84.78	38	54.29	54	59.34
Step II	**E**	4	8.70	20	28.57	15	16.48
	R	1	2.17	0	0.00	0	0.00
	TOTAL	46	100.00	70	100.00	91	100,00
		f	***%***	***f***	***%***	***f***	***%***
	TR	25	54.35	41	58.57	47	51.65
Step III	**GR**	21	46.65	29	41.43	44	48.35
	TOTAL	46	100.00	70	100.00	91	100.00

As seen on Table 4.67, **P utterances** are distributed at Design I, as 4.35% (n=2) for P-GR; at Design II, 15.71% (n=11) for P-GR, 1.43% (n=1) for P-TR; at Design III, 24.18% (n=22) for P-GR. **M utterances** are distributed at Design I, as 34.78% (n=16) for M-GR, 50.00% (n=23) for M-TR; at Design II, 22.86% (n=22) for M-GR, 31.43% (n=22) for M-TR; at Design III, 27.47% (n=25) for M-GR, 31.87% (n=29) for M-TR. **E utterances are** distributed at Design I, as 6.52% (n=3) for E-GR, 2.17% (n=1 for E-TR; at Design II, 2.86% (n=2) for E-GR, 25.71% (n=18) for E-TR; at Design III, 14.38% (n=14) for E-TR, and %1.10 (n=1). **R utterances are** distributed only at Design I as 2.17% (n=1) for R-TR.

Table 4.67 Group and Task Regulation Utterances in Group Discussions in Case II

	Design I		Design II		Design III	
	f	%	*f*	%	*f*	%
O-GR	0	0.00	0	0.00	0	0.00
O-TR	0	0.00	0	0.00	0	0.00
P-GR	2	4.35	11	15.71	25	24.18
P-TR	0	0.00	1	1.43	0	0.00
M-GR	16	34.78	16	22,86	25	27.47
M-TR	23	50.00	22	31.43	29	31.87
E-GR	3	6.52	2	2.86	1	1.10
E-TR	1	2.17	18	25.71	14	15.38
R-GR	0	0.00	0	0.00	0	0.00
R-TR	1	2.17	0	0.00	0	0.00
TOTAL	46	100.00	70	100.00	91	100.00

4.5 Design Principles

The last the research question is "*How should synchronous OCL environments be designed by considering shared metacognitive regulation?*". This research question was answered based on two focus-group interviews/ open-ended survey data (I & II) obtained after Design I and II, one-to-one structured interview data obtained after Design III and observational field notes taken through the activities.

4.5.1 Focus Group Interviews/ Survey with open-ended questions I

After Design I was completed, focus group interviews were conducted in Case I and the same questions in an open-ended survey format were sent to participants of Case II in order to take students' views to re-design instruction for Design II. Students' views were taken on *role distribution*, *the structure of the scripts*, their *collaboration method* in groups, and the *teacher's role.*

4.5.1.1 Role distribution

In Design I, group members were required to submit the group answers at the end of the activity, so they needed to choose someone to submit the answers. They were asked whether they need to share the group duties and possible roles.

Students in both cases stated that someone responsible is required to write the shared answers and to ask other group members for their contribution. Exemplary quotations from Case I and Case II are listed below, respectively: (See Appendix L & N for all original and translated statements.)

"Someone can be responsible for writing the responses of discussion questions."

(Code1000: Case I, Section I, G4)

"There might be an assistant of group representative. While group representative is dealing with writing, his/her assistant can listen to the sound records, can copy and paste things and can substitute in case of internet connection problems" (*Code1001: Case I, Section I, G5)*

*"*There should be someone to indicate shared responses*." (Code1002: Case I, Section II, G1)*

*"*The group study should be the one that any member contributes." *(Code1003: Case I, Section II, G2)*

"There might be a responsible assisting to group representative, and can write the responses to the related part." *(Code1004: Case I, Section II, B6)*

"There might be someone lead the discourse and another responsible for writing the responses." *(Code1005: Case II, Section II, SAE)*

"Someone can write/ share the consensus after discussion*." (Code1006: Case II, Section II, MVO)*

"Someone can lead the discourse and someone can be the group leader." *(*Code1007: *Case II, Section I, Aİ)*

*"*Each member has to come to group study." *(Code1008: Case II, Section I, HE)*

4.5.1.2 Structure of scripts

Students were also asked for their opinions about structure of scripts placed at the left side of group activity interface. Students mostly stated that the scripts have to be **simple** and **intelligible**. The visual used at the center of screen should be **legible** and clear. Participants also expressed need for a **timer** and **use of smileys** to reflect their emotions during the discourse. Exemplary quotations are listed below:

"It should be clear that every member can understand." *(Code1009: Case I, Section I, G2)*

"Information can be more descriptive and visually assisted. There may be catchy pictures that will enable us to learn. In fact, emoji is very nice though in terms of expressing feelings." *(Code1010: Case I, Section I, G3)*

"Information should be clear and easy to understand, easy to access." *(Code1011: Case I, Section II, G1)*

"Information should be clear in a way that the group members can understand. The information should be comprehensible so as not to be confused. The content should be clear, not have too much details, not complicated, by visually enriched." *(Code1012: Case I, Section II, G6)*

"We think that scripts are sufficient.*" (Code1013: Case I, Section II, G5)*

"There must be a clock showing the duration and a presentation that summarizes the subject." *(Code1014: Case II, Section I, MK)*

"The orientation should be clear and understandable; the activity should not begin without understanding the group representatives." *(Code1015: Case II, Section I, Aİ)*

4.5.1.3 Collaboration

Students were asked how they collaborated during activities and their evaluations on it. Students in both cases stated that the roles are needed to regulate/lever the collaboration. *Choosing a group leader and assistant, asking each member for their opinions, participating activities after getting prepared*, need for *exchange of information* during the activities were stressed as important considerations:

"Responding in order or with the questions we know its answer…" *(Code1016: Case I, Section I, G2)*

"For the question, we can follow each member and tell them to work. We can follow the subject and discuss the issues we do not understand in the group, we can try to be more efficient in the course. We can help each other with challenging issues." *(Code1017: Case I, Section II, G3)*

"The fact that everyone is prepared for the lesson makes us more active in the event. In this regard, we must attend the class as ready. When we discuss our subjects with each other and if the desired qualifications are applied, an effective communication within the group is established and maintained." *(Code1018: Case I, Section I, G3)*

"We plan to elect representatives and representative assistant every week." *(Code1019: Case I, Section I, G5)*

"Group members should be able to work regularly on SCORM packages and participate sufficiently during the event. Everyone should be active during group discussion." *(Code1020: Case I, Section I, G1)*

“Everybody should share their opinion. finally, a common decision must be made.”

(Code1021: Case II, Section II, EK)

“Participants in the online course must attend the event. Those who do not participate in the course should not be included in the group. When everyone talks at once, it creates a challenge. In the group event, the group president must give a voice to everyone in turn.” *(Code1022: Case II, Section I, MEÇ)*

“Each person's idea should be asked one by one.” *(Code1023: Case II, Section I, BS)*

“Information should be exchanged. Group representatives must direct each other.” *(Code1024: Case II, Section I, Aİ)*

Although majority of participants stressed the exchange and sharing of the information, a few of students preferred cooperation rather than collaboration. They said that questions can be shared among the members or each member can give response independently. As exemplary quotations:

“Distribution can be made by the number of questions. If there are 10 questions, it can be decided to answer 2 questions among 5 people. There should be people who write, copy and send questions. Question distribution should be made as soon as activity begins.” *(Code1025: Case I, Section I, G4)*

“Everyone should answer questions on a separate page. Then we should have a joint conversation.” ***(****Code1026: Case II, Section II, SAE)*

4.5.1.4 Teacher’s role

Concerning teacher’s role, participants expressed different level of guidance. In Case I, students voiced the need of teacher in an encouraging role. Also, they set forth that teacher can summarize the content at the end. In both Case I and Case II, they said that teacher should observe the groups, check learning difficulties and guide them.

Thus, all of the participants agreed on teacher's responsibility of leading the activities, but wanted him/her to be around them. As exemplary quotations:

"The teacher should guide, be descriptive, and communicate the most intensely." *(Code1027: Case I, Section II, G1)*

"Teacher can check us every 5 min. and observe what we're doing and at which point we're having problem. For today's lesson, we can say that the teacher could briefly summarize the subject." *(Code1028: Case I, Section II, G3)*

"The teacher should be able to convey something to everyone, come to the check occasionally, and have a good approach to us. The teacher should explain the event in a clear, fluent and simple language, tell us about the places we don't understand and be exciting. This approach improves participation and clarity. Students should be able to communicate with students, be able to attract students' attention and get feedback from group members about group activity." *(Code1029: Case I, Section II, G6)*

"The teacher should be instructive, descriptive, guiding." *(Code1030: Case I, Section I, G5)*

The role of the teacher in groups should be to check the progress, to look at the general situation of the group and to encourage those who don't participate." ***(****Code1031: Case I, Section I, G3)*

"It should support the production of ideas and have a guiding role." *(Code1032: Case II, Section I, YBD)*

"If the teacher checks the group occasionally, it contributes to us". *(Code1033: Case II, Section I, HE)*

"Encouraging…" "Guide…" (Code1034: Case II, Section I, SAE, Case II, Section I, EK)

4.5.2 Focus Group Interviews II

Focus group interviews were conducted after Design 2 in both cases. Students' views were taken on *role distribution*, their *collaboration method* in groups, and *evaluation* phase.

4.5.2.1 Role Distribution

It was asked to participants how the role distributions contribute them. Students in both cases reported positive expressions of it. Making role distribution was stated as supportive for a planned flow of collaboration, enhancing sharing reasonability and sharing workload among the group members. Time monitoring was also done periodically by means of role distribution, whereas it had been a problem in the first design. Some exemplary statements are listed below:

"1-Evaluating together after giving the shared answers, 2-Checking time continuously, 3-Contributing to see our mistakes, 4- Having sense of responsibility" *(Code1035: Case I, Section I, G1)*

Another group from Section II stated the benefits and suggested the exchange of roles over the weeks:

"We think that the change of communication, technology and assessment managers every week contribute to a planned and shared contribution in order not to impose full responsibility on a person. We can work more planned manner since the tasks are shared equally*." (Code1036: Case I, Section II, G2)*

"Role distribution contributes to not loading responsibility to a single person, it easies the learning. The time use becomes more convenient. The difficulties for the delegates, on the other hand, are that they have difficulties in terms of declaring their ideas in the conversation, so they may not be able to catch up the flow due to their responsibility." *(Code1037: Case I, Section II, G5)*

“It enabled us to use time effectively. It also ensured the active participation of all group members.” *(Code1038: Case II, Section I, VÇ)*

“When sharing the task, we understood better what we should do. Sharing tasks has saved our time. It was a chaos in the first practice, but in the next one, when everyone performed the required tasks, it prevented chaos.” *(Code1039: Case II, Section II, MVO)*

Participants were also asked for any refinements on role distributions. Participants mostly reported the roles and duties as adequate:

“We don't have any role suggestion to add or remove. Roles are perfectly logical. It should stay in that way.” (Code1040: Case I, Section I, G4, G5), (Case I, Section II, G1, G2, G4), (Case II, Section I, HE, MEÇ), (Case II, Section II, Tİ, FK)

One of the groups stated that they didn’t need communication role because they handled it together:

“The role we want to be removed is communication because we can handle this role together.” *(Code1041: Case I, Section I, G1)*

One of the focus groups and a one of the participants stated that teacher/group president should have distributed the roles albeit it had already been determined as a duty of communication responsible:

“Each week, the roles should be determined by the teacher. Because usually the same people do the same thing every week. you may need to go outside the usual. Sometimes, if our teacher arranges the role distribution, then we can contribute.” *(Code1042: Case I, Section II, G5)*

“One can be the group president and make the role distribution.” *(Code1043: Case I, Section II, AS)*

4.5.2.2 Collaboration

The important steps and considerations concerning for collaboration were listed by the participants. Role distribution was stated as the first step to be taken. Time monitoring, having joint answers, evaluating answers were thought as common considerations by students of both cases. As exemplary quotations:

- "The role distribution must be done first.
- Questions should be discussed respectively.
- The time should be used consciously.
- Group members should help each other when tasks are down.
- The question should not be passed without discussing on. Otherwise, there might become confusion and the responsible member cannot write the shared answer.
- Not everyone should write to the side at the same time, because the writing bar is being replaced by it.
- Our answers would be better if the answer key was on the same page. it's hard to look back at the answer key and write back." *(Code1044: Case I, Section I, G3)*
- "Roles should be exchanged among the members in each week.
- We should discuss on having joint answers.
- We should decide on roles faster to start discussion.
- Without making any distribution of roles, everyone should say what they cannot do.

- First of all, we should take into consideration what each other says. In that way, we can complete the activity more quickly.
- We should use the keyboard as fast as possible.
- Our friend, who reminds us of the time, should often remind the time remaining."

(Code1045: Case I, Section II, G4)

- "Role distribution
- Discussing questions
- Checking answers
- Evaluation
- Writing and sending the joint answers
- Checking time continuously."

(Code1046: Case II, Section I, BS)

- "Role distribution
- Comprehending the questions
- Discussion
- Deciding joints answers
- Writing the answers."

(Code1047: Case II, Section II, Tİ)

4.5.2.3 Evaluation

Concerning what they think about possible contribution of evaluation phase, students mostly shared positive statements as below:

"Making evaluation allows us to see our mistakes and deficiencies and to evaluate them with our friends." *(Code1048: Case I, Section I, G5), (Case I, Section II, G5), (Case I, Section II, G1)*

"It was better. We saw the answers to the questions and received immediate feedback." (*Code1049: Case II, Section I, HE), (Case II, Section II, Tİ), (Case II, Section II, FK)*

Although evaluation phase was perceived as beneficial on learning, students noted to importance of evaluating the answers together as a group.

"The whole team should do the evaluation not a person. One person can't look at all the questions and get the answers. If the questions are shared and checked, it will be faster. If only a member reviews that only s/he sees the answers, but others does not see so this way it does not contribute to us a lot." *(Code1050: Case I, Section I, G3)*

As another point, one of the groups argued that answer key and questions should have been at the same interface not to create distortion. As exemplary statement:

*"*We're wasting time using the answer key. If the answer key is not in a separate Word file, it will be easier to compare and not spend a lot of time in that part. When we move from the screen to another screen, we have experienced disconnection." *(Code1051: Case I, Section II, G4)*

4.5.3 One-to-One Interviews

Through one to one structured interview, students' perceptions on components of SM and components of *CoI (SP, CP, TP)* were explored. Concerning shared-

metacognition, students were asked about their opinions on *Planning*, *Monitoring* and *Evaluation* phases of group activity. To understand opinions about components of CoI, questions were structured according to CP, SP and TP.

4.5.3.1 Shared-Metacognition

4.5.3.1.1 Planning

Students were asked what to be decided/planned before starting group discussion in order to conduct a successful group work. Students in Case I mostly stated *sharing roles* as an important consideration. To remind; at the third design, students were supposed to decide on specific group members who would be in charge of Technology, Communication and Evaluation responsibilities. Thus, they think that role distribution should be done in Planning phase. Besides role distribution, students stated that they need to decide on how they will study together, which is coded as *Deciding on collaboration strategy.* Additionally, reading and examining the responsibilities under each role, checking whether everyone is ready and prepared for the activity, skimming the discussion questions, managing time according to load of the task, deciding on how to communicate, checking the assignment links and documents were all stated as important consideration to be done in Planning Phase, immediately before starting to discuss activity. See Table 4.68 for codes, frequency and exemplary quotations.

Table 4.68 Students' Perceptions on Planning Phase in Case I

Codes	F	Quotations	Code#
Sharing roles	9	"At first, before answering the question, deciding on technology, communication, and evaluation roles facilitated the working process." ZA	1053
Deciding on collaboration strategy	7	"We shouldn't solve the questions in mixed order. We should start with the first question. If we do not mix the order, it becomes easy to transfer answer to the note field." EÇ	1054
Examining role responsibilities	3	"Everybody should know his/her role and must know the underlying tasks." AS	1055
Checking readiness for task	3	"If someone is not prepared for the event, s/he should only watch the events from the outside." AsK	1056
Skimming discussion questions	3	"We need to read carefully, perform the task after understanding the requirements." BSG	1057
Planning Time	2	"We can decide how to answer the questions and see how many questions there are." AyK	1058
Deciding on Communication strategy	1	"Not everyone should write simultaneously." ZA	1059
Checking assignment documents		"We checked the link you shared and talked what we have for the activity."AyK	

In Case II, students mostly stated *sharing roles* as an important task to be done in Planning phase. The other considerations are stated as examining role responsibilities, managing rime, skimming questions, deciding on collaboration strategy, checking readiness, and deciding on redundancy (See Table 4.69).

Table 4.69 Students' Perceptions on Planning Phase in Case II

Codes	F	Quotations	Code#
Sharing roles	12	"We've been trying to distribute who gets what role." RK	1060
Examining role responsibilities	3	"We need to talk about the work we required to do." EA	1061
Planning time	2	"We can talk about how to use time." MVO	1062
Skimming discussion questions	2	"We should skim the discussion questions." Aİ	1063
Deciding on collaboration strategy	1	"A common decision should be made to resolve the questions in order. For example, one cannot solve the next question. everyone should proceed in the same way in a certain order." Tİ	1064
Checking readiness for task	1	"The activity may start after we all say we can start." SU	1065
Deciding on role redundancy	1	"If a member is not prepared for the task, we can decide that s/he can be given a communication responsibility instead." MK	1066

4.5.3.1.2 Monitoring

For understanding how students monitor knowledge and process; they were asked how they decide whether a member knows or does not know the discussion content, what they think about role distribution, what would be the collaboration steps they can follow, and what would be written on scripts that they can follow.

Knowledge Level

Students were asked how they understand whether a group member knows the subject or not. Students shared the indicators of knowledge level as on Table X. That is, not giving answer, writing the same answer, correcting others' mistakes, giving inadequate/correct answer, giving answer quickly, writing synchronously with others were all stated as positive/negative indicators of knowledge level.

Table 4.70 Students' Perceptions on Monitoring in Case I

Codes	F	Quotations	Code#
Not replying questions	8	"If they did not write, that means they did not know nothing. I warn them and warned them why they didn't write anything." BSG	1067
Writing previously stated answer	3	"When someone wrote the same information in the lecture book, and I thought that s/he's writing from the book." BA	1068
Correcting mistakes	3	"I could write wrong answer. We corrected each other's mistakes." AyK	1069
Giving Inadequate/irrelevant answer	2	"… when s/he writes a short sentence." İÇ	1070
Declaring explicitly	2	"They themselves were already saying." İÇ	1071
Answering quickly	2	"When s/he typed faster…" PY	1072
Giving correct answer	1	"The working person is able to establish well established sentences." HŞ	1073
Confirming answer	1	"I understand it when someone confirm or agree with us." ZA	1074
Writing synchronously with group members	1	"The person has worked if s/he writes at the same time as everyone, or if s/he writes after someone..." ZÇ	1075

Students in Case II similarly indicated unresponsiveness, inadequate, correct or fast answer, correcting mistakes as indicators of knowledge level. Additionally,

answering confidently, focusing on roles instead of task or stressing key points of the task are thought as indicators of knowledge level (See Table 4.71).

Table 4.71 Students' Perceptions on Monitoring in Case II

Codes	F	Quotations	Code#
Not replying questions	4	"Some friends were quiet. I could see they didn't know the subject because of their silence." BS	1076
Not Commenting	3	"If someone shares an idea about a topic, when others don't, it means that s/he doesn't take the event too seriously or s/he doesn't work or there's a lack of information" HE	1077
Giving inadequate/ Irrelevant answer	2	"For a person who doesn't write enough, I thought s/he might have less knowledge." Tİ	1078
Giving correct answer	2	"When the answer is correct in the evaluation section, you understand that the respondent knows it. " EK	1079
Answering confidently	1	"The person who knows is more confident in answering the questions." EK	1080
Correcting mistakes	1	"If one reacted in a corrective way then we could feel that s/he had worked harder." MK	1081
Answering immediately	1	"S/he can answer quickly without thinking." FK	1082
Focusing mostly on roles	1	"They only performed a given responsibilities." MVO	1083
Emphasizing key points	1	"There were important points. I never paid any attention to them. They have said tricks. They said you should pay attention. So, I thought this such a person was more knowledgeable." SAE	1084

Role Distribution

Students were asked what they think about the role distribution. Students in Case I expressed their perception under two categories, which are *function of the role distribution* and *their suggestions on role distribution*. Concerning function of roles, majority of the students stated that role sharing helped them to learn responsibility sharing. Also, sharing roles was stated as accelerating the group work process since there was time limitation and also helped them to be organized.

Besides function of roles, they stated that it was needed to follow whether a member perform his/her responsibility. Additionally, though there were 3 roles, the number of group members would be more than 3; thus, this point should have been considered. *Role and capability match* were another suggestion, since, for example, technology role required the related member to be capable to copy, paste posts and upload them to the system. Furthermore, group work related responsibilities were stressed as necessary, and lastly there were single-person suggestions as *excluding*

communication role, including reflection role, role redundancy in case of internet connection problem, and *time notification from instructor* (See Table 4.72).

Table 4.72 Students' Perceptions on Role Distribution in Case I

Category	Case I Codes	F	Quotations	Code#
Function of Roles	Enabling to take responsibility	6	"We learned to take responsibility." ZÇ	1085
	Accelerating process Organization function	1	"Roles were necessary because there was a time limit" "Roles were required to complete on time." PY	1086
Suggestions	Following role performance	3	"I think it would be better if there was a warning that the roles were done or not." BA	1087
	Group size role number match	2	"Because there were not so many people in the group, roles matched with 3 members. There was no problem for us.ZA	1088
	Role and capability match	2	"If there was a problem with my computer, there had to be another technology responsible. If I were alone, we would be unsuccessful." HŞ	1089
	Role rotation	2	"There will be rotation in the roles and every week everyone will know the order." İÇ	1090
	Team related roles	2	"There were technology and communication responsibility. What else could be." EÇ	1091
	No need for communication role	1	"I don't think someone would be in charge of communication responsibility. Because we were communicating within the group by ourselves." AyK	1092
	Reflection role	1	"There should have been the interpreter/reflection responsible after the last evaluation part." MD	1093
	Role redundancy	1	"Other friends were also saying they can substitute roles, which was useful again when the internet broke." FZG	1094
	Time notification from instructor	1	"I don't think we need to follow time. So, it is better for the teacher to do it for us, to warn us with start or finish messages." AyK	1095

Students in Case II, similarly, expressed their opinions under two categories, which are *function of roles* and *suggestions for role distribution*. For functions of roles, they expressed those functions as helping them to be more organized, managing time, sharing responsibilities, and constituting a shared answer.

Regarding *suggestions*, students stressed group size and role number equivalence, need for following role performance, need for moderator, planning role redundancy in case of internet connection problem. Additionally, they expressed technology role's load as higher than the load of others (See Table 4.73).

Table 4.73 Students' Perceptions on Role Distribution in Case II

Category	Codes	F	Quotations	Code#
Function of Roles	Organization function	5	"It is absolutely logical to share roles. If not, this time a huge confusion might happen and time may not be enough. The fact that someone is observing us relieves the other group members. It also reduces the workload." MK	1096
	Supporting time management	4	"It made us faster." EK	1097
	Enabling to share workload	3	"With no roles, the load rode almost over one person, but when we shared the roles, everyone was engaged in proportionally." FK	1098
	Supporting to build shared answer	1	"I think it's logical to have work sharing because it's group work. Because if there were no roles, nothing in common would come." RK	1099
Suggestions	Group size role number match	2	"For the more crowded classes I'm telling this. There were 3 roles, but sometimes we had to perform a role as two people." Tİ	1100
	Following role performance	1	"For example, someone was given a role, but s/he was not responding." SU	1101
	Role redundancy	1	"There could be problems from the Internet. Then someone else would do his/her duty." SU	1102
	Role distribution duty	1	"There may be another role like a moderator to distribute the roles or someone who can give feedback in the role division." AS	1103
	Group regulation related roles	1	"It was very nice to copy/paste the notes there. … we did the role distribution but we discussed the answers together." EA	1104
	Technology role's load	1	"The technology responsible took up more duties there." EA	1105

Collaboration Steps

In order to understand, what students perceive as necessary steps to be done through the group work process, they were asked which steps could be in order to be successfully collaborate. Majority of the students in Case I said sharing roles, monitoring answers' correctness through the process, answering questions, and answering question in order from 1 to n as important steps. Furthermore, synthesizing answers to get a shared answer, monitoring time, expressing opinions, evaluating answers were all stated as consideration to be successfully collaborate. There were also single person opinions as given on Table 4.74 below:

Table 4.74 Students' Perceptions on Collaboration Steps in Case I

Codes	F	Quotations	Code#
Sharing roles	7	"For me, who should decide what we certainly have to do." BA	1106
Monitoring answers' correctness	6	"We need to check what we were writing." İÇ	1107
Answering questions	5	"… the question solution phase." ZÇ	1108
Answering questions in order	5	"When we started with first questions, some of our friends could go directly to the 2nd, 3rd question. This made us ignore the question." AyK	1109
Synthesizing answers	3	"Everybody should start with the first question and present their opinions. After that we have to create an answer by synthesizing all of our ideas." ZA	1110
Managing time	3	"…check the time…." FZG	1111
Expressing opinions	3	"We need to exchange ideas." AsK	1112
Doing evaluation	3	"Finally, when the time is over, we must evaluate." EÇ	1113
Respectful communication	2	"Our answers need to be respected." ZA	1114
Having content knowledge	1	"Some friends come as unprepared. So only one-person answers." HŞ	1115
Understanding questions	1	"So first we have to look at the questions given by the teacher." ÇÇ	1116
Monitoring other's answers	1	"We tried not to write the same sentence." YU	1117
Asking questions to peers	1	"We should ask to our friends when needed to take advantage of their information." ÇÇ	1118
Understanding instructions	1	"We need to understand the subject. We need to quickly understand what we're asked to do." İB	1119

In Case II, students stated sharing roles, managing time, being in coordination, having enough content knowledge, performing role duties, monitoring roles and posts, communicating and synthesizing answers as important considerations. Additionally, there were single-person opinions as active participation, doing evaluation, having role knowledge, helping each other and moderating discussion (See Table 4.75).

Table 4.75 Students' Perceptions on Collaboration Steps in Case II

Codes	F	Quotations	Code#
Sharing roles	10	"First of all, sharing responsibility is very necessary." BS	1120
Managing time	6	"We need to use the time effectively." FK	1121
Being in coordination	5	"… the group needs to work collaboratively." EA	1122
Checking questions	3	"I think we should have a look at the questions before discussion." FK	1123
Performing roles	3	"Everyone had to act according to his/her role." Tİ	1124
Monitoring other's answers	3	"We were trying to write at the same time. Someone might wipe the other one' post." EK	1125
Communicating effectively	2	"We must be in touch and fast." Aİ	1126
Synthesizing answers	2	"We need to intervene as the answer was correct or sometimes as if the answer was common or not." MVO	1127
Discussing actively	1	"…sometimes a couple of people are active, which makes the group's success a bit lower." EA	1128
Evaluating answer	1	"We need to ask whether the given answer is right." MVO	1129
Having role knowledge	1	"We had to know how to succeed on the mission." HE	1130
Helping each other	1	"We were trying to help each other in every way." HE	1131
Moderating discussion	1	"A person like moderator is needed to manage the chat. Because we're having a discussion over the internet, and the words can be mixed." BS	1132

Script Structure

Scripts, a part consisting of guidelines and discussion questions to be considered/ completed during group activity, were another important consideration since students were required to follow them during the activity, and therefore it might affect students' actions and thoughts through the process. Students were asked what they need or do not need in scripts. They mostly stated role related considerations such as name of roles, role and responsible person names, previous role distribution to be used for rotation, and role-based access to the related parts. For example, only technology responsible could upload the document, or only evaluation responsible could take noted concerning right/wrong answers. In addition to role-related considerations, need for a timer showing remained time during the activity, adding a reflection section, a section to show activity satisfaction, task difficulty, simultaneously writing on notes and script part were also declared.

Table 4.76 Students' Perceptions on Script Structure in Case I

Codes	F	Quotations	Code#
Role based access authorization	3	"When a member writes to the Notes section and another person writes at the same time, notes are mixed. I don't know if it can be prevented."" İB	1133
Explicit roles(n=3)	6	"The system has enabled us to share into our communication, technology and evaluation to work within the group." FZG	
Role and member equality (n=1)		"There could be 4 responsibilities for 4 people. A person could not be idle in this way." MD	1134
Role history for rotation (n=2)		"Every week, it is better if the same people don't take the same role, but there should be in a rotation." İÇ	
Timer	2	"There could be something like a stopwatch." AyK	1135
Use of on-hand script	2	"I think it was all necessary. It was like it was supposed to be. Everything was serving a purpose." BSG	1136
Reflection	2	"Repeating the unit could be written in the Notes section." PY	1137
Activity satisfaction panel	1	"There might be a part like group members are generally satisfied with the event or not." AsK	1138
Group members' names	1	"The names of group members can be written." ZÇ	1139
Integrated answer sheet	1	"We could note how much the subject was understood and the points that were not understood." AsK	1140
Part explanations (ex: what to do in evaluation)	1	"Mostly, we have had trouble on what to write at Evaluation section." ZÇ	1141
Task difficulty panel	1	"The difficulty level of the problem can be added."AsK	1142
Transfer from chat to note part	1	"Simultaneous writing to both chat and Notes section feature can be added." İB	1143

In Case II, students mostly liked the present version of the scripts, yet there were single person suggestions like roles, role-based access authorization, short questions, immediate evaluation, timer and clear numbering of questions (See Table 4.77).

Table 4.77 Students' Perceptions on Script Structure in Case II

Codes	F	Quotations	Code#
Use of on-hand script	7	"I think it's pretty clear." SU	1144
Roles (n=1)	1	"Almost every task, there were roles such as a person to copy or send, it was good." RK	1145
Pre- role sharing (n=1)	1	"I think it would be more useful if role sharing was done before groups were set up" RK	1146
Role based access authorization (n=3)	3	"… The previous letters disappeared while writing. I've only suffered such a problem." Tİ	1147
Short questions		"For example, I didn't understand what I read. I was reading it for the second time. Sometimes I read the third time." RK	1148
Instant evaluation		"Evaluation can be instant. When we write the answer, our answer can be evaluated as correct or incorrect." FK	1149
Timer		"I think, if it's a 40-minute event, for example, 10 minutes left or 20 minutes left or the last remaining time may be notified." MVO	1150
Numbering of discussion questions	1	"If there were more than one question, there were such a problem. Let's just say we're going as 1B 1C. There also were 2A 2B 2C. When someone said 'I'm doing A', it was not clear which question's options it was." BS	1151

4.5.3.1.3 Evaluation

Students were supposed to form a shared answer and evaluate that shared answers at the evaluation phase according to given answer sheet. Thus, they were both asked how they obtained a shared answer and what they think about evaluation phase.

Concerning how they obtained a shared answer, they asserted that *frequency of an answer, when an answer was confirmed by another, when someone presented a rationale for his/her answer* were asserted are the reasons how they decided on an answer as a shared answer. Additionally, if someone *insisted on his/her answer*, that answer was written as a shared answer. Also, students mixed their answers to obtain a shared answer. Lastly, a student said they first shared their opinions, then they *skipped* to another question to create a time interval to *think* about the questions, and *return*ed to question to construct a shared answer.

For the evaluation phase, they stated having the answer sheet enabled to get feedback, make an evaluation together, help them to recall the correct answer later as they need, and to revise their answers. However, they expressed the need for a brief answer sheet due to time limitation. On the other hand, checking personal answer instead of checking shared answers or making negative comments to those having given wrong answer were expressed as undesirable implementations at this phase (See Table 4.78).

Table 4.78 Students' Perceptions on Evaluation in Case I

Category	Case I Codes	F	Quotations	Code#
Shared Answer	Frequency of answers	5	"They usually look at the majority's answer and decide. When 3-5 people said the same answer, I didn't think there would be a different right answer." AsK	1152
	Confirmation of answers	5	"Both my friend X said my answer was right, and I'm just saying you're right, too. Then I was writing the answer." İB	1153
	Rationality of answer	4	"When we said this is the answer because of this reason, everyone was accepting." İÇ	1154
	Insisted answer Merged answers Share-Think-Revise Cycle	1	"For example, I insisted that my answer is correct. Friends did not object and added my answer to Notes." PY "Everybody wants a part of their answer to be added the common answer." ZÇ "Everybody was checking their answer again. Then everyone was asked to think about that question again, we would go to the other question and turn back it later." FZG	1155
Evaluation Phase	Providing feedback	6	"In this section, we noticed where we wrote less or where we overwrote." BSG	1156
	Supporting shared evaluation	5	When we read the answers, we though that we could write this or there is such a point." İÇ	1157
	Need for a brief answer sheet	4	"The answers to some questions were too long. It was better to look at the answers together due to time limitation." BA	1158
	Checking self-answer	3	"At least I checked my own answers. I think the common answers are already true." AsK	1159
	Enhancing recall	1	"I remembered the word we wrote wrongly in the exam. We remembered that we wrote it wrong in the activity." İB	1160
	Inducing negative comment		"My answer was wrong as well, and they said they did not add my answer." PY	1161
	Supporting revision		"It allowed us to do repetition" HŞ	1162

In Case II, students decided on the shared answer according to *confirmative statements*, *assertiveness of responder*, if an answer is *supported with a rationale*, if an answer was *frequently* stated, and *credibility of the responder*.

For the evaluation phase, students stated positive perceptions. They pointed out evaluation phase as a way of *getting feedback*, *enhancing learning*, *making shared evaluation* and an *opportunity for preparing for exam* (See Table 4.79).

Table 4.79 Students' Perceptions on Evaluation in Case II

Table X
Students' Perceptions on Evaluation in Case II

Category	Codes	F	Quotations	Code#
Shared Answer	Confirmation of answer	6	"Everybody confirmed the answers. Then, that answer was written directly as a common answer." MK	1163
	Insisted answer	3	"If someone was sure of his/her answer, s/he insisted that his answer be written. I did the same." FK	1164
	Rationality of answer	3	""The answer having the most logical rationale was written, whereas if the reason for the answer is not logical, it was eliminated." AS	1165
	Frequency of the answer	3	"We wrote the majority's answer." EA	1166
	Credibility of responder	2	"We considered the answer of our X friend. We were relying on his/her answer as s/he was working as a teacher." RK	1167
Evaluation Phase	Providing feedback	7	"Of course, it's made a positive impact. We realized our own mistakes" EK	1168
	Enhancing learning	4	"Although many of our answers were wrong, we learned the correct one, at least." RK	1169
	Supporting shared Evaluation	4	"I think it is a very nice implementation. After the answer key was shared, we were having discussion on it." AS	1170
	Preparation for exam	3	"The feedback helped us on the exam. For example, we had a wrong answer. While ANOVA was the answer we have said something else, so it helped me to remember ANOVA." EA	1171

4.5.3.2 Community of Inquiry

4.5.3.2.1 Cognitive Presence

Students were asked whether their friends contributed to his/her learning/cognitive presence during the group study or not. Students in Case I stated that they exchanged

information with their friends, made brainstorming while answering questions, realized they were making a mistake as their friends' answers diverged with their answers, or someone defend his/her solution, connected/integrated their ideas, and felt sense of puzzlement as they encountered with contradicting answers (See Table 4.80).

Table 4.80 Students' Perceptions on Cognitive Presence in Case I

Category	Case I Codes	F	Quotations	Code#
Exploration (N=9)	Information Exchange	4	"When they wrote something, I realized a different point." BA	1172
	Brainstorming	3	"Everyone was telling all the answers immediately" ZÇ	1173
	Divergence	2	"When my friends wrote something, I realized I was looking at wrong lecture notes, or when my friends answered, it was exactly the same as I thought about the answer. " FZG	1174
Resolution (N=1)	Defending solutions	1	"When I stumbled upon the question, when 2 people answered the question, I learnt correct answer based on what they said. Then, when we check out at evaluation phase, then I made sure of the answer." ZA	1175
Integration (N=3)	Connecting ideas	3	"When I couldn't complete the answer, one of my friends were doing so." İB	1176
Triggering event (N=1)	Sense of puzzlement	1	"Of course, when we were talking about questions there, we were learning something from each other." HŞ	1177

Students in Case II stated that they exchange information with their friends, they learnt the correct answer as their answers contradicted with those of their friends, they created solutions, connected ideas, supported each other's' ideas to get a common answer, and felt a sense of puzzlement in case of contradicting opinions (See Table 4.81).

Table 4.81 Students' Perceptions on Cognitive Presence in Case II

Category	Case II Codes	F	Quotations	Code#
Exploration (N=7)	Information exchange	5	"For example, if I know a subject well or I don't know it, my friend wrote it."	1178
	Divergence	2	"If someone's answer contradicted with my answer, I thought whether it might be correct. I was thinking on the way s/he thinks. If it contradicted in my head, I said the answer was not like that, or was true." HE	1179
	Creating solutions	2	"I learned how to examine the texts, from which perspectives to look at them during the activities." MK	1180
Integration (N=4)	Connecting ideas	1	"Since everyone's perspective is different, I learn when someone else give answer." Aİ	1181
	Convergence among group members	1	"Everyone supported each other, so we decided on a common decision. The knowledge of all of us was combined, not the answer of a single person." Tİ	1182
Triggering event (N=2)	Sense of puzzlement	2	"There were situations in which I remained in dilemma. I had a chance to correct my own misconceptions when someone else wrote the opposite things to my mind." MVO	1183

4.5.3.2.2 Social Presence

To understand the students' social presence in group activities, they were asked what would affect their communication and motivation.

4.5.3.2.2.1 Communication

For communication, students in Case I expressed their perceptions by referring the problems. The most prominent factor was declared as technology efficacy. Since students communicate through texting, keyboard use capability was stated as an important consideration. Synchronously answering the same question was another point affecting their communication. Although questions were numbered as 1a, 1b, 1c and so on, some group members skipped to another question while their friends were solving another one. Similarly, unfollowing discussion posts was also stated as affecting factor. Criticizing those not following the discussion posts, or those giving wrong answers were also declared as affecting communication negatively. Though doing group activity through texting was seen as more confident environment and

let students have a thinking time than communicating via microphone, texting made students give shorter answers due to texting difficulty. Group members *not participating* and the *group members felt lack of motivation* were also perceived as factors affecting communication negatively (See Table 4.82).

Table 4.82 Students' Perceptions on Social Presence-Communication in Case I

Category	Case I Codes	F	Quotations	Code#
Open Communication (N=9)	Discussing questions synchronously	4	"It was a problem that everyone was solving different questions at the same time." İB	1184
	Criticizing un-followers	2	"For example, if the terms were required to be written during the event, someone wrote them. But when someone wrote the same term again, we said why you wrote the same." PY	1185
	Not being able to follow communication		"Messages were scrolling, so the person in charge of communication was asking the answer again, it was a problem."	1186
	Asking questions only a single person	1	"Let's say I want to ask something to a specific person. It's not appropriate when you don't consult with the person doesn't have information." ZG	1187
Technology Competency (N=6)	-	6	"Sometimes my group mates couldn't understand what I wrote, not I mean, because of the keyboard." BSG	1188
Affective Expression (N=5)	Expression of emotions, use of humor, respect	4	"Sometimes I make jokes to soften the environment. I mostly monitor myself as I seem to imply something or threaten somebody."AsK	1189
	Confidence	1	"Of course, I can't say the same what I wrote, on the microphone. I think it's better to communicate by typing." PY	1190
Physical conditions (N=3)	-	3	"For instance, I can't write when I have a child in my lap." BA	1191
Other	Texting environment as providing thinking time	1	"I can overcome a confusion while writing. At least writing provides an integrity rather than saying what I say piece by piece." YU	1192
	Requiring to write short answers		"It's different talking to each other. Being physically side by side is different. For example, we try to write short messages while typing."	1193
	Unwilling members		"I know a few people don't want to be in the group. When I 'm in a group with someone I don't like, neither I, nor s/he want to be in it." HŞ	1194
	Unresponsive members		"We couldn't say anything to those who were unresponsive. We just got angry instead." MD	1195

In Case II, similarly, technology efficacy and need of being synchronous were declared as prominent factors affecting communication. Texting environment were liked due to having opportunity to follow/catch posts as someone missed a part, and being a confident environment in comparison with communicating via microphone. Although students found the texting environment problematic in terms of expressing emotions due to lack of facial and vocal expressions, they created a group cohesion through group harmony. Lastly, physical conditions like internet connection problem stated as a factor affecting their social presence (See Table 4.83).

Table 4.83 Students' Perceptions on Social Presence-Communication in Case II

Category	Codes	F	Quotations	Code#
Open communication (N=5)	Discussing questions synchronously	3	"I think the microphone would create a mess Because everyone will speak at the same time." BS	1196
	Texting as easing to follow answers	1	"We have a chance to read the posts again." BS	1197
	Asking clarification questions to understand underlying meaning	1	"When someone doesn't write his/her opinion, of course, we naturally have trouble communicating with him/her. We have to ask him/her what s/he thinks." EA	1198
Technology Competency (N=3)	-	3	"I wrote slowly, someone wrote faster than me before I wrote." HE	1199
Affective expression (N=2)	Lack of expression of emotions	1	"Sometimes we can't tell exactly what we mean by writing, so it creates misunderstanding." SU	1200
	Confidence with texting	1	"We couldn't love the microphone as a class. I think I express myself very well by testing." FK	1201
Group Cohesion	Harmony	1	"If you asked who I wanted to be a group, 3 of the 4 people would be among the ones I would choose myself." Aİ	1202
Physical conditions	Connection problem	1	"Because everyone's Internet connection is not perfect, sometimes someone writes the correct answer, but it appears lately." AS	1203

4.5.3.2.2.2 Motivation

Students were asked about the factors affecting their motivation. In Case II, students stressed active participation of their friends as the most prominent factors increasing

their motivation, whereas technical problems as decreasing their motivation. Additionally, while giving right answer was stated as increasing motivation, giving wrong answer was stated as decreasing motivation. Completing activity on time was also stated increasing motivation. Besides these, there were single-person statements like thought of unfair grading, being criticized by others, being faster responders, group warmth, entertaining learning environment and etc. as affecting motivation. (See Table 4.84).

Table 4.84 Students' Perceptions on Social Presence-Motivation in Case I

Codes	F	Quotations	Code#
Engaging actively	6	"When we were active, we closed the computer happily. We felt good." İÇ	1204
Technical Problems	5	"Internet connection problem has been a factor reducing my motivation." ÇÇ	1205
Time Management	3	"It was a motivating factor to finish the activity in time and then move to the evaluation section." PY	1206
Being prepared	3	"Asking the questions, I know (laughs) mostly increased motivation." BSG	1207
Answer Accuracy	2	"When I gave the wrong answer, I was sorry on behalf of myself and my group." İÇ	1208
• Unfair grading • Being criticized by other members • Being faster responder • Being late comer • Being observed by instructor • Entertaining learning environment • Group warmth • Ignorance of answers • Regarding only single person's answers • Task difficulty	1	"I've been trying so hard and the fact that X got a higher score than me made me crazy." MD "When I give the wrong answer and people criticize me…" İÇ "Uploading the file to the system before everyone was a motivating factor." PY "Once I was late, and 10 minutes had passed. You've set up groups. Everyone started answering questions." ZA "I had a very nice and enjoyable event. It was very nice for me." AsK "I should not say exclusion, but when my opinion was not asked…" ZÇ "Before planning begins, my motivation falls when only one's answer is taken into consideration before anyone writes something." BSG "The difficulty of the subject affects my motivation. I thought we couldn't finish them or nor. I was in a hurry." BA	1209

In Case II, similarly, engagement and successfully managing time were perceived as increasing motivation. Different from Case I, when students became aware of their lack of knowledge, they were motivated. As single-person opinions, ignorance of

answers, answer accuracy, feeling of being observed by instructor, being prepared for the activity and etc. were stated as affecting motivation (See Table 4.85).

Table 4.85 Students' Perceptions on Social Presence-Motivation in Case II

Codes	F	Quotations	Code#
Engaging actively	4	"Everyone's participation in the process has had a positive impact on my motivation." MK	1210
Time management	3	"Time shortness affected motivation. We've worried about whether we can finish the activity on time or not. Actually, time is enough but it affects psychologically." SU	1211
Letting to be aware of knowledge deficiency	2	"We saw some of our friends prepared well, so we realized our lacks. I thought I didn't work on the subject. It gave me a plus to turn off my deficiency." AS	1212
• Ignorance of answers • Answer accuracy • Being observed • Course preparation • Physical conditions • Positive reflection • No role distribution Technical problem	1	"The answer I said was true, but we didn't write it to the shared answer. So, my motivation has decreased." MVO "Answering the questions as soon as possible and giving the right answer increased my motivation." EA "When the teacher said that I was watching you and following, it increased my motivation." FK "There were children with us. There were times when the child cried when I was going to write." HE "When I was asked for an idea on the subject, or when our friend was saying my answer was true, it encouraged me to write and made me happier." HE "When there was no role distribution, we didn't know what to do we became demoralized." RK "We had a problem with the connection. It inevitably affected our motivation."	1213

4.5.3.2.3 Teaching Presence

The group activity consisted of three phases, which ere *before* an activity started, *while* an activity was going on and, *after* an activity was completed. Therefore, students' perception of teaching presence was explored through these three phases.

In Case I, students expect from their instructor to inform them about the group activity requirements, and to present the content before group activity get started. During the group activity while some of the students expected nothing from the instructors, some expected from instructor to deal with technical problems and reinforce student participation. After the group activity, students expect from

instructor to summarize discussion, diagnose misunderstanding, share answers, inform about the next activity (See Table 4.86).

Table 4.86 Students' Perceptions on Teaching Presence in Case I

Theme	Category	Code	F	Quotations	Code#
Before	Design and organization	Set Curriculum, Design methods	8	"You're telling us what we were supposed to do. We were just trying to figure it out." AsK	1214
	Direct instruction	Present content	5	"I would like to have a little lecture, I at least as a summary." FZG	1215
	Direct instruction	Respond to technical problems	6	"You were informing us when there was a problem." İB	1216
During	No intervention	-	6	"There wasn't anything to do there. We were evaluating ourselves." PY	1217
	Facilitating Discourse (N=2)	Drawing in participation by asking questions	1	"Asking questions when all group members are confused…"YU	1218
		Reinforce student contribution	1	"We would be very happy if you warned passive members." MD	1219
After	Direct instruction (N=8)	Summarize discussion	6	"After the event, I would expect the teacher to have such a summary." ZÇ	1220
		Diagnose misconceptions	1	"Teacher can say "Kids, you've made a mistake there, so be careful". We can talk about mistakes." BA	1221
		Confirm understanding	1	"Teacher can give the answers at the end." HŞ	1222
	Design and organization	Set curriculum for the next session	1	"For example, it was helpful for me when the teacher said" study on this topic or remind the subject." ZA	1223

In Case II, similarly, students expect from instructor to inform about the activity and present the content before group activity get started. During the group activity, while the majority do not expect anything from the instructor, some of the students want instructor to observe them, to notify time, to respond technical problems, and monitor their learning process. After the discussion, they want from instructor to inform them about misconceptions, to provide feedback and summarize the content (See Table 4.87).

Table 4.87 Students' Perceptions on Teaching Presence in Case II

Theme	Category	Code	F	Quotations	Code#
Before	Design and organization	Set Curriculum, Design methods	6	"The teacher should remind that there would be an activity before a week or a few days before. S/he can talk about the importance of the event, the roles we have to take, what needs to be done." SU	1224
	Direct instruction	Present content	2	"A preliminary information, not related to the group work, but related to content, subject would be shared." BS	1225
During	No intervention	-	5	"When the discussion began, the teacher should not have an intervention, as s/he has already do not so." BS	1226
	Observe students	-	2	"I just want the teacher to be as observer as s/he did so. I'd rather stay it that way too." AS	1227
	Guiding	-	2	"Teacher as guide." Tİ	1228
	Direct instruction	Respond to technical concerns	1	"So, when there is a problem, s/he should help solve it." MK	1229
	Facilitating discourse	Reinforcing student contribution	1	"When we say something wrong, s/he can encourage us to think of it a little more or show us a different point." HE	1230
After	Direct instruction (N=6)	Diagnose misconceptions	3	"After the group activity, s/he could explain more about our mistakes." FK	1231
		Summarize discussions	2	"After the activity, we could repeat the lesson focusing on mistakes. S/he could give more explanation." AS	1232
	Assess performance	-	2	"I think it was good to have feedback as in evaluation phase." RK	1233

4.5.4 Observational Field Notes

At that part, observational field notes taken in Case I and Case II are presented. In both Case I and Case II, some of the students did not attend to group activities. Thus**,** **missing group members** would be a problem while forming consistent groups. Thus, in the next sessions, groups including at least 10 registered students were formed; thus, in case of missing members, there might be at least 3 students to study together. *(Case I and Case II)*

Another problem was technology competency of the students. Although students were registered to a fully-online associate program, they did not have enough information to use Google Drive, shortcuts for copy/paste, uploading homework

LMS. Thus, support videos were recorded and shared with the students so as not to face such **technology related problems** during the implementation. *(Case I)*

Researcher was responsible to share activity link with the 6 groups. However, researcher **mistakenly shared a wrong link** with a group, and need send the link again *(Case I)*

Submission or evaluation forms would be better to be opened in the Adobe Connect interface in order to decrease load for researcher and not to interrupt students. Additionally, all arrangements must be done before the sessions. However, Adobe Connect platform permits to assign only active members to groups. Thus, once a group member disconnected from the session, s/he had to be added to the same group again. Due to this problem, researcher/teacher needed to be **alert for any disconnection** problem *(Case I and Case II).*

In one of the sessions of Case I, some students complained about the physical environment where they connected to the course. Thus, participating with **writing instead of audio connection** was better in terms of controlling environmental factors such as noise or lack of technical equipment *(Case I).*

In Case II, missing groups member was again a problem. Besides missing members, **late-comers** created problems once the activity had started. In that situations, the late comer was informed immediately and then assigned his/her group. *(Case II).*

While designing screen interface, the **font size and legibility of text and visuals** should be considered. In one of activities of Case II, a student connected via his mobile device. Though he did not have any problem, the type of device might create problem as if visuals are used for the activity. *(Case II).*

CHAPTER 5

DISCUSSION and CONCLUSION

At this chapter, major findingsof the study were discussed and synthesized with the previous studies. Concluding remarks, and implications of the study were presented.

5.1 Community of Inquiry

At this part, the results regarding sub-dimensions of Community of Inquiry Framework were discussed with the previous research results.

5.1.1 Cognitive Presence

In this study, while CP levels of students at Case I increased significantly, CP levels of students at Case II stayed stable throughout the design. Students in Case I experienced most of the CP related tasks at Exploration phase, while Case II students did at mostly exploration and integration phases. At Design III, the percentage of CP and RS utterances were in balance at Case I, while CP was replaced with RS at Case II. One of the considerations effecting the level of CP might be the nature of task. In Case I, the subject was Medical Terminology, and in Case II, it was Statistics course. Gorsky, Caspi, Antonovsky, Blau, and Mansur (2010) compared active participation rates in science courses versus humanity courses' forums, and found results in favor of science course. Concerning to the TP, CP and SP, the ratio of these three presences was constant through different subject areas/disciplines. Garrison, Cleveland-Innes, and Fung (2010) found that humanities and social science courses are suitable for more discussion and critique, and were statistically significant correlated with CP. Arbaugh, Bangert, and Cleveland-Innes (2010) integrate the existing literature on CoI and subject matter effects with seven disciplines at two U.S universities, and

found that CoI is more pertinent for applied disciplines than pure ones. The courses were categorized based on Biglan's (1973) classification, which were hard pure (natural sciences), hard applied (know-how through hard knowledge), soft pure (humanities and social sciences) and soft applied (know-how through soft knowledge). In Arbaugh, Bangert, and Cleveland-Innes (2010) study, in one of university, students enrolled in Allied Health and Technical "(medical transcription, web development and other trade courses") had higher scores in CoI dimensions than students taking other courses. In other university, students enrolled in Quantitative courses rated lower scores (p.41). Garrison (2017) also argued that nature of task affects nature of the interaction and discourse quality. In these studies, even though the disciplinary difference studies do not cover all the courses of a discipline, the results were generalized over it. Thus, it not possible to have certain decisions on subject area effect. In terms of phases of CP in terms of PIM, while some of the subjects of a specific discipline might require exploration of information, another subject of the same discipline might be more appropriate for higher phases of CP like integration of knowledge. Based on Biglan's (1973) classification, higher phases (integration and resolution rather than exploration and trigger) of CP might be more visible in applied disciplines. Thus, though there is not assertive empirical research on disciplinary effects, while the same instructional design statistically increased the associate degree students' CP scores in Medical Terminology course, the scores of graduate students enrolled in Statistics course remained constant, which is similar to the Arbaugh, Bangert, and Cleveland-Innes (2010)'s results. Nevertheless, it is important to note that graduate students taking Statistics course experienced higher phases of CP than associate degree students through the shared-metacognition oriented design, although their CP levels remained constant through the designs of instructional design.

Besides the nature of task, the nature of teaching method/ function of teaching presence is another consideration affecting CP (Garrison, 2017). This study was implemented in an instructional setting having Flipped Classroom's (FC) characteristics. FC refers to a pedagogical approach through which students

individually handle the direct instruction part, so a dynamic and interactive group learning space can occur by the guidance of the instructor by focusing on the higher learning outcomes like applying the learnt concepts or creatively engaging with them (Bergmann & Sams, 2014). Specifically, in this study, the necessary background information was provided before the class through digital learning materials (video, animation, text and etc.), and the class time was separated for collaborative group work. CoI Framework and FC approach have a common ground on emphasizing higher learning outcomes. While CoI builds critical thinking procedures and the collaborative establishment of individual and shared understanding (Garrison, 2017), FC's basic premise is that direct instruction is conveyed individually, so in-class time is spent for richer and more important learning outcomes (Bergmann & Sams, 2014). In this study, students were required to complete pre-class materials (video, reading materials) and to have a collaborative discussion activity. While all the lectures were in FC format in Case I; in Case II, instructor followed direct instruction in some lectures. Teaching role was distributed among students and the instructor. Arbaugh (2007) expressed that the role of teacher in CoI to cultivate CP is important with regard to designing course content and student interaction. Garrison & Arbaugh (2007) further argued that it is important to distinct the role of facilitation and direction. While students are required to be aware of the objectives, phases of inquiry, and discourse level, TP must include both the role of moderating and directing the discourse. However, if the aim is to observe how students direct/regulate their own learning, the boundaries of teaching role should be more sensitively determined. Directing the discourse explicitly might inhibit students' own metacognitive and regulative behaviors. While the literature reports FC, coaching and feedback as factors affecting CP (Lee & Kim, 2018; Stein, Wanstreet, Slagle, Trinko, & Lutz, 2013), it is not such clear when the goal of the course is to enhance metacognition /shared-metacognition along with the components of CoI. Explicitly directing students while they are collaborating can hinder them to direct their own learning process. As in those cases, instructional design of the learning materials, before-instruction process, observing on-going discussion and after-

instruction process become more of an issue. Ensuring that students have enough background information before the discussion, informing them about the discussion process (roles, script design, and etc.), observing them through the discussion them and giving feedback after-the instruction are the important components in regard to nature of teaching method.

In addition to the nature of the task and teaching method, students' maturity levels and characteristics might be considered as a mediating variable on CP and CoI. The great majority (89.7%) of Case I students was female. Their age ranged from 17 to 37 (M =23.10, SD = 5.28). Case I students' Online Readiness scores were high (*M* = 4.01, *SD* = .45). Lastly, the Case I consisted of associate degree-level students. On the other hand, majority (66.7%) of Case II students were male. Their age ranged from 24 to 37 (*M*= 29.39, *SD* = 4.78). Case II students' Online Readiness scores were similarly high (*M* = 4.30, *SD* = .48). The Case II consisted of graduate level students. Akyol, Ice, Garrison, & Mitchell (2010)'study posited that age might be one of most prominent determinants of how the instruction is perceived. While 18-22, 38-47, 48-62 years old students tend to perceived TP and CP as same construct, for those 23-37 and 38-47 years old, three factor structure of CoI has emerged. For group of 38-47, when the epistemological orientation was objectivist, two factor structure has obtained; on the other hand, for constructivist-oriented courses, three factor solution was produced. Conversely, Horzum's (2015) study with 277 undergraduate students revealed that there was not any significant difference in TP, SP, and CP scored of students in terms of their, gender, age, department, and online learning experiences. Kim, Kwon, & Cho (2011) found that gender, online learning experience, and work status were not significant factors on learning satisfaction and SP. For the age variable, Shea & Bidjerano (2008) reported that 18-25 years old age group showed less CP than older age groups (26-40 and older). SP component resulted with non-significant effect for age variable. For TP variable, Design and Organization component showed significant affect with age, but Facilitation component did not result any significant effect with age. The younger students' score was lower than the scores of older students. In regard to the effect of degree, age and gender, Carlon

et al. (2012)'s study revealed that being graduate/undergraduate student, age and gender did not have impact on TP, CP, and SP. On the other hand, course experience affected SP, but did not affect CP. Although the existing studies have contradictory results, learners' characteristics might be considered as possible factors influencing CoI levels.

5.1.2 Teaching Presence

Garrison and Akyol (2015) argued that while CP shows the inquiry process's cycle and structure, TP is required to define online students' regulatory roles and responsibilities in a CoI. TP, is further stated as a component to understand metacognition by easing discourse in order to enhance self-regulation and correcting misunderstanding via collaboration to enhance coregulation. Thus, they asserted commonality among the dimensions of TP (design and organization, facilitating discourse and direct instruction) and metacognition (monitoring and managing learning).

Although the past literature is in favor of continuous feedback and coaching during discussion, (Stein, Wansstreeet, Slagle, Trinko & Lutz, 2013), this study reveals that students' TP levels stayed stable even in case of student-led discussions without any instructor mediation and/or coaching. In both cases, interview results also support that the most frequently stated demand of students for during the discussion phase is no teacher intervention. Yet, drawing students into participation, notifying time, dealing with technical problems, observing the students were expressed as expectations from the instructor by a couple of students in both cases. In contrary to the past conventional research, in which the more feedback, the better learning (Gerben et al., 2010; Stein et al., 2013), most of the students in both cases did not require just-in time feedback and/or intervention during the discussion. Designing scripts to be followed during the discussion is actually an echo of design and organization component in this study. Collaboration scripts, including guidance about the order of tasks, share the learning activities or roles among the members,

are a type of scaffolds explicitly orienting students to structuring the group activity in small groups (Kollar, Fischer, & Hesse, 2006). The advents in technology, like CASSIS (Kollar, Fischer, & Hesse, 2006), the CREATE (Borge, Ong & Rose, 2018; Borge & Shimoda, 2019) mentioned in literature part have been shaping the nature of teacher support by making it more implicit and automated. The problem in those systems is the need of artificial intelligence (AI), which can monitor each student individually, group discourse and regulation, and support the collaboration accordingly. According to the observational data, the complex and dynamic nature of individuals and collaborative group work made it harder to observe, read the discourse flow of each group synchronously. Besides instructions helping students to regulate group discussion in scripts, role sharing (Chiu, 2000; Benne & Sheats, 2007; Borge & White ,2016; Volet, Vauras, Salo, & Khosa, 2017) is another tool for distributing TP. Type of roles in online CoI and responsibilities under each role are prominent issues structuring distribution of TP among the students, and also between students and teacher. When the goal of instruction is to create a collaboration (not cooperation) and sustain a shared-understanding, determining roles based on regulative tasks instead of task itself becomes essential. Otherwise, as observed in this study, students have tendency to cooperate instead of collaborate to build a joint understanding.

5.1.3 Social Presence

SP as a mediating variable between TP and CP composes of three components, which are affective communication, open communication and cohesive responses (Garrison & Arbaugh, 2007; Garrison, 2007; Garrison, 2017). Though the main goal is not to develop an environment to share emotions, climate is important to achieve academic goals (Garrison, 2017). Indicators of affective communication includes visual cues and vocal intonations normally. But, in text-based learning environment, these indicators are replaced with use of emoticons, content of the discourse, capitalization, humor, and self-disclosure. In collaborative inquiry, reciprocal and

considerate communication also built open communication. Expressing agreement/disagreements, recognizing and responding others are all together construct open communication. Lastly, cohesive responses refer and relates addressing other group members by their names, using words like we and/or ours. Group cohesion, increasing the capacity of collaboration, construct the SP with open and affective communication categories of SP.

In that study, the purpose of collaboration/group work was stressed before the activity to enhance group cohesion, and also parallel to the aim of the study, a joint/shared answer for each discussion question was stressed as a task requirement. However, the nature of text-based learning environment affected students' perception of SP. Although text-based environment enabled them to reread posts, typing keyboard slowly was stated as negatively affecting their writing/responding during the interviews. Despite the fact that the discussion was held synchronously, the flow of discussions posts created a synchronicity problem like the results reported in previous research (Johnson & Aragon, 2003; Sung & Mayer, 2012). The mostly stated component affecting the SP in both cases was open communication. Lack of emotions, addressing only a specific group member, and unresponsiveness of group members was expressed as negative aspects affecting their SP. The previous research also indicated that students shared their concerns on lack of immediacy, being a faceless environment and lack of non-verbal cues for text-based communication (Karen, 2010). Although emotional expressions are thought under SP component (Garrison, Anderson, & Archer, 2010; Garrison & Arbaugh, 2007; Garrison, 2007; Garrison, 2017), an emerging term Emotional Presence refers a broader term comprising of self-efficacy, openness, self-awareness, high level of ability to control emotional states (Majeski, Stover, & Valais, 2018). Motivation was specifically reported as a component significantly contributing to predict CoI and its three factors (Kilis & Yıldırım, 2018). Hence, motivational components were also investigated in that study due to the dynamic, emergent nature of SP. Group members' engagement, finishing the discussion task on time, answer accuracy, and being prepared for the

discussion were all mentioned as motivating states in the collaborative group discussions.

Technical problems during the discussion was, on the contrary, stated as a demotivating factor. Additionally, being criticized by other group members, unfair grading, answering questions immediately, being observed by instructor, task difficulty were single-person statements to be considered as affecting students' motivation. Regarding observed SP utterances, SP statements were at most 5% of all discussion designs in two cases. The SP statements' percentage might be affected by design and organization of the discussion. Since it was small-group, time limited, and scripted collaborative activity; the number of students, duration of discussion activity and scripts, or combination of these conditions together might have affected the percentage of SP statements. In Kilis & Yildirim's (2019) study, whole group discussions were held with an average 65 students in each of six discussion group, discussion posts were analyzed according to the subdimensions of SP, the highly reflected dimension affective/personal communication, referred as Affective Communication in Garrison (2017, p.45) whereas the least one was Cohesive Responses. Another point was the inclusion teacher into discussions and nature of the questions. Teacher can redirect the communication or the nature of questions can require students to reflect their feelings. Thus, the higher percentage of SP does not always mean to and conclude with to higher CP, but can be explained with other personal/environmental variables. Kilis and Yildirim (2019) stressed the appropriateness of context (Facebook, Adobe Connect on Moodle) as enhancing discussion, corroborated with previous research (Mazer, Murphy, & Simonds, 2007; Schroeder, Minocha, & Schneider, 2010; Ozturk, 2015). In a similar manner, in that study, text-based and scripted learning environment on Adobe Connect system might have affected SP as well.

Concerning to the theoretical structure of CoI framework, which has reported as a valid and reliable tool (Caskurlu, 2018; Olpak & Kiliç Çakmak, 2018), this study also revealed that the main three components (CP, TP, SP) facilities the instructional

design and presents a broad and general perspective. However, for OCL environments, TP and SP components require further elaboration. This study defines the role of instructor as before, during and after instruction phases. The existing indicators of TP (Design & Organization, Direct Instruction and Facilitating Discourse) were distributed and expanded over Before, During & After instruction. CoI framework, at that point, doesn't specify when to give direct instruction or facilitate discourse. For the SP component, this study showed that the nature of the online learning environment and learners' technology competency affect their motivation and so their SP. Regarding theoretical structure of CoI Model, for which Kilis and Yıldırım (2018) offered a new dimension regulatory presence to the tentative emergent model, this study also supports the inclusion of regulatory process; however, posits/suggests regulation of comprehension and regulation of collaboration processes as meta-level components on CP and SP components, respectively.

5.2 Shared Metacognition

At the part, results of shared-metacognition were discussed.

5.2.1 Examination of shared-metacognition episodes

The aim of this DBR was to examine shared-metacognition in online CSCL environments through the lens of CoI Framework. In online small-group community, where students work collaboratively on a shared task to get a joint solution/answer, the observable components of shared-metacognition construct occurred as orientation-planning, monitoring, and evaluation-reflection based on the micro-level content analysis of group posts. The observed components of the shared-metacognition are in line with the existing research on metacognition construct (Brown, 1987; Webb, 2009; Meijer, Vennman, & van Hout-Wolters, 2006; De Backer, Van Keer, Valcke, 2015). Orienting, planning, monitoring and evaluating

skills were distinguished as key metacognitive regulation skills and main executive control functions (De Backer et al, 2015; Meijer et al, 2006). In parallel with the individualistic view of metacognition construct, the growing attention in collaborative learning put effort on understanding this construct in social context (viz., Jafarigohar & Mortazavi, 2016; Jafarigohar & Mortazavi, 2017; Garrison & Akyol, 2015; Panadero & Järvelä, 2015; Iiskala, Vauras, Lehtinen & Salonen, 2011; Hurme, Merenluoto & Järvelä, 2009). From the social and interpersonal perspective; similarly, metacognition construct has been conceptualized on a similar theoretical ground. Exemplary categories have been reported as Planning, Monitoring and Evaluating (e.g. Khosa & Volet, 2014; Kim & Lim, 2018), or Orientation, Planning, Monitoring, and Evaluation (e.g. De Backer, Van Keer, Valcke, 2015), or expanded as Orientation, Planning, Monitoring, Evaluation and Reflection (e.g. Molenaar, Chiu, Sleegers, & van Boxtel, 2011; Meijer, Vennman, & van Hout-Wolters, 2006). In parallel with existing research, three components, Planning, Monitoring and Evaluation, were mutual in both cases of this study. Orientation and Reflection components; on the other hand, were rarely observed through the designs. While Orientation posts occurred in line with Planning posts, Reflection related posts were written/merged with Evaluations posts. Thus, this study reveals that Orientation-Planning and Evaluation-Reflection components do not appear as separate components.

This study further advances the specification of each component from group-related (collaboration) regulative actions and task (content/comprehension) related regulative actions. Through each component, students either performed shared metacognitive regulation actions for their collaborative works or for their learning/comprehension. However, the percentage of actions for each component was not in balance. Students mostly did plans for their collaborative actions, but rarely did so for their learning. It was just the opposite for evaluation component. They evaluated their task performance, but rarely evaluate their collaboration performance. For monitoring components, they both monitored their learning and collaboration progress. De Backer, Van Keer, and Valcke (2015) mentioned a similar

specification for Monitoring and Evaluation components. Monitoring related utterances were codes under three sub-categories, which are "comprehension monitoring, monitoring of progress, monitoring of collaboration", and Evaluation were codes as "Evaluating learning outcomes, evaluating learning process, evaluating collaboration". (p.70). In co-regulation related studies, regulation activities were examined as task regulation and team regulation (Saab, 2012; Chan, 2012). Janssen, Erkens, Kirschner, & Kanselaar (2012) stated that four types of activities are required for online collaboration, which are "task-related activities, social activities, regulation of task-related activities, and regulation of social activities" (p. 28). In Hurme, Merenluoto, & Järvelä (2009)'s study, two-step procedure was pursued. In the first step, metacognitive regulation, social and cognitive statements were distinguished; in the second step, metacognitive regulation messages' contribution was specified.

In other studies, discussion episodes were analyzed in terms of different criteria. Iiskala, Vauras, Lehtinen, & Salonen (2011) analyzed shared metacognition episodes based on functions of episodes, which were defined whether a turn facilitate (i.e. activate or confirm) the direction of the activity or inhibit (i.e. slow, change, stop) the flow of the activity. This way of examination was first considered in the developed coding scheme, but in practice it was hard to ensure the intention in a discussion episode. The function of an episode had to examined contextually. For example, it was hard to code an episode "It think, this is enough!" as positive or negative. It might be positive if the activity time was about up or the group really completed the answer, or negative if the group's knowledge-level is not enough to discuss further, or the group member did not be motivated to go on. Furthermore, a negative statement might inspire/trigger a group member in a positive way. Retrospective focus-group interviewing might be a solution in that case in order to ensure the effect/reflection of a statement on actions. Additionally, a statement might be coded both as negative and positive based on how it's comprehended by group member. Thus, this issue remained uncertain, and the results were not reported due to the possible doubt in reliability and validity. De Backer, Van Kerr, & Valcke

(2015) examined student posts in a multi-layered structure. At first, the statements were segmented as metacognitive, task-executive, or off-task. In this study, metacognition construct was studied/coded from individual, co-regulative and socially-shared metacognitive regulation perspectives. The episodes of socially shared metacognitive regulation were determined if it consisted of reciprocal conversational turns. The number of participants in such action-reaction was stated as three or more. However, while two students were reflecting/exchanging their metacognitive skills in a collaborative discussion, the other groups member(s) might possibly observe the reflected regulative processes. Thus, the in-peer studies, it might clear to categorize episodes as co-regulative, but in collaborative groups, this discrimination is not such clear. Thus, the unit of analyses might be one sole statement of a student as well. Thus, in that study, single turn & statement was also coded as a shared-metacognitive regulation statement. Multi-layered coding procedure was followed in many studies (e.g. Molenaar, Chiu, & Sleegers, 2011; Molenaar, Sleegers, & van Boxtel, 2014; Kim & Lim, 2018; De Backer, Van Keer, & Valcke, 2015; Khosa & Volet, 2014). Although some of the studies discriminated cognitive, social and metacognitive messages, they did not report a theoretical base for it. At that point, it is important to note that Community of Inquiry Framework presented a powerful theoretical ground to investigate and also distinguish cognitive, social, and teaching presence episodes from the shared-metacognition episodes.

5.2.2 Assessing Shared-Metacognition Construct

Shared-metacognition construct was mostly studied based on observational data. Video recording of game sessions (e.g. Iskala, Vauras, & Lehtinen, 2004), video-recordings of reciprocal peer tutoring groups (e.g. De Backer, Van Kerr, & Valcke, 2015a), recording of messages from a text-based learning environment (e.g. Hurme, Merenluoto, & Järvelä, 2009; Chen, Chiu, & Wang, 2012; Hurme, Järvelä & Palonen, 2006; Wang, Kollar, & Stegmann, 2017), recording of verbal transactions and writing down of nonverbal communication of students studying in game-based

mathematical learning environment (e.g. Iskala, Vauras, Lehtinen, & Salonen, 2011), audio-recording of conversations (e.g. Molenaar, Chiu, & Sleegers, 2011; Molenaar, Sleegers, & van Boxtel, 2004), audio and video-recordings of classrooms (e.g. Goos, Galbraith, & Renshaw, 2002; Borge & White, 2016; Khosa & Volet, 2014; Kim & Lim, 2018) were transcribed and, the obtained data were analyzed to decide on type of episodes. Think-aloud protocols were also conducted in a few studies (Jafarigohar & Mortazavi, 2017; Goos & Galbraith, 1996). However, in such stimulated recall type data collections; hindsight bias, which means metacognitive thinking that did not occur at the time of action might be prompted by interview questions during the stimulated recall, might occur (Iskala, Vauras, & Lehtinen, 2004). Due to the possibility of validity threats, a text-based synchronous collaborative online learning environment was set to observe in-time episodes. In the pilot study, asynchronous discussion forum was arranged to create a community of inquiry; however, students rarely commented on each other's posts, they even hardly responded to the questions. Thus, a synchronous text-based instructional setting in which group members collaboratively work on a task to solve/discuss problems jointly was a more valid source of data to examine the components of shared-metacognition construct. For triangulation of data, interview protocols were set to determine what they think about the phases of shared-metacognition construct, but possibly not being reflected during the group work. Another source of data was gathered via shared-metacognition questionnaire. Garrison and Akyol' s (2015) study on development of shared-metacognition construct for communities of inquiry exposed two-factor questionnaire including self-regulation and co-regulation dimensions. Although in the original study, monitoring and managing sub-factors of self-regulation and co-regulation were explored, the data did not prove this hypothesis. However, the adapted version used in this study revealed three-factor structure as Individual Monitoring, Individual Regulation and Group Regulation. Thus, the Self-Regulation component was separated into two dimensions. The items related with skills (strategy use and evaluation) was considered under Individual Regulation factor. The term self-regulation term was replaced with Individual-

regulation since self-regulation has already been defined as a construct in the literature (viz. Zimmerman, 2005). In another study, Rapchak (2018a, 2018b) also developed The Social Metacognitive Awareness Inventory, which hypothesized based on two factors, knowledge of cognition and regulation of cognition; however, the data set did not confirm this assumption; thus, the inventory was published as a single factor-model. Thus, observational and self-reported data collection tools have some structural limitations. While data transcribed from recording in-time learning processes does not reflect students' internal processes, self-report data might be manipulated or might be biased due to hindsight effect. Due to possible limitations of data collection tools, the data for this study were collected in multiple-way to consolidate more complimentary results. Another possible point is that self-reported data collection tools to measure shared-metacognition construct is still in its infancy. Whether the shared-metacognition construct is a version of metacognition construct with the same dimensions, or it consists of individual and group related dimensions with/without sub-dimensions requires further research. Nevertheless, this study proves that, the adapted version of shared metacognition consists of three components, which are individual regulation, individual monitoring and group regulation.

5.2.3 Examination of Shared-Metacognition in Different Contexts

The results of the study revealed that while shared-metacognition, individual monitoring, individual regulation, and group regulation levels of students in Case I increased significantly from Design I to Design III, there was not such a significant change in Case II. In Case I, associate degree level students were taught Medical Terminology course, and in Case II graduate level students were taking Quantitative Research Methods course. Shared-metacognition was studied across a body of empirical research in many fields (e.g. Larson & Gerber, 1978; Goos & Galbraith, 1996; Goos, Galbraith, & Renshaw, 2002; Iiskala, Vauras, & Lehtinen, 2004; Iiskala, Vauras, Lehtinen, & Salonen, 2011; Chen, Chiu, & Wang, 2012; De Backer, Van

Keer, & Valcke, 2015; Iiskala, Volet, Lehtinen, and Vauras, 2015). Most of the studies were done in Mathematics courses (Iiskala, Vauras, Lehtinen, & Salonen, 2011; Hurme, Merenluoto, & Järvelä, 2009; Iiskala, Vauras, Lehtinen, 2004; Chen, Chiu, & Wang, 2012; Goos, Galbraith, & Renshaw, 2002; Hurme, Järvelä, & Palonen, 2006; Goos & Galbraith, 1996). The problem-solving nature of Mathematics makes it a favorable subject-domain to study the shared metacognition construct; in fact, shared-metacognition occurs when the participants intentionally and reciprocally engage to complete a joint problem-solving process (Hurme, Merenluoto, & Järvelä, 2009). In these collaborative problem-solving oriented Mathematics contexts, Iiskala, Vauras, & Lehtinen (2004) reported that shared-metacognition is more visible in difficulty tasks than in easy tasks. In Iiskala, Vauras, Vauras, Lehtinen, & Salonen's (2011) study, similarly, shared-metacognition utterances were more often and longtime in the difficult problems. Hurme, Merenluoto, & Järvelä (2009) stated that when shared-metacognition occurs, the feeling of difficulty decreases. In this study, perceived task difficulty levels of students in Case I increased from design I to design II, which means they perceived the activity more difficult. Nevertheless, in parallel to perceived task difficulty levels, Individual Monitoring and Community of Inquiry Levels increased as well. Concerning to the visibility of shared-metacognition utterances, the percentage of planning episodes decreased from Design I to Design II. Lack of planning task or team related activities might be a reason for this increment in perceived task difficulty. Hurme, Palonen, & Järvelä's (2006) study on examination of metacognition in joint discussions also showed that planning episodes were never seen in the analysis. Wang, Kollar, & Stegmann's (2017) examined whether adaptable scripting foster regulation skills in CSCL, in which the task was about solving authentic problem cases on psychological concepts. This experimental study on the effect of adaptable scripts, meaning an intelligent computer system or an instructor follow and measure students' performance during the activity and modify the script accordingly, revealed that planning episodes were most frequent in unscripted condition. The adaptable scripting increased students' planning activities

in comparison with non-adaptable script; additionally, the adaptable script condition increased monitoring and reflection episodes in comparison with without script condition. In this study, scripts became more structured and rigid through the design. As the script become more rigid, shared-metacognition levels and perceived group performance increased in Case I, while those levels of students stayed high and stable in Case II. Additionally, perceived learning and perceived individual performance stayed high and stable over the three designs in both cases. Thus, this study also reveals that the rigidness of collaboration scripts, a kind of scaffolds explicitly orienting students to structuring the group activity in small groups (Kollar, Fischer, & Hesse, 2006), has to be set according to the group and/or, it has to be adaptable. For Case II, consisting of graduate students/relatively more mature group, a flexible/ unstructured script might work as well. Concerning to the grade level, Larkin's (2009) study in a writing course with first and second grade students revealed that teacher's direct questioning to enhance reflection did not always assist their metacognition. Being over-supportive or not giving enough time to students to reflect themselves hindered their metacognition processes, which might be a reason why students preferred no teacher intervention at all during the collaborative activities in this study. The influence of different types of scaffolds on metacognitive activities were also examined. Conversely, structured and problematizing scaffolds increased individual and shared metacognition of students in an English writing course (Jafarigohar & Mortazavi, 2017). Similarly, Molenaar, Chiu, Sleegers, & van Boxtel (2011) reported that elementary students provided with metacognitive scaffolds in CSCL showed more metacognitive knowledge than students in control group. Motivational scaffolds statistically increased metacognitive strategy (planning, monitoring, evaluation) use in an English course (Jafarigohar & Mortazavi, 2016). Scaffolding positively affected students' intra-group social metacognitive interaction. The contradictory studies conducted in different contexts showed that shared-metacognition construct is not a subject-domain dependent construct, and can be enhanced with instructional design by considering the contextual differences.

5.3 Design Principles

Drawing on evidence from aforementioned results and the results gathered through the designs, six design principles were offered and elaborated under this heading.

5.3.1 Principle I

Design and Organize the Instruction/Present the Content Before the Activity

This study was implemented in Flipped Classroom, which refers a pedagogical approach through which students individually handle the direct instruction part, so a dynamic and interactive group learning space can occur by the guidance of the instructor by focusing on the higher learning outcomes like applying the learnt concepts or creatively engaging with them (Bergmann & Sams, 2014). CoI Framework and FC approach have a common ground on emphasizing higher learning outcomes. While CoI builds critical thinking procedures and the collaborative establishment of individual and shared understanding (Garrison, 2017), FC's basic premise is that direct instruction is conveyed individually, so in-class time is spent for richer and more important learning outcomes (Bergmann & Sams, 2014). In this study, students were required to complete pre-class materials (video, reading materials) and to have a collaborative discussion activity. In that sense, in order to engage in discussion activities, students must have necessary background knowledge. In CoI Framework, Instructional Design and Organization element of Teaching Presence component, which comprises of setting content, time, netiquette, technology, and methods, must be done before the discussion activity. Alternatively, if the content is not provided before the class, it has to be presented directly by the instructor. Thus, student would have background knowledge for collaborative activity.

5.3.2 Principle II

Provide orientation to support technology competency before the activity

In CSCL, students' technology competency was an issue to be considered since the nature of learning environment required students to connect to the learning system, type their responses during activity, upload their group work and etc. Although students' Compute/Internet Self Efficacy levels were measured as quite high, their observed performance showed that they had trouble in using basic typing functions like copying/pasting text. Using keyboard fast and effectively was declared as a collaboration requirement by the participants. Synchronously answering the same question was stated as a consideration affecting their communication pace. Thus, introducing system interface, preparing orientation videos on how to use the functions of the system has to be considered as task to be done at the very beginning of the course.

5.3.3 Principle III

Use scripts to design learning environment

Examination of discussion activity episodes, and past literature confirmed that shared-metacognition utterances can be categorized as Orientation-Planning, Monitoring and Evaluation-Reflection actions (e.g. Khosa & Volet, 2014; Kim & Lim, 2018; De Backer, Van Keer, Valcke,2015; Molenaar, Chiu, Sleegers, & van Boxtel, 2011; Meijer, Vennman, & van Hout-Wolters, 2006;). This study further advances the specification of each component from group related (collaboration) regulative actions and task (content) related regulative actions. Planning, Monitoring and Evaluation phases were similarly declared as a Framework to design the collaboration scripts in previous research conducted by Kim and Lim (2018), in which 5 principles were proposed and a framework to be used in collaborative project-based learning environments to promote socially shared metacognition. The

principles are: “1) provide sufficient opportunities to monitor team progress, 2) have students identify potential issues, 3) encourage students to discuss possible solutions, 4) promote the efficient use of team resources through task prioritization, and 5) have students assign each team member to specific task” (pp.196-198. Inside each cycle of metacognitive phases (Planning, Monitoring and Evaluation), four main steps to be followed for coordination of team work were listed. Through following collaboration scripts, group members are required to “identify potential issues”, “discuss possible solutions”, “prioritize tasks”, and “assign roles”, respectively (p.199). Collaboration scripts are prepared according to the framework and followed continually till the group members achieve the goal. Based on these framework and design principles, they developed collaboration scripts and implemented them in an educational psychology course with 32 university students. Results indicated that collaboration scripts enhance SSMR in terms of knowledge construction and team planning. Borge & White (2016) proposed a framework to be followed in co-regulated collaborative learning environment to enhance learners’ socio-metacognitive expertise. The Framework includes two main phases, as Before Collaboration, at which the systemic support is required to be established. This step includes the main preparation such as organizational change consisting of change at norms, values, preparation of new tools and etc.; models of competence includes the prototypes or representations of planned collaboration process for students; and preparing rules and aligning them with cognitive tools and distribution of workload. At the During the Collaboration step, similar to Kim & Lim (2018)’s framework planning, practice of activity and reflection phases are listed, and stressed with the keyword joint for planning and reflection parts. Joint process planning is detailed with determining group goals, deciding problems, offering strategies, and distributing roles. At the practice phase, students are required to repeatedly practice the activity. Some structured guidance or visual clues are suggested to enhance this phase. Lastly, at the reflection phase learners should compare, evaluate their status with the desired one.

Collaboration scripts can be designed according to these emerged components of shared-metacognition. Collaboration scripts are a kind of scaffolds explicitly orienting students to structuring the group activity in small groups. Scripts includes guidance about the order of tasks, share the learning activities or roles among the members (Kollar, Fischer, & Hesse, 2006). Concerning script design, students mostly stated role related considerations in scripts such as name of roles, assigned names, previous role distribution (role distribution history) to be used for role rotation, and role-based access to the related script parts. For example, only technology responsible could upload the activity document, or only evaluation responsible could take notes concerning right/wrong answers. In addition to role-related considerations, need for a timer showing remained time during the activity, adding a reflection section, a section to show activity satisfaction, task difficulty, simultaneously writing on notes and script part were also declared as further requirements.

Script design in CSCL environment has been highly recognized topic in recent studies. In both cases of this study, the online system interface was divided into four parts (modules), which were scripts, role definitions, activity material(s) and chat. At script part, instructions how to send the activity results, the duration of Planning, Discussion and Evaluation parts were written. Under Planning heading, Technology, Communication and Evaluation responsible were required to be texted. In order to let students to determine a group strategy, an instructional sentence (Skim the discussion questions and decide how to study together!) was added. At the Discussion part, activity questions, answer entry places, and evaluation comment entry places were arranged and highlighted with different colors. At role definition module, each role and related responsibilities were defined. The keyword shared was added at this part to guide students to construct a joint-answer. At the Activity module, activity text/pictures were added., and lastly the Chat module was for group members to discuss the activity questions. Borge, Ong and Rose (2018), Borge and Shimoda (2019) used an online regulation system called CREATE to promote socio-metacognitive expertise. The chat module of the system includes two main parts,

which are Discussion and a Workspace. While students communicate at the discussion part, tabs at Workspace part are opened at a time. These tabs are “Plan, Chat, Reflect and Monitor” (Borge, Ong & Rose, 2018, p.73; Borge & Shimoda, 2019, p.167). Plan tab orients student to do their future discussion meetings and the regarding objectives, reminders; At the Chat tab, topic, its length description of parts, and description for the time of using Reflect and Monitor tabs are written. At the Reflection part, an interactive list of criteria is given to make students rate their individual performance. The items are “Verbal Equity, Joint Idea Building, Develop Joint Understanding, Contributing Alternative Ideas, Quality of Claims, Norms of Evaluation and Affect” (Borge & Shimoda, 2019, p.169). The average score of each item is shown at the Monitoring part, and members use this information to determine/evaluate their strengths and weaknesses, the well-working strategies and to create their own group strategy. Time description, separated phases of shared-metacognition, and instructional guidance sentence were the similar parts of the systems. CASSIS was another learning environment integrated with scripts on roles. Two roles, analyst and critic, were prompted to learners. The analyst was required to conclude analyses on the given case and answer his/her peer’s critiques. The Critic was required to criticize his/her partners’ analyses. In order to execute the roles, some exemplary prompts were sent such as “constructive critic” or “Regarding your suggestions for modifications” (Wang, Kollar, & Stegmann, 2017, p.160). The scripts were sent through the CASSIS, and it is named as adaptive scripting, which is defined as scripts sent via intelligent system measuring/monitoring group members’ levels and adjust scripts based on that data. The adaptative feature of that system was to give opportunity to the learners in order to choose which role they want to play. The CASSIS online system includes description of task, timer, orientation map, discussion map and, a case text (Wang, Kollar, & Stegmann, 2017, p.160). In this study, task description, activity text was similar to the design of this study. Adaptive scripting based on group members shared-metacognition levels was a need in this study as well. Similarly, in this study, students in Case I also suggested

satisfaction level panel, task difficulty panel and reflection panel to enter their evaluation at the end of the group activity.

5.3.4 Principle IV

Let students assign collaboration roles by themselves

Through the designs of instructional design, roles concerning to the regulation of collaboration tasks rather than regulation of content has emerged, and these roles were classified as Technology, Communication and Evaluation responsible. The main responsibility of Communication responsible was to note down role distributions and joint-answers to the scripts. To do so, the responsible was required to ask to the group to construct a shared answer. The primary responsibility of Technology Responsible was to prepare the activity to upload the system, and to monitor the time. The main responsibility of Evaluation Responsible was to control whether each group member shared an answer or not, and to manage the group to evaluate joint-answers based on a provided answer sheet. In the previous literature, Borge & White (2016) proposed four roles, which are "Collaboration Manager, Communication Manager, Mediation Manager, and Productivity Manager (p.329). Among these categorizations, the responsibilities of communication and productivity manager intersect with Communication and Evaluation responsible emerged in this study. While productivity manager evaluates the products and manage the time during the process, and communication manager is responsible to combine shared ideas. Another categorization made by Chiu (2000) as Facilitator, Proposer, Supporter, Critic and Recorder. The Facilitator invites others to participate via questions and comments; monitor group process through supportive critical evaluation; softens criticism through critical questions, and balance support and criticism via adjacent supportive and critical evaluations. The Proposer offers new ideas; the Supporter shows advantages and elaborates the ideas; The Critic shows drawbacks and offers alternatives; and lastly the Recorder summarizes the group ideas and progress. Among this classification, the Facilitator corresponds to

Communication role. Conversely, in this classification, the focus is on content rather than collaborative processes. As another example of content-focused roles, Volet, Vauras, Salo, & Khosa (2017) developed a coding scheme based on Benne & Sheats' (2007) role categorization. The roles were categorized as content focused, performance focused, evaluation focused and social role. Content focused and evaluation focused roles were task-oriented roles. Performance role has the characteristics of coordinator role (Belbin, 1993). Benne and Sheats (2007) classified these roles under three broad categories, which are "Group task roles, Group building and maintenance roles, and Individual roles." (p.31). Group task roles' function was to facilitate and coordinate group to solve the problem and related solution; Group building and maintenance roles' orientation was toward to regulating group as a group, and Individual roles is about the member's specified needs and satisfactions (pp.31-33). Benne & Sheats (2007)'s group building and maintenance roles support the emerged three roles in this study, but content-related roles were not supported by the results of this study since all the students were responsible to construct a joint-answer collaboratively.

Concerning to the functionality of role distribution, in Case I, the design in the third design elicited a significant change in perceived effect of role distribution on group collaboration in comparison with the design in the second design. In Case II, there was not such a significant change. Although there was not significant change in Case II, qualitative data revealed that students in both cases stated that role distribution was a requirement to regulate/lever the collaboration. Based on focus- group interview data, choosing a group leader and assistant, asking each member for their opinions, participating activities after getting prepared, need for exchange of information during the activities were stressed as important considerations. In both cases, making role distribution was stated as supportive for a planned flow of collaboration, enhancing sharing reasonability and sharing workload among the group members. Time monitoring was stated as a task to be done periodically by means of role distribution. Additionally, based on one-to-one interview data, majority of the students in Case I stated that role distribution helped them to learn

responsibility sharing. Also, sharing roles was stated as accelerating the group work process and helping them be more organized. Similarly, students in Case II expressed that role sharing helped them to be more organized, managing time, sharing responsibilities, and constituting a shared answer. Based on data gathered through field notes, technology competency of students was a criterion to get a related group role. Borge and White (2016) mentioned three types of roles based on their functions, which are procedural, intellectual and competence-based roles. Procedural roles are used to share authority to group member to reconstruct the social roles, intellectual roles are used to help students comprehend the important part of content (e.g. controlling predictions, summarizing findings, examining relationships) through discourse prompts guided by teacher. Lastly, competence-based roles have been implemented to enunciate a clear model of competence for a definite skill, but no used to distribute authority. In this study, the emerged three types of roles (Communication Technology and Evaluation) had mostly procedural functions. Intellectual actions, conversely, were not assigned to a specific group member, but required to be shared among the group members. The term getting joint-answers/decisions were stressed for the sake of creating a collaborative learning environment.

Besides the functions of roles, Case I students stated that it was needed to follow whether a group member perform his/her responsibility or not. Additionally, though there were 3 roles, the number of group members might change and be more than 3, which should be considered as an issue. Role and capability match were another suggestion. Computer competency was stated as a necessary prerequisite to be technology responsible. Furthermore, group work related responsibilities were stressed as necessary, and lastly there were single-person suggestions such as excluding communication role, including reflection role, role redundancy in case of internet connection problem, and time notification from instructor. Case II students stressed the importance of group size and role number equivalence, need for monitoring role performance, need for moderator, planning role redundancy, which means substituting a role of a group member in case of internet connection or any

other problem. Additionally, they expressed technology role's load as higher than the load of others. A backup plan for roles were mentioned as role shifting/role switching by Volet et al., (2017). Benne and Sheat (1948, 2007) conceptualized role flexibility, which means roles can be adopted and used based on situational requirements by group members. In addition to the complexity and fluidity of human behaviors (Salazar, 1996), technical problems during group discussions creates a requirement of role redundancy/role shifting. In this study, although the responsibilities for each role were defined orthogonally, these roles intersect at some points. In Mudrack and Farrall (1995)'s study, functional roles previously reported by Benne and Sheat (1948) were examined in terms of whether systematic relationships exist between them or these roles are totally orthogonal. The results revealed that maintenance role activities are linked with task roles, but some of the roles are not categorized as hypothesized. Thus, in terms of categorization of responsibilities for each role, there might be linked responsibilities. As a last point, based on field notes, time monitoring was one of the hardest tasks during collaborative study. Due to the fact that students recommended time notification from the instructor; however, technology itself can be designed to assist such a role; that is, the interval of time notifications can be determined by group members, but be monitored by the system instead of group members.

5.3.5 Principle V

Observe Orientation-Planning, Monitoring, and Evaluation-Reflection phases during the activity

Examination of discussion episodes clearly showed that both "Orientation-Planning" and "Evaluation-Reflection" do not seem as separate components, but these three components; Orientation-Planning, Monitoring and Evaluation-Reflection, were mutual in both cases of this study. This study further advances the specification of each component from group/team related (collaboration) regulative actions and task (content/comprehension) related regulative actions. As elaborated

under Teaching Presence heading, though the previous literature is in favor of continuous feedback and coaching during discussion, (Stein, Wansstreeet, Slagle, Trinko & Lutz, 2013), the results of this study revealed that students' TP levels stayed stable even in case of student-led discussions without any instructor mediation and/or coaching. According to the interview results, the most frequently stated demand of students for during the discussion phase was "no teacher intervention at all". Yet, drawing students into participation, notifying time, dealing with technical problems, and observing the students were expressed as expectations by a couple of students. In order to observe students' task and group related performance, the specifications of three phases of instruction are further elaborated.

For **Orientation-Planning phase**; sharing roles, deciding on collaboration strategy, checking group members' task readiness and planning time were mutually declared as actions to be done at the planning phase by students of both cases. Additionally, Case I students stated skimming questions, deciding on communication strategy, and checking assignment document before starting discussion as tasks to be done at Planning phase. Students in Case II, moreover, asserted role sharing redundancy as a further action. For Orientation, in previous studies, it is stated that students do task analysis, become aware of how they perceive the task and activate their previous knowledge (De Backer, Van Kerr, & Valcke, 2015a). Meijer et al. (2006) explained Planning with "examining special case for the problem", "considering, essentially equivalent problems", "reformulating the problem'', and ''assuming a solution and determining its properties" for a problem-solving context (p.220). De Backer, Van Kerr, & Valcke (2015a) affirmed these categories as "selecting and sequencing problem-solving strategies and developing action plans" (p.65). Planning of learning activities such as arrangement of activities and choosing strategies were also affirmed as Planning activities by Molenaar, Chiu & Sleegers (2011) and Molenaar, Sleegers, & van Boxtel (2014). The process when learners decide on goals and do a strategic planning for coordinating tasks was described as Planning by Wang, Kollar, & Stegmann's (2017). Joint process planning was explained as setting process goals, forecasting problems, and determining strategies to reach to the determined goals

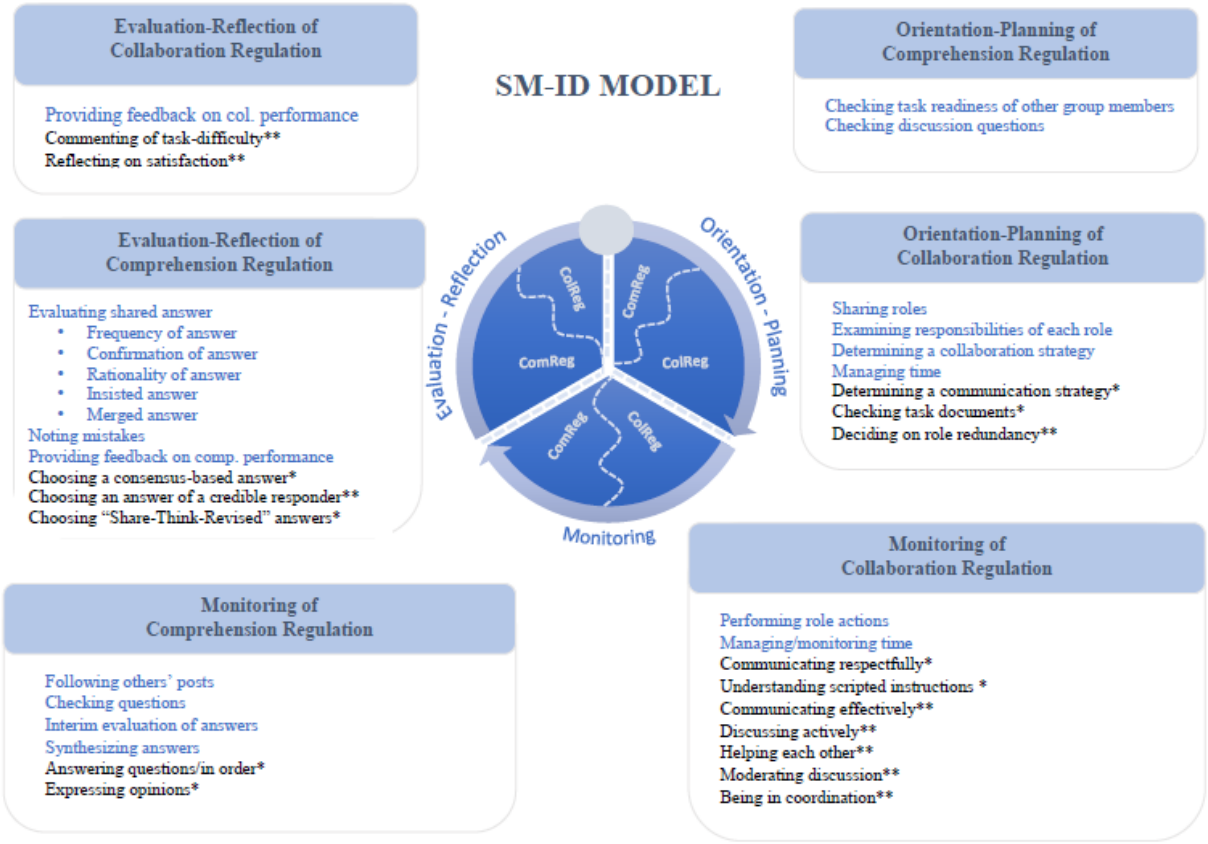
(Borge & White, 2016). In this study on the other hand, Planning occurred in a broader set of activities encompassing two complementary regulative actions; which were Planning Task Regulation and Planning Team Regulation. Concerning Planning of Task, students expressed that asking for task readiness and skimming discussion questions were required to be done before starting discussion. On the other hand, sharing roles, examining responsibilities for each role, determining a collaboration strategy, planning time, deciding on role redundancy, determining a communication strategy, and checking task documents were signified as actions for Planning of Team Regulation. Among these regulative actions, "sharing roles" was the most frequently stated action by participants of both cases. In regard to strategy determination, this study further specifies the areas of strategy determination. Students stated that before starting activity, it is required to decide how to work together and how to communicate with each other. For example, whether the discussion question/problem would be discussed sequentially or in a mixed order is a consideration of planning phase. Similarly, whether group members would declare their posts in order or randomly has to be planned before passing to discussion phase.

Concerning **Monitoring phase**, sharing roles, managing time, following others' answers, synthesizing and evaluating answers were expressed as collaboration actions by students of both cases. Case I students; furthermore, conveyed monitoring answers accuracy of group members, answering questions in order, expressing opinions, communicating respectfully, having content knowledge, understanding questions, asking questions to group members, and understanding instructional scripts as actions for successful collaboration. Case II students added being in coordination, checking questions, performing role responsibilities, communicating effectively, discussing actively, having information on responsibilities of each role, helping each other, and moderating discussion for successful collaboration. In previous literature, monitoring consists of quality check of learning or problem-solving process through diagnosing inconsistencies and controlling task execution (Meijer et al., 2006, Webb, 2009). Based Meijer's categorization of metacognition, Molenaar, Chiu, Sleegers & van Boxtel (2011) and Molenaar, Sleegers, & van Boxtel

(2014) delineate monitoring as controlling the process of learning, checking continuity and understanding of the task. Wang, Kollar, & Stegmann (2017) state that for monitoring to occur, learners keep the process going on and interact with each other through help-seeking. Khosa & Volet (2014) focus on the task-related monitoring actions like "seeking information, adding information, reflecting on task, stopping discussion, exploring ideas, questioning meaning, concluding from discussion, justifying decision and reflecting on meaning" (p.295). In Kim & Lim's study (2018), a collaboration script was developed. In that script, two instruction were included to guide students for monitoring, which were "Discuss what additional resources should be reviewed to refine the team report, … and discuss all possible solutions to the issues" (p.200). Monitoring actions in this study were categorized as team-related or task-related actions. In such a collaborative learning environment, while following others' posts, synthesizing answers, checking questions, interim evaluation of answers, answering questions/in order, and expressing opinions were categorized under the Monitoring Task Regulation category, performing role actions, managing/monitoring time, communicating effectively, communicating respectfully, discussing actively, helping each other, moderating discussion, being in coordination, and understanding scripted instructions were classified as Monitoring Team Regulation. A similar description was found in De Backer et al. (2015)'s study, in which different descriptions of monitoring like comprehension monitoring, monitoring of progress, and monitoring of collaboration were bunched together. Participants in this study were also asked how they monitor the comprehension of other learners. Accuracy and timing of responses were stated as knowledge level indicators of group members in both cases. Case I students stated additional knowledge level indicators, which were rewriting the previously stated response, confirming a given response, declaring self-knowledge level explicitly, writing synchronously with other group members. Furthermore, Case I students asserted additional knowledge level indicators as not commenting on posts, answering confidently, mostly focusing on role' responsibilities, and emphasizing key points of the task.

Focus group interviews and one-to-one interviews revealed students' perceptions on **Evaluation-Reflection phase**. Concerning what they think about possible contribution of evaluation phase, in focus-group interviews, students mostly shared positive statements in focus group interviews. Evaluation phase was perceived as a way of allowing them to see our mistakes and deficiencies, to get immediate feedback jointly. Based on one-to-one interviews, concerning to the criteria how to develop a shared-answer; the frequency of answer, rationality of the answer, whether the answer is confirmed by other group and/or insisted by the responder were stated as criteria to accept it as joint. Case I students further developed share-think-revise group strategy to get a shared-answer. On the other hand, Case II students declared that credibility of the responder was a criterion to accept and submit the answer on behalf of the group members as joint answer. Evaluating questions with a given answer sheet as a group were stated as a way of having feedback and checking the joint-answer together. Case I students expressed it as an opportunity to check their own answers and enhancing recall later. Case II students stated it as enhancing learning and an opportunity to get prepared for exams. The need for a brief answer sheet was expressed by Case I students. So, students in both cases mostly focused on comprehension evaluation, but not evaluation of collaboration. The percentage of discussion utterances also revealed that student rarely even never evaluated their team/collaboration performance. Molenaar, Chiu, Sleegers & van Boxtel (2011) and Molenaar, Sleegers, & van Boxtel, (2014) exemplify an evaluation episode as "we posted a good question!", and a reflection episode as "Why do we have the most difficult task?" (p.620). Wang, Kollar, & Stegmann (2017) argue that in reflection process, learners performs actions on their collaboration or quality of their activity. An exemplary statement was given as "Good teamwork!" (p.162). The importance of joint process reflection was stressed by Borge & White (2016) as providing structured support to students for getting them evaluating their performance based on the predefined criteria, and helping them to use available problems for process learning by evaluating and generating new strategies. Khosa & Volet (2014) declared evaluation as a dimension of metacognitive regulation and defined it as low level,

which comprise of considering task requirements or all dimensions of content, or high level, which involve conceptual confirmation. In De Backer et al.'s (2015) view of evaluation, different aspect like evaluation of problem-solving process, learning outcomes or collaboration were included. Thus, parallel to the existing research, evaluation and reflection statements complement each other, and are not definitively separate dimensions, but includes comprehension related and collaboration related indicators. To illustrate how evaluation-reflection components complemented each other, group members assess their joint-answers and reflect their comments such as "I think, we were good!". As a final remark on dimension of shared-metacognition, it is important to note that due to the rareness of orientation and reflection statements, it is hard to code them as exclusive dimensions. Three complementary phases of shared-metacognition focused instructional design and specifications of sub-elements are represented on Figure 5.1:



Blue Ink: Mutual, Case I:, Case II:**, **ComReg**: Comprehension Regulation, **ColReg**: Collaboration Regulation, **SM**: Shared-Metacognition, **ID**: Instructional Design*

Figure 5.1. Shared Metacognition Instructional Design (SM-ID) Model

5.3.6 Principle VI

Evaluate/Reflect on Collaboration and Comprehension Process

Students' perceptions distributed the responsibilities of teacher through the phases of instruction. While designer/presenter role has emerged as a before-discussion task, the observer role has been mentioned for the during-discussion phase. Although the past literature is in favor of continuous feedback and coaching during discussion, (Stein, Wansstreeet, Slagle, Trinko & Lutz, 2013), this study reveals that students' TP levels stayed stable even in case of student-led discussions without any instructor mediation and/or coaching, and interviews results yielded that students in both cases did not want teacher intervention during the discussion. However, the positive impact of feedback on learning is a strongly stated argument (e.g. Gerben et al., 2010; Stein et al., 2013). In that sense, evaluating and reflecting on the group's collaboration and comprehension performance was stated as a requirement to be done immediately after the group activities. That is, summarizing discussion, diagnosing misconceptions, confirming understanding, and setting content for the next session were voiced as after-discussion tasks of teacher. To sum up, six design principles and the indicators of TP were simplified at the Table 5.1 below for the sake of clarity.

Table 5.1 Summary of Design Principles

BEFORE	DURING	AFTER

Principle 1: Design and Organize the Instruction/Present the Content Before the Activity
• Set content
• Present/Deliver content
• Establish time parameters for phases of discussion
• Form groups by considering irregular participants
Principle 2: Provide orientation to support technology competency before the activity
• Prepare online tutorials for technology competency
• Introduce interface
Principle 3: Use scripts to design learning environment
• Arrange interface by including Chat, Role Definitions, Activity Materials, and Scripts
• Arrange script according to the phases of shared-metacognition
• At the Planning part, include aim of activity, roles, duration of phase
• At the Monitoring part, include activity questions and text place for responses
• For the Evaluation part, include Evaluation text entry place under each question/task
• Embed role definitions and activity materials
	Principle 4: Let students assign collaboration roles by themselves at Planning phase
	• Observe how students assign the roles
	  ○ Communication responsible (*Monitoring and taking notes on role sharing and joint-answers)*
	  ○ Technology Responsible *(Monitoring time, Copying/Pasting shared-answers to send/upload it)*
	  ○ Evaluation Responsible *(Monitoring whether each group member contribute or not, taking notes of wrong answers)*
	• Observe role shifting/redundancy in case of any connection problem
	• Handle technical problems
	Principle 5: Observe Orientation-Planning, Monitoring, and Evaluation-Reflection phases during the activity
	• Observe students' collaboration and comprehension performance according to the the proposed SM-ID Model (See Figure 5.1 above)
		Principle 6: Evaluate/Reflect on Collaboration and Comprehension Process
		• Diagnose misconceptions
		• Summarize the discussion
		• Confirm understanding
		• Set content for the next session

5.4 Concluding Remarks

This study was one of the pioneer attempts to examine shared-metacognition construct in multiple online CSCL cases through the lens of Community of Inquiry with DBR methodology. The findings pointed out that Community of Inquiry Framework presented a powerful theoretical ground to investigate and also distinguish cognitive, social, and teaching presence episodes from shared-metacognition episodes. Some ancillary conclusions were also made on the dimensions of CoI. While TP and SP levels stayed high and stable in both cases, CP levels of students at Case I increased significantly, but stayed stable in Case II. However, it is important to note that graduate students taking Statistics course (Case II) experienced higher phases of CP than associate degree students through the shared-metacognition oriented design, although their CP levels remained constant through the designs of instructional design. Thus, the nature of the course content, teaching method and students' levels might be considered with the instructional design. Concerning to the CP dimension, although the past literature is in favor of continuous feedback and coaching during discussion, this study reveals that students' TP levels stayed stable even in case of student-led discussions without any instructor mediation and/or coaching. Interview results also support that the most frequently stated demand of students for during the discussion phase is no teacher intervention. The TP indicators in existing CoI Framework has been rearranged as before, during and after activity actions. In the proposed structure, design and organization and presenting content components were considered as before-activity tasks; observer role of teacher was stressed as during-activity task; and summarizing discussion, diagnosing misconceptions, confirming understanding, and setting content for the next session would be after-activity tasks. In addition to the existing indicators of SP dimension, synchronicity of discussion flow, participants' technology competence, and motivational factors also were declared as affecting factors. Technical problems occurred during the discussion, perceived difficulty in time management, accuracy of group answers, ignorance of given responses, feel of being observed by the

instructor, physical conditions in which the participant connects to the learning environment, and role distribution were possible de/motivational factors to be considered as affecting factors on SP in such CSCL environment. Thus, the shared-metacognition focused instructional design advanced CoI Framework by clustering existing indicators of TP dimension as before, during, after activity task, and by expanding the SP dimension by including motivational and contextual factors.

The study also sheds light on understanding the structure of shared-metacognition construct. Development of a multi-layered literature-based coding scheme set out a reliable and valid way of examining the utterances of discussion posts. Based on the analysis of discussion utterances, Orientation-Planning, Monitoring, and Evaluation-Reflection were proved as the components of shared-metacognition construct in two CSCL setting. As opposed to the existing structure of metacognition construct, Orientation and Reflection components were rarely observed through the designs. While Orientation posts occurred in line with Planning posts, Reflection related posts were observed along to Evaluations posts. Thus, this study reveals that Orientation-Planning and Evaluation-Reflection do not seem as separate components, but as complimentary components. This study further advances the specification of each component from group related (collaboration) regulative actions and task (content/comprehension) related regulative actions. Through each component, students either performed shared metacognitive regulation actions for their collaborative works or for their learning. However, the percentages of actions for each component was not in balance. Students mostly did plans for their collaborative actions, but rarely/hardly did so for their comprehension. It was just the opposite for evaluation component. They evaluated their comprehension/task performance, but rarely/hardly evaluated their collaboration performance. For monitoring components, they monitored their comprehension and collaboration progress with almost equal effort. In addition to the observational examination of shared-metacognition construct, adaptation of shared-metacognition questionnaire into Turkish revealed the three-dimensional structure of the construct, which are individual monitoring, individual regulation, and group regulation. This

categorization of the shared-metacognition reveals the static and dynamic nature of the construct for individual regulation component; however, the group regulation components occurred as a single dimension. Thus, the perceived data gathered via the adapted questionnaire yielded the individual aspects of the shared-metacognition construct. The results obtained through the questionnaire revealed that while shared-metacognition, individual monitoring, individual regulation, and group regulation levels of students in Case I increased significantly from Design I to Design III, there was not a significant change in Case II. As the script has become more rigid, shared-metacognition levels increased in Case I, while those levels of students stayed high and stable in Case II. Thus, this study showed that the rigidness of scripts has to be set according to the group.

On the basis of the results, six evidence-based instructional design principles were offered in order to highlight shared-metacognition along with cognitive and social aspects that already being considered through the CoI Framework. As a first design principle, in order to get participant to be ready for discussion, design and organization/presenting content indicators of Teaching Presence has to be done before the activity. In CSCL, technology competency of students is an issue due to the nature of learning environment, in which at least basic computer literacy is required to be able to participate into flow of discussion. In that sense, technology orientation, as a second principle, is required to drop the load that might be efforted to understand system features during the activity. Using scripts to design the instruction was offered as third principle. The iterative cycles of research yielded that scripts can be designed according to the phases of shared-metacognition. In the fourth principle, in addition to scripts, role use was recommended to be used as cognitive tool. Through the designs of instruction, roles concerning to the regulation of collaboration tasks rather than regulation of content has emerged, and these roles were classified as Technology, Communication and Evaluation responsible. The self-assigned role definition was embedded into scripts so as to pass the buck to students for regulating their collaboration and comprehension by themselves. With the fifth principle, instructor's role was highlighted as an observer. Thus, the process

of shared-metacognition was modelized to set forth the phases of shared-metacognition, and its subsumed components and indicators. Lastly, with the sixth principle, the role of instructor turned into sage on the stage with the responsibilities of pointing and clarifying possible misconceptions. Ultimately, instructor's role has turned into combination of design, observe and reflect actions since the goal becomes to create self-directed shared-metacognition focused instruction.

5.5 Implications

Under this heading, implications for further research and practice were presented.

5.5.1 Implications for further research

Research with multi cases such as K-12 level students and/or under-graduate level students from different disciplines, would be beneficial to further specify shared-metacognition construct and to test the offered design principles. Additionally, it is needed to study shared-metacognition construct in face-to-face group-based setting and in online setting comparatively in order to reveal how the design principles and the shared-metacognition works/differentiate in those settings.

In this study, shared-metacognition was examined through the dimensions of CoI Framework. Participants characteristics such as their age, gender, achievement levels, self-efficacy levels, motivation levels were not analyzed as mediating variables. Although socially-shared metacognition is not mentioned as age-related variable, further research is needed to test such hypothesis. Additionally, although the cases of study were selected purposefully based on specific criteria such as being fully online courses at higher education level, being volunteer for instructional design implementation for a long period at student, instructor, and administration level and etc., the participants of those cases were mostly female students. Gender issue is left to be investigated in further research, and gender-based generalizations should be made with caution.

In the future research, webinars and face to face setting can be video-recorded to include oral and facial expressions of participants in order to construct a complete picture of the concept.

The study has been implemented in one semester. Longitudinal treatments can reveal more comprehensive picture and long-term effects of design. Moreover, this study was the students' first CSCL experience though they were already familiar with the system since they were the students of an online program. The effect of long-term implementation might let students to be more familiar with the phases of instructional design, collaboration roles and regarding responsibilities; thus, it might affect their cognitive load, and so their collaboration performance and shared-metacognition levels.

From a theoretical perspective, in the previous literature, social perspective of metacognition has been studied with different names such as social metacognition, socially shared-metacognition, socially shared metacognitive regulation. Although in this study, a multi-layered coding was formed by including different keywords, these concepts still require further research to determine the possible mutuality and discrepancy among them. Furthermore, the linkage between individual perspective of metacognition and shared-metacognition needs further study. Shared-metacognition construct's theoretical structure, which was hypothesized as self and co-regulation needs further validation. The use of terminology requires considerable attention since the self-regulation and co-regulation concepts have already been studied comprehensively.

From a methodological perspective, the correlation among shared-metacognition dimensions of community of inquiry is a prominent topic of study. It has been stated/hypothesized that shared-metacognition might be at the overlap of TP and CP components (Garrison, 2017); however, the construct might be correlated with SP dimension as well. The impact of motivational factors, communication skills of students, refinements on collaboration roles hold much promise to better understand the structure and function of shared-metacognition.

Concerning to the facilitation and maintenance of shared-metacognition in online learning, the potential of Virtual Reality and Augmented Reality might offer promise from the stand point of examining non-verbal indicators of the construct. In order to create adaptable scripts according to the characteristics of group, Artificial Intelligence and real-time analysis of learning analytics during online group discussions appear as prominent topics of research.

Two cases, associate level Medical Terminology and graduate level Statistics courses, shows different edge of implementation areas. Graduate level students appreciated even preliminary version of the instructional design. It might be due to their exiting individual metacognition levels. Thus, maturity level of students might be inversely correlated with the rigidness of scripts. Although the proposed Model was well accepted by students of two cases, further research is still needed to better determine strictness of scripts.

Concerning to use of developed coding scheme, a multi-layered coding scheme was offered based on a systematic literature review. However, the fourth layer, which indicates the function of an episode as facilitating or inhibiting, couldn't work as assumed and vice versa. An episode coded as inhibiting might work as facilitating for a group member. Retrospective interview strategy might work to determine the exact function of an episode.

5.5.2 Implications for practice

For practical implications, this study portrays the implementation of SM-ID Model and concerning design principles over two cases. The context of the cases must be considered in case of a similar instructional design. Especially being online and synchronous courses is an important consideration to follow the SM-ID Model. In asynchronous settings, possible time laps among the discussion episodes can affect performing the stages of Model. Since all the group members might not be available at the same time, a partially-joint answer might be sent as a group answer. On the

other hand, in face-to-face settings, emotional responses, gestures, facial expressions might play role to reflect shared-metacognition.

Group formation was an issue due to the irregular participants. Thus, attendance lists of first one or two weeks should be recorded to determine irregular participants. Thus, regular students can be assigned as core group members. In concern with group size, group number was varied from 3 to 5 people in this study. Larger groups might affect the distribution of role and interaction. When forming a larger group is unavoidable, role-shifting and substituting a role alternately among members might be solutions, or responsibilities under each role might be shared among the group members. Late comers were another issue affecting group formation. In this study, late comers were welcomed and added to the groups for the sake of their learning and for ethical considerations. However, an online class policy should be decided and written in the syllabus to inform students at the very beginning. Doing an online check-in one day before the class, for example, might be beneficial to arrange groups. During the collaborative group studies, some of the students had internet connection problems, so they dropped-out. When a student reconnected to the system, Adobe Connect assigned her/him to whole class groups, not to the sub-activity group. These students immediately assigned to their own group by the researcher. Due to the system limitation, instructors/instructional designers should keep the group list and monitor the groups for such problems.

Beside contextual considerations, instructor has to get prepared to handle technical workload. In order to perform better collaborative activities, students must have necessary background knowledge. Thus, in FC, some motivational tools might be set to let students get prepared before the collaborative activity. Although the teaching method was mainly FC, traditional way content delivery before the collaborative activity would work as well. In both conditions (traditional/FC), teacher should ensure that background information is delivered before the collaborative activity. Besides setting content, orientation materials/explanations should be delivered before the collaborative activity to inform students what they face when they join

activity. Thus, at digital content preparation, delivery of contents, setting and maintaining instructional setting will bring workload to the instructor.

Online learning requires instructors/practitioners to have technological competency besides pedagogical and content knowledge. The technical workload in online learning is inevitable, and the perceived workload is considered to be inversely correlated with their technical competency level. In addition to providing technical support to instructors, improvement these online platforms from an instructional design perspective rather than from a commercial perspective has become prominent. Topics such as system usability, tracking-reports of student activities during the collaboration, automated group formation, cognitive load of learners, are suggested to be further investigated by instructional designers.

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APPENDICES

A. Literature Review on Community of Inquiry

#	Bibliometric results	Demographic results	The performed Study	Synthesis of the results
1	(Redstone, Stefaniak, & Luo, 2018) The Quarterly Review of Distance Education	Sample size: 24 peer reviewed articles published between 2008-2017 Subject Area: NA Level of education: NA	Literature review on CoI	Four themes were emerged, which are confirmation studies on validity and reliability of the CoI instrument, investigating CoI in various contexts, measuring causal relationships among components of CoI, and possible revisions on CoI Model.
2	(Caskurlu, 2018) The Internet and Higher Education	Sample size: 310 students Subject Area: Learning Design and Technology Level of education: Graduate level	Confirmation of dimensions of CoI through CFA	The data confirmed three factors model (SP:9 items, 3 factors, CP: 12 items, four factors, TP: 13 items, 3 factors)
3	(Lee & Kim, 2018) BMC Medical Education	Sample size: 55 students Subject Area: Medical education Level of education: Undergraduate level	Measurement of students-centeredness, perceived CoI in flipped classrooms	The level of student-centeredness and perceived levels of sub-dimensions of CoI increased significantly for both high and low achievers in flipped classrooms.
4	(Baisley-Nodine, Ritzhaupt, & Antonenko, 2018) E-Learning and Digital Media	Sample size: 25 students Subject Area: Journalism Level of education: Undergraduate	Exploring SP in an online course enhanced with Twitter	There was positive relationship between SP, CP and TP. SP could be constructed on a micro-blogging environment.
5	(Kovanovic et al., 2018) Computers & Education	Sample size: 1487 students in five MOOCs Subject Areas: Introduction to Functional Programming, Solving Complex Problems, Introduction to Drinking Water Treatment, Technology for Biased Products Level of education: NA	Evaluation of COI survey in MOOCs	Three existing Model was expanded with 3 additional dimensions, which are “course organization and design” as sub-dimension of TP, “group affectivity” as sub-dimension of SP, and “resolution phase of inquiry learning” as sub-dimension of CP. (p.44)

#	Bibliometric results	Demographic results	The performed study	Synthesis of the results
6	(Jaurena & Dominguze, 2018) International Review of Education	Sample size: 24 teachers Subject Area: NA Level of education: NA	Examination of teachers' role in MOOCs	Digital technologies facilitated the evolution in education, but teachers' roles did not change.
7	(Kim & Koh, 2018) Journal of Multilingual and Multicultural Development	Sample size: 31 students Subject Area: Foreign language learning Level of education: Undergraduates	Comparing tandem learning pedagogy with traditional learning through the CoI Framework	In tandem classrooms, TP level did not change for Russian students, but improved for Korean students. Concerning SP, tandem learning did not increase engagement or interaction, and lastly for CP in perceptions tandem learning exceeded perceptions in traditional learning.
8	(Baytiyeh, 2018) European Journal of Engineering Education	Sample size: 48 working engineers Subject Area: ProGreen online diploma program Level of education: Graduate	Exploring practicing engineer's presence in a specific online diploma program.	EFA exposed five factors: "sense of belonging, self-directedness, self-actualization, interaction, and instructional guidance" (p.265). The highest rated factor was sense of belonging, yet there was not a correlation between it and instructional guidance. Instructional guidance, on the other hand was highly correlated with self-directedness and self-actualization.
9	(Kilis & Yıldırım, 2018) Computers & Education	Sample size: 1535 students Subject Area: Information and Communication Technology Level of education: University students	Examining CoI through self-regulation, metacognition and motivation	Self-regulation, motivation and metacognition significantly predicted CoI and its sub-dimensions. A new dimension, regulatory presence was offered on the tentative model.
10	(Gurley, 2018) Online Learning Journal	Sample size: 86 educators Subject Area: NA Level of education: NA	Exploration of teachers' preparation for teaching, perceived teaching presence, perceived teaching presence behaviors in online and blended learning contexts.	According to the results, there was not a statistically significant difference between instructors perceived total teaching presence depending on preparation to teach and design and organization in blended and online learning platforms. However, there was a statically significant difference between TP of facilitation depending on teachers' preparation to teach in blended and online learning environment. The mean value of those completing certification was higher than mean of teachers taken on-the-job-training.

#	Bibliometric results	Demographic results	The performed Study	Synthesis of the results
11	(Cutsinger, Wall, & Tapps, 2018) Online Journal of Distance Learning Administration	Sample size: 65 students Subject Area: NA Level of education: College setting	Examination of instructor presence levels in online versus non-online course in college level	There was not a statistically significant in instructor presence levels in online and non-online courses.
12	(Hsu & Shiue,2018) EURASIA Journal of Mathematics, Science and Technology Education	Sample size: 138 students Subject Area: Digital Content Marketing Level of education: University students	Exploration of relationship among the dimensions of CoI in an interdisciplinary project-based learning context enhanced with Google Applications.	TP and SP positively influenced CP. SP is more predictive in clarifying CP than the support given during online discussions.
13	(Chang-Tik, 2018) Interactive Learning Environment	Sample size: 377 students Subject Area: Hard-pure, soft-pure, hard-applied, soft-applied courses Level of education: University students	Exploration of correlation between dimensions of CoI and learning styles in blended learning context	Kinesthetic variable has impact on three sub-components of CoI. Read/Write variable influenced TP components. *(VARK questionnaire: V: Visual, A: Aural, R: Read/Write, K: Kinesthetic)*
14	(Olpak & Çakmak, 2018) Online Learning Journal	Sample size: 1150 students Subject Area: Various online courses Level of education: University	Confirmation of validity and reliability of CoI survey in Turkish	The data confirmed three-components CoI survey in Turkish.
15	(Hilliard & Stewart, 2019) The Internet and Higher Education	Sample size: 229 students Subject Area: Writing Level of education: University students	Examining whether time-spent in high versus medium blend courses has impact on components of CoI	The perceived TP, CP and SP in high blended (50% online) was higher than the values in medium blend (33%) courses.
16	(Smadi, Parker, Gillham, & Müller, 2019) Nurse Education in Practice	Sample size: 138 students Subject Area: Nursing Level of education: Undergraduates	Determining the levels of awareness and desire to implement CoI in online and blended nursing courses in Australian higher education schools	Only 20% of the were aware of the CoI Framework; 90% thought it as essential. 70% of the respondents did not use any framework for instructional design.

B. Literature Review on Shared-Metacognition

#	Research	Sample Participants	Research Design	Subject/Task	Data Analysis	Main conclusion
1	(Jafarigohar & Mortazavi, 2017)	240 English as Foreign Language learners	Experimental Design	English writing	2-way analysis of covariance, Kruskal-Wallis test, Chi-Square tests	Both structured and problematizing scaffolds statistically increased both individual and shared metacognition. As these two scaffold types were provided together, they contributed individual and shared metacognition more effectively. Learners' proficiency levels did not moderate effect of scaffold types.
2	(Jafarigohar & Mortazavi, 2016)	60 English as Foreign Language learners	Experimental Design	English reading, writing, listening, speaking tasks	Mann-Whitney U Test	The motivational scaffolds statistically increased metacognitive strategy (planning, monitoring, evaluation) use in inter and intra-individual levels.
3	(Garrison & Akyol, 2014)	191 graduate and undergraduate students	Multivariate Statistics Inferential Statistics	X	EFA (Oblimin rotations) Paired t-tests	Students 'mean of self-regulation is statistically higher than group regulation' means. Females' self and co-regulation mean values are statistically higher than males' self and co-regulation mean values. Self-regulation and co-regulation dimensions constitute shared-metacognition. There is not clear separation of monitoring and managing sub-dimensions.
4	(Garrison & Akyol, 2012)	76 graduate and undergraduate students	Multivariate Statistics	X	EFA (principal component analysis)	The results did not reveal the qualitatively hypothesized metacognition model, which is defined with three factors (knowledge of cognition, monitoring of cognition, regulation of cognition).
5	(Panadero & Järvelä, 2015)	17 articles	Literature Review	Socially shared regulation of learning (SSRL)	Narrative review of articles	SSRL is mostly studied through mixed methods including recorded observational data SSRL enhance students' performance.
6	(Iiskala, Vaurus, Lehtinen & Salonen, 2011)	4 ten years old dyads of high achieving pupils	Qualitative Research	Collaborative Mathematical problem-solving	Analysis of episodes qualitatively based on function (Facilitate, Activate, Confirm, Inhibit, Slow, Change, Stop), Focus (Situation model, operation, incidental matter)	Metacognitive experiences enhance socially-shared metacognition. The length and frequency of episodes in difficulty problems were higher than those in relatively easier problems.
7	(Hurme, Merenluoto, & Järvelä, 2009)	2 groups of 3 pre-service primary teachers	Case Study	Computer-supported mathematics course	Analysis of group interactions as cognitive social, metacognitive (interrupt, promote, change) statements	As socially-shared metacognition occurs, the feeling of difficulty decreases. Those students who have enough cognitive and metacognitive skills starts the activity and others respond on them.
8	(Iiskala, Vauras & Lehtinen, 2004)	Two ten years old 4th grade high achieving pairs	Qualitative Research	Mathematical word problems	Qualitative analysis of videotapes while playing a computer-supported mathematical learning game & Interviews	Metacognition is not only studied from individualistic perspective, but from inter-individual level.

#	Research	Sample Participants	Research Design	Subject/Task	Data Analysis	Main conclusion
9	(Backer, Van Kerr, & Valcke, 2015a)	64 first-year students	Case study	Educational Science	Mixed models of logistic regression	Reciprocal peer tutoring (RPT) group showed a positive change in socially shared regulation metacognitive regulation and tutee-prompted coregulation. RPT demonstrated negative evolution in tutor-prompted coregulation. Focus of the shared regulation "was correlated with orientation, monitoring and deep-level regulation" (p.63).
10	(Larkin, 2009)	172, first and second grade students between the ages of 5 to 7	Narrative Research	Writing	Qualitative content analysis	The results showed that young are capable of engaging in metacognitive communication, and purposefully use metacognition to write text by collaborating. However, instructor's direct questioning did not always contribute metacognitive communication.
11	(Molenaar, Chiu, Sleegers, & van Boxtel, 2011)	152 4th, 5th, 6th grade elementary students	Experimental Study	Writing tasks on countries in a virtual learning environment	Multivariate analysis of conversion turns	Students who were provided metacognitive scaffolds (structuring/problematizing) showed more metacognitive knowledge than those in control group. Students who dealt with more cognitive tasks and fewer off-tasks were more successful on metacognitive knowledge test.
12	(Molenaar, Sleeger & van Boxtel, 2014)	54 elementary students	Experimental Study	Writing tasks on countries in a virtual learning environment	The Mann-Whitney Test Stepwise regression analysis	The results revealed that scaffolding positively affected students' intra-group social metacognitive interaction. It is also reported that there is a significant correlation between, participation, students' metacognitive knowledge and intra group social metacognitive interaction; that is, students' participation in intra-group shared social metacognitive interaction explained twelve percent of the variance in metacognitive knowledge of students.
13	(Akyol & Garrison, 2011)	Discussion posts (53, 82,76 in each week) of 16 students	Narrative Analysis	Graduate course on the topic of blended learning	Qualitative content analysis	Metacognitive behaviors can be observed in online learning environments. Constructing the fourth components, learning presence, to Community of Inquiry Framework undermine the Framework's integrity. Metacognition construct has a potential to develop and refine the Framework since it is more compatible with the assumptions and components of CoI Framework.
14	(Chen, Chiu, & Wang, 2012)	894 messages on a website given by 183 high school students	Quantitative Study	Mathematics	Statistical discourse analysis Multi-level, Single Level analysis	Social metacognition, justifications increased the probability of correct new idea (CNI). The more experienced a student, the more CNI s/he had.

#	Research	Sample Participants	Research Design	Subject/Task	Data Analysis	Main conclusion
15	(Goos, Galbraith & Renshaw, 2002)	Secondary school students at the age of 11-12	Qualitative Study	Mathematics	Qualitative content analysis based on Reading, Understanding, Analysis, Exploration, Planning, Implementation, Verification episodes	Students' lack of critical thinking and poor metacognitive decisions were related with unsuccessful problem solving, whereas fruitful results were favored in case of students challenged and disposed of unhelpful thoughts and effectively supported valuable techniques.
16	(Hurme, Järvelä & Palonen, 2006)	13-year-old Finnish secondary school students	Narrative Analysis	Geometry	Qualitative content analysis as metacognitive knowledge, metacognitive skills, and not metacognitive	The metacognitive activities were observed among the students, but planning activities were not seen. There is a relation a between aspects of interaction and metacognitive activity. When pairs of students monitored and evaluated the discussion posts, they came to favorable position in the communication.
17	(Goos & Galbraith, 1996)	2 students	Case Study	Mathematical problem solving	Qualitative verbal analysis of think-aloud problem-solving sessions, retrospective interviews, questionnaires for measuring metacognitive awareness	Though metacognitive roles contributed to students mostly, some social interactions blocked progress.
18	(Rapchak, 2018)	309 first year students	Causal Comparative Study	Education, nursing, pharmacy, allied health, liberal art	The Metacognitive Awareness Inventory The Social Metacognitive Inventory Scale An independent sample-t test One-way ANCOVA Test	Students metacognitive awareness scores in face to face and asynchronous online version of the course were statically similar, their social metacognitive awareness scores were statistically different. Students in online course's social metacognitive awareness scores were lower than students' scores in face to face course.
19	(Larson & Gerber, 1987)	34 learning disabled (LD) and 34 low achieving (NLD) students	Experimental Study	X	Two-Factor Analysis of Variance with repeated measures	Metacognitive training resulted with improvements in negative behavior reports' quantity, ratings done by staff on rehabilitation achievement, promotions at institutional living unit phase level. Due to the significant correlation between social metacognitive skills and effective behavior signals, social metacognition support over social behaviors.
20	(Chan, 2012)	2 research articles	Literature Review	Computer-supported collaborative learning environment	Discussion of two papers	In future studies, it is suggested to expand methodological approaches by tracing data, make multiple measurements for construct validity, and administer instructional studies to improve co-regulation in CCL.

#	Research	Sample Participants	Research Design	Subject/Task	Data Analysis	Main conclusion
21	(Chiu & Kuo, 2012)	X	Conceptual paper	X	X	The difference and similarities of metacognition and social metacognition are discussed in terms of scaffolding, regulation of emotions, resource demand, visibility of cognitive and metacognitive processes, management of cognition.
22	(Wang, Kollar & Stegmann, 2017)	87 university students	Experimental Study	Educational Science, Psychology, Sociology and Communication Science	One factorial pre-posttest design	Planning processes were mostly detected in the unscripted condition. In adaptable script condition, planning activities were higher than those in non-adaptable condition, while monitoring and reflection activities were often more performed than those in unscripted condition
23	(Borge & White, 2016)	28 fifth grade urban elementary school	Mixed method approach	Science	Interaction analysis of video	Students mostly understand the structure and aim of roles. They accepted and used roles in order to regulate and monitor their activity. Their ability to perform roles to regulate and monitor roles developed through the time.
24	(Khosa & Volet, 2014)	Second year undergraduate students	Development and validation of a coding scheme	Veterinary medicine	Analysis of cognitive and metacognitive activities via coding scheme, chi square test to test the difference between high- and low-level activities' frequency	A theory-based coding scheme on analysis of interpersonal cognitive and metacognitive regulatory analysis was validated.
25	(Backer, Van Keer & Valcke, 2015b)	64 first-year Educational Science students	Case study	Instructional Science	Binary logistic regression analysis	Questioning and explaining activities are positively correlated with SSMR. Also, the probability of reciprocal peer tutoring groups engagement in SSMR are significantly increased by cognitively and metacognitively oriented transactive discussions.
26	(Iiskala, Volet, Lehtinen & Vauras, 2015)	Four 12-year-old girls	Case study	Scientific inquiry	Social network analysis	SSMR inhibits the unsuitable direction of continuing cognitive processes. SSMR was seen in all parts of the process.

		Sample Participants	Research Design	Subject/Task	Data Analysis	Main conclusion
27	(Volet, Vauras, Salo, & Khosa, 2017)	23 second year undergraduate veterinary medicine students	Qualitative study	Physiology	Concept map analysis	The findings showed that participants had tendency to adopt content focused roles in higher performing roles, and procedural roes in lower performing groups.
28	(Kim & Lim, 2017)	32 university (undergraduate and graduate students)	Experimental Design	Educational Psychology Course	Quantifying audio-recorded team discussions Negative Binomial Regression	SSMR positively affected students' interaction concerning group planning, and knowledge construction. The results also validated the framework for the design of collaboration, which consists of Planning, Monitoring and Evaluating components.
29	(Zheng, 2017a)	96 undergraduates (73 female and 23 male)	Content analysis	Law and Chinese Language and Literature	Cluster analysis and sequential analysis method	The results showed that bunch individuals could co-manage each other by defining objectives, planning, sanctioning procedures, checking and controlling, just as making transformations. Nonetheless, making variations happened the least among the entirety of the kinds of co-regulation behavior.
30	(Zheng, 2017b)	41 college students	Content analysis	X	Cluster analysis and sequential analysis method	The results indicated that group members can socially regulated their behaviors to orientate goals, make plans, monitor the collaborative learning processes, evaluate solutions, and make adaptations. However, high-achievement groups perform better than low-achievement groups regarding their socially shared regulation abilities.
31	(Kollar, Fischer, & Hesse, 2006)	X	Conceptual Analysis	X	X	Collaboration scripts includes five parts, which are learning objectives, types of learning activities, sequence of the activities, role sharing, and representation type (textual, graphical and etc.).
32	(Chiu, 2000)	X	Conceptual Analysis	X	X	classified collaboration roles as Facilitator, Proposer, Supporter, Critic and Recorder. Each role is defined with strategies and individual actions.
33	(Borge & Ong, 2018)	37 students	Case Study	Information Science and Technology	Discourse analysis	A four-step system was developed, including Plan, Chat, Reflect and Monitor parts. Socio-metacognitive sense-making utterances was categorized as "Other, Reporting, Process Monitoring, Process Refection, Process Planning, and Process Revising"
34*	**(Benne & Sheats, 2007)**	X	Conceptual Analysis	X	X	Member roles were classified as group task roles, group building and maintenance roles, and individual roles.
35*	**(Borge & Shimoda, 2019)**	X	Conceptual Analysis	X	X	A learning tool was developed by considering socio-metacognitive expertise. A pragmatic model of discourse competence was followed. Two dimensions of discourse competence were declared as Information Synthesis (distribution of verbal contribution, developing shared understanding, shared idea building) and Knowledge Negotiation (exploring different point of views, qualified arguments, constructive verbal communication).

C. Case I and Case II Group Participant List

Case	*Design*	*G1*	*G2*	*G3*	*G4*	*G5*	*G6*
Case I Section I	**I**	AyK BA AsK	FZG FK KK	KA MD EÇ GK	NG YA ÖÖ	RA SNA PGU YDu	SK SB ZA
	II	BA BEC AsK AyK	SŞE FK NG	KA GK EÇ MDer	SNA YDu RA ÖÖ	YA ZK YDe Yİ	XXX
	III	AyK BA AsK	FZG YA ZA MG	KA EÇ MDem MDer	SB NG İÇ	SNA RA RE YDu	XXX
Case I Section II	**I**	NA AS BY AÖ	BSG ÇÇ Eİ	FD ES EÖ HD GP	HD İU FO MB	İB MS MY PY	ZÇ SA NKA
	II	AS AÖ BY NA	BSG ZÇ Eİ ZÇ	FD EÖ HatD	İU SA FO HakD	PY IB MY	XXX
	III	NA AK BY	BSG ZÇ Eİ	FD HŞ ZK	HakD İU SA MB	İB MY PY	XXX
Case II Section I	**I**	RK AS HE VÇ	BS Aİ MK EA	XXX	XXX	XXX	XXX
	II	RK AS VÇ	BS Aİ SU MK	XXX	XXX	XXX	XXX
	III	HE RK MK AS	MEÇ BS EA Aİ	XXX	XXX	XXX	XXX
Case II Section II	**I**	Tİ EK FK SAE MVO	XXX	XXX	XXX	XXX	XXX
	II	Tİ EK FK SAE MVO	XXX	XXX	XXX	XXX	XXX
	III	Tİ EK FK SAE MVO	XXX	XXX	XXX	XXX	XXX

XXX: Not applicable, G: Group

D. Multivariate Normality Test Codes

Reading Dataset

```
> dataset = read.table(file.choose(), header = TRUE)

> library(MVN)
```

Mardia's MVN Test

```
> result <- mvn(data = dataset, mvnTest = "mardia")
> result$multivariateNormality
```

Mardia's MVN Test Output

```
             Test        Statistic p value Result
1 Mardia Skewness 9391.66139468062       0     NO
2 Mardia Kurtosis 67.6924277451979       0     NO
3             MVN             <NA>    <NA>     NO
```

Henze-Zirkler's MVN Test

```
> result <- mvn(data = dataset, mvnTest = "hz")
> result$multivariateNormality
```

Henze-Zirkler's MVN Test Output

```
          Test       HZ p value MVN
Henze-Zirkler 1.266114       0  NO
```

Royston's MVN Test

```
> result <- mvn(data = dataset, mvnTest = "royston")
> result$multivariateNormality
```

Royston's MVN Test Ouput

```
     Test        H p value MVN
1 Royston 1744.942       0  NO
```

Doornik-Hansen's MVN Test

```
> result <- mvn(data = dataset, mvnTest = "dh")
> result$multivariateNormality
```

Doornik-Hansen's MVN Test Output

```
            Test        E dF      p value MVN
1 Doornik-Hansen 448.7247 52 1.566084e-64  NO
```

Energy MVN Test

```
> result <- mvn(data = dataset, mvnTest = "energy")
> result$multivariateNormality
```

Energy MVN Test Ouput

```
          Test Statistic p value MVN
1 E-statistic  8.689542       0  NO
```

The R codes were generated based on the instructions provided by Korkmaz, Goksuluk and Zararsiz's article "**MVN: An R Package for Assessing Multivariate Normality**" (2018).

E. Adapted Version of Shared-Metacognition Questionnaire

Factors	*Items*	*FL*	*AR*	*CR*	*AVE*
	BİREYSEL gerçekleştirdiğim öğrenme etkinliklerimi düşündüğümde:				
IM	1. Gösterdiğim çabanın farkında olurum.	.66	.893	.943	.502
	2. ********	.81			
	3. Motivasyon düzeyimin farkında olurum.	.78			
	4. ********	.65			
	5. Bir problemin zorluğu hakkında yargıda bulunurum.	.62			
	6. ********.	.74			
	7. *******	.72			
	8. ********	.67			
	BİREYSEL gerçekleştirdiğim öğrenme etkinliklerimi düşündüğümde:				
IR	9. Gerek duyduğumda kullandığım öğrenme stratejisini değiştiririm.	.80	.895	.889	.618
	10. *******	.88			
	11. Gerektiğinde çeşitli öğrenme stratejileri kullanırım.	.86			
	12. *******	.63			
	13. *******	.73			
	Öğrenme etkinliklerine bir GRUBUN üyesi olarak katıldığımda:				
GR	14. *******	.74	.944	.606	559
	15. Gruptaki diğer arkadaşlarımın yorumlarını okurum/dinlerim.	.69			
	16. *******	.75			
	17. Gruptaki diğer arkadaşlarımın yorumları üzerinde derinlemesine düşünürüm.	.78			
	18. *******.	.76			
	19. *******	.79			
	20. *******	.62			
	21. Gruptaki diğer arkadaşlarımdan bilgi talep ederim.	.77			
	22. *******	.80			
	23. *******.	.77			
	24. *******	.72			
	25. *******.	.74			
	26. *******	.77			

IM: *Individual Monitoring,* ***IR****: Individual Regulation,* ***GR****: Group Regulation,* ***FL:*** *Factor Loadings,* ***AR:*** *Alpha Reliability,* ***CR:*** *Composite Reliability,* ***AVE****: Average Variance Extracted*

F. Focus Group Interview/ Open Ended Questions

Design I Focus Group Interview Questions

1. Grup temsilcisi seçerken nelere dikkat etmek gerektiği düşüyorsunuz?
2. Grup performansınızın artabilmesi için grup temsilciliği dışında ne tür rol (görev) dağılımları yapılabilir?
3. Grup etkinlerinde yazılı ve sözlü olarak verilen bilgilendirme/yönlendirmeler nasıl olmalıdır, neleri içermelidir?
4. Grubun her bir üyesinin grup etkinliğine aktif olarak katılabilmesi için nasıl bir yol/yöntem izleyebilirsiniz?
5. Grup etkinlikleri sırasında öğretmenin rolü ne olmalıdır?
6. Grup etkinlikleri sırasında yaşadığınız zorluklar nelerdi? Nasıl çözümlediniz? Neleri çözümlemekte zorluk yaşadınız?
7. Grup performansınızın artması için bundan sonraki etkinliklerde nelere dikkat etmeyi düşünüyorsunuz? Nasıl bir strateji izlemeyi düşünüyorsunuz?
8. Grup etkinliklerinin geliştirilmesi için önerileriniz nelerdir? (Süre, kaynaklar, ekran tasarımı vb.)

Design II Focus Group Interview Questions

1. Rol (İletişim, Teknoloji, Değerlendirme Sorumluları) dağılımı yapmanızın grup çalışmanıza getirdiği katkılar nelerdir? Lütfen açıklayınız.
2. Eklenmesini ya da çıkarılmasını istediğiniz roller ve bu rollerin sorumlulukları (görevleri) neler olabilir? Lütfen açıklayınız.
3. Grup etkinliklerini başarılı (zamanında ve eksiksiz) bir şekilde tamamlamak için hangi adımları izlemek gerekir? Lütfen izlenebilecek adımları sıralayınız.
4. Etkinlikler sırasında cevap anahtarından ortak cevaplarınızı grupça değerlendirmenizin size katkıları nelerdir? Lütfen açıklayınız.
5. Grup etkinlikleri sırasında yaşadığınız zorluklar nelerdir? Nasıl üstesinden geldiniz? Nelerin üstesinden gelmekte zorluk yaşadınız?

G. One-to-One Interview Questions

SHARED-METACOGNITION *(N =8)*	
Planning *(n=1)*	Grup çalışmasının başarılı bir şekilde tamamlanması için neleri **planlamak** gerekliydi?
Monitoring *(n=5)*	
Knowledge Level (n=1)	Grup çalışması sırasında grup arkadaşlarının konuyu bilip bilmediğini gözlemleyebildin mi? Nasıl anladın?
Role Distribution (n=1)	Grup çalışmasının başarılı bir şekilde tamamlanması için **rol dağılımı** yapılmasını gerekli midir? Eve/Hayır: Neden? Hangi roller olmalıdır? Neden?
Collaboration Steps (n=2)	Sence uzaktan eğitim ortamında grup çalışmasının başarılı bir şekilde tamamlanması için grupça hangi adımları takip etmeniz gerekir/di? *Uzaktan eğitim yoluyla almakta olduğun... dersindeki grup performansınızı olumlu/olumsuz etkileyen faktörler nelerdi?
Script Structure (n=1)	Grup çalışması için tasarlanan ortamda ne gibi **açıklamalar/yönlendirmeler/bölümler** yer almalıdır?
Evaluation (n=2)	*Grupça vermiş olduğunuz ortak cevapların doğruluğuna dair grupça nasıl değerlendirmeler yaptınız? *Size cevap anahtarının paylaşılıp değerlendirme yapmanızın istenmesi hakkında ne düşünüyorsun? (Olumlu/olumsuz)

COMMUNITY of INQUIRY *(N=7)*	
Cognitive Presence (n=2)	*Grup çalışmaları sırasındaki öğrenme deneyimini paylaşabilir misin? Konuyu öğrenmeni etkileyen (kolaylaştıran /zorlaştıran) durumlar nelerdi? Hangi koşullarda öğrendiğini ya da öğrendiklerinin pekiştiğini düşündün? *Grup arkadaşlarınla etkinlikler sırasındaki etkileşiminizin/ grup arkadaşlarının sana ne gibi bir katkısı olduğunu düşünüyorsun? Örneklerle açıklayabilir misin?
Social Presence (n=3)	
Communication (n=2)	Tamamlamış olduğumuz grup etkinliklerini düşündüğümüzde yazılı iletişim konusundaki kendi yeterliliğini değerlendirebilir misin? Grupça iletişim kurma konusunda neler yaşadınız? Grup iletişiminizi olumlu/olumsuz etkileyen faktörler nelerdi?
Motivation (n=1)	Grup çalışması sırasında motivasyonunuzu etkileyen durumlar nelerdi(r)?
Teaching Presence (n=2)	*Tamamlamış olduğumuz X dersini düşündüğümüzde öğrenci sayısını, süreyi ve teknolojik imkanları göz önünde bulunduracak olursak; öğretmenin rolü/sorumluluğu ne olmalıdır? *(Probes: Sanal derse başlamadan hemen önce sanal ders süresi içinde Sanal derste grup etkinlikleri devam ederken, grup etkinlikleri sisteme yüklendikten sonra sanal derste)* *Dersin işleyiş şeklinin (dersten önce çalışıp derste etkinlik yapılması) öğrenmen üzerindeki etkisi hakkında ne düşünüyorsun? Olumlu/olumsuz)

H. Single Item Questions

Design I

1. Grup etkinliğinin zorluğunu değerlendiriniz: (**1:** Çok kolaydı…**9:** Çok zordu)
2. Grup etkinliğine sağladığınız bireysel katkınızı değerlendiriniz: (**1:** Hiç katkı sağlamadım...**9:** Çok katkı sağladım.)
3. Grubunuzun performansınızı değerlendiriniz: (**1:** Hiç başarılı değildik…**9:** Çok başarılıydık)
4. Grup etkinliğinin öğrenmeniz üzerindeki etkisini değerlendiriniz:(**1:** Hiç etkili değildi…**9:** Çok etkiliydi.)

Design II

1. Grup etkinliğinin zorluğunu değerlendiriniz: (**1:** Çok kolaydı…**9:** Çok zordu)
2. Grup etkinliğine sağladığınız bireysel katkınızı değerlendiriniz: (**1:** Hiç katkı sağlamadım...**9:** Çok katkı sağladım.)
3. Grubunuzun performansınızı değerlendiriniz: (**1:** Hiç başarılı değildik…**9:** Çok başarılıydık)
4. Grup etkinliğinin öğrenmeniz üzerindeki etkisini değerlendiriniz:(**1:** Hiç etkili değildi…**9:** Çok etkiliydi.)
5. Rol (İletişim, Teknoloji, Değerlendirme) paylaşımının grup performansınız üzerine etkisini değerlendiriniz: :(**1:** Hiç etkili değildi…**9:** Çok etkiliydi.)
6. Grup içinde cevaplarınızı değerlendirmenizin öğrenmeniz üzerine etkisini değerlendiriniz: (**1:** Hiç etkili değildi…**9:** Çok etkiliydi.)

Design III

1. Grup etkinliğinin zorluğunu değerlendiriniz: (**1:** Çok kolaydı…**9:** Çok zordu)
2. Grup etkinliğine sağladığınız bireysel katkınızı değerlendiriniz: (**1:** Hiç katkı sağlamadım...**9:** Çok katkı sağladım.)
3. Grubunuzun performansınızı değerlendiriniz: (**1:** Hiç başarılı değildik…**9:** Çok başarılıydık)
4. Grup etkinliğinin öğrenmeniz üzerindeki etkisini değerlendiriniz:(**1:** Hiç etkili değildi…**9:** Çok etkiliydi.)
5. Rol (İletişim, Teknoloji, Değerlendirme) paylaşımının grup performansınız üzerine etkisini değerlendiriniz: :(**1:** Hiç etkili değildi…**9:** Çok etkiliydi.)
6. Grup içinde cevaplarınızı değerlendirmenizin öğrenmeniz üzerine etkisini değerlendiriniz: (**1:** Hiç etkili değildi…**9:** Çok etkiliydi.)
7. Soruları cevaplamaya geçmeden önce verilen ek süre içinde grupça PLANLAMA yapmanızın grup performansına etkisini değerlendiriniz: (**1:** Hiç etkili değildi…**9:** Çok etkiliydi.)

I. Implementation Process

Week	Date	Subject	Data Collection
1	13.02.2018	-	Informing students Consents Demographics & OLR scale
2	20.02.2018	Integumentary system	Orientation
3	27.02.2018	Integumentary system	Orientation
4	06.03.2018	Skeletal system	1st design (SMQ & CoI scales)
5	13.03.2018	Skeletal system	-
	21.03.2018	Skeletal system	Focus group interviews I
6	27.03.2018	Muscular system	-
7	03.04.2018	Muscular system	2nd design (SMQ & CoI scales)
8	10.04.2018	Nervous system	Focus group interviews II
9	17.04.2018	Nervous system	
10	24.04.2018	Nervous system	3rd design (SMQ & CoI scales)
11	08.05.2018	Digestive system	
12	15.05.2018	Digestive system	
13	22.05.2018	Digestive system	Focus group interviews III
14	29.05.2018	-	One-to-one interviews
Case I Medical Terminology			

Week	Date	Subject	Data Collection
1	08.02.2018	Explanation of course content and introduction of resources	Informing students Consents Demographics & OLR scale
2	15.02.2018	Quantitative research techniques and assumptions, parametric and nonparametric research Variable Types Research Design Types (Descriptive, Experimental)	Informing students Consents Demographics & OLR scale
3	22.02.2018	Analysis and interpretation of features such as frequency, distribution, percentage, etc. with SPSS program Data analysis in quantitative research (descriptive statistics), Normal Distribution, Type 1 and Type 2 errors and their interpretation	
4	01.03.2018	(Normality, Skewness, kurtosis)	Orientation
5	08.03.2018	Experimental and quasi-experimental research designs and design, Survey and Correlational research	
6	15.03.2018	Research Designs	1st design
7	22.03.2018	Reliability & Validity	Interview I
8	29.03.2018	Reliability & Validity	2nd design
9	05.04.2018	Data analysis in quantitative research (Descriptive Statistics), Data entry and analysis to the SPSS program	Interview II
10	12.04.2018	Analysis and interpretation of features such as frequency, distribution, percentage with SPSS program	-
11	19.04.2018	Application and interpretation of T-test analysis with SPSS	-
12	26.04.2018	Application and interpretation of ANOVA, Chi-Square analysis with SPSS	-
13	03.05.2018	T-Test, ANOVA	3rd design
14	10.05.2018	Reporting of Quantitative Research results	Interview III
Case II Quantitative Research Methods			

J. Ethical Committee Consent Form

UYGULAMALI ETİK ARAŞTIRMA MERKEZİ
APPLIED ETHICS RESEARCH CENTER

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2017

Konu: Değerlendirme Sonucu

Gönderen: ODTÜ İnsan Araştırmaları Etik Kurulu (İAEK)

İlgi: İnsan Araştırmaları Etik Kurulu Başvurusu

Sayın Prof.Dr. Zahide YILDIRIM ;

Danışmanlığını yaptığınız doktora öğrencisi Amine Hakan ATAŞ'ın *"Farklı Soru Tiplerinin Çevrim İçi Araştırma Topluluğundaki Öğrencilerin Bilişsel Düşünmelerine ve Paylaşımlı Üstbilişlerine Etkisi"* başlıklı araştırması İnsan Araştırmaları Etik Kurulu tarafından uygun görülerek gerekli onay 2017-EGT-159 protokol numarası ile 01.10.2017 – 30.04.2019 tarihleri arasında geçerli olmak üzere verilmiştir.

Bilgilerinize saygılarımla sunarım.

Prof. Dr. S. Halil TURAN
Başkan V

Prof. Dr. Ayhan SOL
Üye

Prof. Dr. Ayhan Gürbüz DEMİR
Üye

Doç. Dr. Yaşar KONDAKÇI
Üye

Doç. Dr. Zeynep ÇITAK
Üye

Yrd. Doç. Dr. Pınar KAYGAN
Üye

Yrd. Doç. Dr. Emre SELÇUK
Üye

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25 Haziran 2018

Konu: Değerlendirme Sonucu

Gönderen: ODTÜ İnsan Araştırmaları Etik Kurulu (İAEK)

İlgi: İnsan Araştırmaları Etik Kurulu Başvurusu

Sayın Prof. Dr. Zahide YILDIRIM

Danışmanlığını yaptığınız doktora öğrencisi Amine Hatun ATEŞ 'in **"Farklı Soru Tiplerinin Çevrim İçi Araştırma Topluluğundaki Öğrencilerin Bilişsel Düşünmelerine ve Paylaşımlı Üstbilişlerine Etkisi"** başlıklı araştırması İnsan Araştırmaları Etik Kurulu tarafından uygun görülerek gerekli onay **2018-EGT-109** protokol numarası ile **26.06.2018 - 30.07.2019** tarihleri arasında geçerli olmak üzere verilmiştir.

Bilgilerinize saygılarımla sunarım.

Prof. Dr. Ş. Halil TURAN
Başkan V

Prof. Dr. Ayhan SOL
Üye

Prof. Dr. Ayhan Gürbüz DEMİR
Üye

Doç. Dr. Yaşar KONDAKÇI
Üye

Doç. Dr. Zana ÇITAK
Üye

Doç. Dr. Emre SELÇUK
Üye

Dr. Öğr. Üyesi Pınar KAYGAN
Üye

K. Author Permissions

Ebru Öztürk <[redacted]@gmail.com> 23:37 (14 saat önce)
Alıcı: Amine

Amine Merhaba,
Elbette kullanabilirsiniz ölçeği.

Çalışmalarınızda başarılar dilerim,

28 Ara 2016 15:55 tarihinde Amine Hatun Ataş <hatun@metu.edu.tr> yazdı:

...

> Ebru Hocam merhaba,
>
> ODTÜ Bilgisayar ve Öğretim Teknolojileri Eğitimi bölümünde doktora yapıyorum.
>
> Tezimde Col üzerine çalışacağım. Aşağıdaki çalışmanızda adapte etmiş olduğunuz Col questionnaire-i kendi çalışmamda izninizle kullanabilir miyim?
>
> Saygılarımla,
>
> Öztürk, E. T. (2012). An adaptation of the community of inquiry index: The study of validity and reliability. İlköğretim-Online, 11(2), 408.
>
> --
> Amine Hatun Ataş

Konu: Re: The shared metacognition questionnaire
Gönderen: "zehra akyol" <[redacted]@gmail.com>
Tarih: 28 Aralık 2016, Çarşamba, 5:50 pm
Alıcı: Amine Hatun Ataş <hatun@metu.edu.tr>
Cc: "Dr. D. Randy Garrison" <[redacted]@ucalgary.ca>
Öncelik: Normal
Seçenekler: Tüm Başlıkları Göster | Yazdırılabilir Şekilde Göster | Bunu dosya olarak indir | HTML olarak göster

Hi Amina,

You have my permission to use it.
Good luck with your studies.

Zehra

On Dec 28, 2016 5:46 AM, Amine Hatun Ataş <hatun@metu.edu.tr> wrote:

> Dear Garrison and Akyol,
>
> I'm PhD student at Middle East Technical University in Turkey and
> currently studying on my dissertation proposal. It is great to follow
> your deep and well-organized studies on community of inquiry,
> metacogntion, shared metacognition...
>
> For my own study, I want to adapt and use your shared metacognition
> questionnaire (2015). I would like to ask you if I might use it for such
> an academic purpose?
>
> Best Regards,
>
> --
> Amine Hatun Ataş
>
>

Ölçek kullanma izni (ÇÖHBÖ)

Bayram Çetin <[redacted]@gmail.com> 8 Eylül 2017 14:42
Alıcı: Amine Hatun Ataş <aminehatunatas@gmail.com>

Amine Hanım merhaba,

Çevrim içi öğrenmeye yönelik hazır bulunuşluk ölçeğini tez çalışmanızda kullanmanızda bir sakınca yoktur. Yalnızca gerekli alıntı yapma ve referans gösterme ilkelerine uygun olarak kullanmanız yeterli olacaktır. Başarılar dilerim.

Doç. Dr. Bayram Çetin

8 Eylül 2017 14:24 tarihinde Amine Hatun Ataş <aminehatunatas@gmail.com> yazdı:

> Hocam merhaba,
>
> Çevrim içi öğrenmeye yönelik hazırbulunuşluk ölçeğinizi doktora çalışmamda kullanabilir miyim?
>
> Saygılarımla,
>
> Amine Hatun Ataş
> ODTÜ-BÖTE
> hatun@metu.edu.tr

L. Quotations from Focus Group Interview and Open-Ended Questions Between Designs

Design I Role Distribution

Code#	Original Statements	Translations
1000	"Tartışılan soruların cevaplarını düzenli bir biçimde yazma görevi de birine verilebilir."	Someone can be responsible for writing the responses of discussion questions. (*Case I, Section I, G4)*
1001	*"*Temsilci yardımcısı olabilir. Grubu temsil eden kişi yazı işleriyle uğraşırken, yardımcı da ses dosyalarını dinleyebilir ve kopyala yapıştır yapabilir ya da internetten kaynaklı sorunlarda temsilcinin yerini alabilir.*"*	There might be an assistant of group representative. While group representative is dealing with writing, his/her assistant can listen to the sound records, can copy and paste things and can substitute in case of internet connection problems" (*Case I, Section I, G5)*
1002	"Gruptaki ortak görüşleri belirtecek biri olması…"	There should be someone to indicate shared responses. (*Case I, Section II, G1)*
1003	*"*Herkesin katkıda bulunacağı bir çalışma olmalı."	The group study should be the one that any member contributes. (*Case I, Section II, G2)*
1004	"Temsilciye yardımcı olabilir, sorulan soruları hızlı bir şekilde sohbet kısmına yazabilir"	There might be a responsible assisting to group representative, and can write the responses to the related part. (*Case I, Section II, B6)*
1005	"Sözcü ve soru-cevapçı olabilir"	There might be someone lead the discourse and another responsible for writing the responses. *(Case II, Section II, SAE)*
1006	"…tartışıldıktan sonra ortak kararın yazımı paylaşılabilir."	Someone can write/ share the consensus after discussion. *(Case II, Section II, MVO)*
1007	"Grup sözcüsü, grup lideri olabilir"	Someone can lead the discourse and someone can be the group leader. *(Case II, Section I, Aİ)*
1008	*"*Herkes önceden konuya hazırlıklı gelmeli*"*	Each member has to come to group study. *(Case II, Section I, HE)*

Design I Script Structure

Code#	Original Statements	Translations
1009	"Her üyenin anlayabileceği açıklıkta olmalı."	It should be clear that every member can understand. *(Case I, Section I, G2)*
1010	"Bilgilendirmeler daha açıklayıcı görsel destekli olabilir, öğrenmemizi etkin kılacak akılda kalacak resimler olabilir, aslında emoji olsa burada çok güzel olur duyguları ifade açısından."	Information can be more descriptive and visually assisted. There may be catchy pictures that will enable us to learn. In fact, emoji is very nice though in terms of expressing feelings. *(Case I, Section I, G3)*
1011	"Bilgiler acık ve kolay anlaşılır olmalı, erişimi kolay olmalı*"*	Information should be clear and easy to understand, easy to access. *(Case I, Section II, G1)*
1012	"Grup üyelerinin anlayabileceği bir şekilde içeriği olmalıdır, anlaşılır şekilde olmalıdır kafa karıştırmayacak şekilde anlatılmalıdır, içeriği açık olmalıdır, grup üyelerinin anlayamadığı kısımları açıklayacak içerikte, çok fazla ayrıntıya girilmemelidir, karmaşık olmamalıdır, görseller de zenginleştirilmelidir."	Information should be content in a way that the group members can understand. The information should be comprehensible so as not to be confused. The content should be clear, not have too much details, not complicated, by visually enriched *(Case I, Section II, G6)*
1013	"Yönlendirmelerin yeterli olduğunu düşünüyoruz."	We think that scripts are sufficient. *(Case I, Section II, G5)*
1014	"Süreyi gösteren bir saat olmalı, konuyu özetler nitelikte bir sunum olmalı."	There must be a clock showing the duration and a presentation that summarizes the subject. (*Case II, Section I, MK)*
1015	"Yönlendirme açık ve anlaşılır olmalı, grup temsilcileri anlamadan etkinlik başlamamalı."	The orientation should be clear and understandable, the activity should not begin without understanding the group representatives. *(Case II, Section I, Aİ)*

Design I Collaboration Method

Code#	Original Statements	Translations
1016	"Sırayla ya da bildiğimiz konularda cevap verilmesi"	Responding in order or with the questions we know its answer… *(Case I, Section I, G2)*
1017	"Soru için her bir üyeyi takip edip konulara çalışmalarını söyleyip konu takibi yapıp grupta anlamadığımız konuları tartışıp derse daha verimli olmaya çalışırız, zorlanan konularda yardımlaşma"	For the question, we can follow each member and tell them to work. We can follow the subject and discuss the issues we do not understand in the group, we can try to be more efficient in the course. We can help each other with challenging issues. *(Case I, Section II, G3)*
1018	"Herkesin derse hazırlanarak gelmesi etkinlikte daha aktif olmayı sağlar bu bakımdan hazır olarak derse katılmak gerekir. Konularımızı birbirimizle tartıştığımızda istenilen nitelikler uygulandığı taktirde grup içinde etkili bir iletişim kurulup sürdürülmesi iletişimizin gelişmesi sağlar."	The fact that everyone is prepared for the lesson makes us more active in the event. In this regard, we must attend the class as ready. When we discuss our subjects with each other and if the desired qualifications are applied, an effective communication within the group is established and maintained. *(Case I, Section I, G3)*
1019	"Her hafta dönüşümlü olarak temsilci ve temsilci yardımcısı seçmeyi planlıyoruz."	We plan to elect representatives and representative assistant every week. *(Case I, Section I, G5)*
1020	"Grup üyeleri Scorm paketlerine düzenli çalışıp etkinlik sırasında yeterince katılım sağlanmalı. Dersin basında herkesin grup yazışmalarında aktif olması önerilmeli"	Group members should be able to work regularly on Scorm packages and participate sufficiently during the event. Everyone should be active during group discussion. *(Case I, Section I, G1)*
1021	"Herkes fikrini belirtmeli, en son ortak bir karar alınmalı."	Everybody should share their opinion. finally, a common decision must be made. *(Case II, Section II, EK)*
1022	"Çevirim içi derse katılanlar katılmalı. Çevirim içi olup da derse katılmayanları gruba dahil edilmemesi gerek. Her kafadan bir ses çıkması zorluktur. Grup etkinliğinde grup başkanı sırayla herkese söz hakkı tanımalıdır."	Participants in the online course must attend the event. Those who do not participate in the course should not be included in the group. When everyone talks at once, it creates a challenge. In the group event, the group president must give a voice to everyone in turn. *(Case II, Section I, MEÇ)*
1023	"Her kişinin fikri tek tek sorulmalı"	Each person's idea should be asked one by one. *(Case II, Section I, BS)*
1024	"Bilgi alışverişinde bulunulması, grup temsilcilerinin birbirilerini yönlendirmeleri gerekir."	Information should be exchanged. Group representatives must direct each other. *(Case II, Section I, Aİ)*
1025	"Soru sayısına göre dağılım yapılabilir. 10 soru varsa 5 kişi arasında 2 soruya cevap verilmesi şeklinde karar alınabilir, soruları yazan, kopyalayan ve gönderen kişiler olmalı. Soru dağılımı etkinlik başlar başlamaz yapılmalı."	Distribution can be made by the number of questions. If there are 10 questions, it can be decided to answer 2 questions among 5 people. there should be people who write, copy and send questions. Question distribution should be made as soon as activity begins. (Case I, Section I, G4)
1026	"Herkese ayrı bir sayfada sorular sorulmalı. Sonra ortak konuşma olmalı."	Everyone should answer questions on a separate page. Then we should have a joint conversation (Case II, Section II, SAE)

Design I Teacher's Role

Code#	Original Statements	Translations
1027	"Yönlendirici olmalı, açıklayıcı olmalı, bilgileri en yoğun biçimde iletmeli."	The teacher should guide, be descriptive, and communicate the most intensely. *(Case I, Section II, G1)*
1028	"Etkinlik içinde öğretmen her 5 dk. da bir bizi kontrol edip neler yaptığımıza ve nelere takıldığımıza bakıp bizi yönlendirebilir. Bugünkü derste hocanın kısaca özet geçmesi diyebiliriz.*"*	Teacher can check us every 5 min. and observe what we're doing and at which point we're having problem. For today's lesson, we can say that the teacher could briefly summarize the subject. *(Case I, Section II, G3)*
1029	"Öğretmen, herkese bir şeyler aktarabilmeli, ara sıra kontrole gelmeli ve bize yaklaşımının iyi olması gerekli. Öğretmen açık akıcı ve sade bir dille yapılan etkinliği anlatmalı, anlamadığımız yerleri bize anlatmalı, heyecan verici olmalı. Bu yaklaşım katılımı ve anlaşılırlığı artırır. Öğrencilerle iletişimi kuvvetli olmalı, öğrencilerin ilgilerini çekebilmeli ve grup etkinliği hakkında grup üyeleri memnun mu değil mi geri bildirim almalıdır."	The teacher should be able to convey something to everyone, come to the check occasionally, and have a good approach to us. The teacher should explain the event in a clear, fluent and simple language, tell us about the places we don't understand and be exciting. This approach improves participation and clarity. Students should be able to communicate with students, be able to attract students' attention and get feedback from group members about group activity. *(Case I, Section II, G6)*
1030	"Öğretmen öğretici, açıklayıcı, yol gösterici olmalıdır."	The teacher should be instructive, descriptive, guiding. (*Case I, Section I, G5)*
1031	"Öğretmenin gruplardaki rolü, gidişatı kontrol etmek, grubun genel durumuna bakmak katılmayanları teşvik etmek hatalarımız olduğunda uyarmak olmalıdır."	The role of the teacher in groups should be to check the progress, to look at the general situation of the group and to encourage those who don't participate. *(Case I, Section I, G3)*
1032	"Fikir üretmeyi desteklemeli ve rehberlik rolü olmalıdır."	It should support the production of ideas and have a guiding role. *(Case II, Section I, YBD)*
1033	"Öğretmem ara sıra kontrol yaparsa katkısı oluyor." "Teşvik Edici"	If the teacher checks the group occasionally, it contributes to us. *(Case II, Section I, HE)* Encouraging… (Case II, Section I, SAE)
1034	"Rehber"	Guide…(Case II, Section I, EK)

Design II Contribution of Role Distribution

Code#	Original Statements	Translations
1035	"1-Cevapları ortak verdikten sonra birlikte değerlendirme, 2-süreyi sürekli kontrol etme, 3-yanlışlarımızı görmemiz açısından katkı sağlama, 4-Sorumluluk duygusuna sahip olmamızı sağlamakta"	1-Evaluating together after giving the shared answers 2-Checking time continuously 3-Contributing to see our mistakes 4- Having sense of responsibility *(Case I, Section I, G1)*
1036	"İletişim, teknoloji değerlendirme sorumlularının her hafta değişmesi bir kişiye tüm sorumluluğu yüklememek adına planlı ve paylaşımcı bir katkı sağladığını düşünüyoruz. Herkese eşit sayılabilecek görevler düştüğü için daha planlı çalışabiliyoruz."	We think that the change of communication, technology and assessment managers every week contribute to a planned and shared contribution in order not to impose full responsibility on a person. We can work more planned manner since the tasks are shared equally. *(Case I, Section II, G2)*
1037	"Rol dağılımı sorumluluğu tek bir kişiye yüklememek açısından katkı sağlıyor, kolay öğrenmeyi sağlıyor. Süre kullanımının daha rahat olması açısından kolaylık sağlıyor. Temsilciler için zorlukları ise kendi fikirlerini sohbet kısmında beyan etmede zorlanıyorlar ve yetişemeyebiliyorlar."	Role distribution contributes to not loading responsibility to a single person, it easies the learning. The time use becomes more convenient. The difficulties for the delegates, on the other hand, are that they have difficulties in terms of declaring their ideas in the conversation, so they may not be able to catch up the flow due to their responsibility. *(Case I, Section II, G5)*
1038	"Zamanı etkili kullanmamızı sağladı. Ayrıca tüm grup üyelerinin aktif katılımını sağladı."	It enabled us to use time effectively. It also ensured the active participation of all group members. *(Case II, Section I, VÇ)*
1039	"Görev paylaşımı olunca kim nerde ne yapması gerektiğini daha iyi anladı. Görev paylaşımı zamandan tasarruf etmemizi sağladı. İlk uygulamada Karmaşa olmuştu fakat sonrakinde herkes gerekli görevleri yerine getirince karmaşayı da engelledi.	When sharing the task, we understood better what we should do. Sharing tasks has saved us time. It was chaos in the first practice, but in the next one, when everyone performed the required tasks, it prevented chaos. *(Case II, Section II, MVO)*

Design II Refinements on Role Distribution

Code#	Original Statements	Translations
1040	"Eklenmesini veya çıkarılmasını istediğimiz herhangi bir rol yok…Roller gayet mantıklı düzenlenmiş. Bu şekilde kalmalı."	We don't have any role suggestion to add or remove. Roles are perfectly logical. It should stay that way. *(Case I, Section I, G4, G5)* *(Case I, Section II, G1, G2, G4)* *(Case II, Section I, HE, MEÇ)* *(Case II, Section II, Tİ, FK)*
1041	"Çıkarılmasını istediğimiz rol; iletişim çünkü grupça bu rolü birlikte halledebiliyoruz."	The role we want to be removed is communication because we can handle this role together *(Case I, Section I, G1)*
1042	"Rolleri her hafta dönüşümlü olarak hoca belirlemeli. Çünkü genelde her hafta aynı kişiler aynı şeyleri yapıyor alışılmışın dışına gitmek gerekebilir. Bazen bunu hocamız ayarlarsa o zaman katkı sağlayabiliriz."	Each week, the roles should be determined by the teacher. Because usually the same people do the same thing every week. you may need to go outside the usual. Sometimes, if our teacher arranges the role distribution, then we can contribute *(Case I, Section II, G5)*
1043	"Biri grup başkanı olup, rol dağılımını yapabilir."	One can be the group president and make the role distribution. *(Case I, Section II, AS)*

Design II Collaboration

Code#	Original Statements	Translations
1044	"1-Önce görev dağılımı olmalı 2-sorular sırasıyla çözülmeye başlanmalı 3-zaman bilinçli kullanılmalı 4-Görevlerde aksama olduğunda grup üyeleri birbirine yardımcı olmalı 5-Soru çözülmeden diğer soruya geçilmemeli yoksa karışıklık oluyor ve yazan kişi yetiştiremiyor. 6-Yan tarafa herkes yazmamalı çünkü yazı yazma çubuğu yer değiştiriyor bütün hepsi karışıyor. 7-Bizim cevaplarımızla cevap anahtarı aynı sayfada olsa daha iyi olurdu cevap anahtarına bakıp geri yazmak zor oluyor"	1- The role distribution must be done first 2- Questions should be discussed respectively. 3- The time should be used consciously. 4- Group members should help each other when tasks are down. 5- The question should not be passed without discussing on. Otherwise, there might become confusion and the responsible person cannot write the shared answer. 6- Not everyone should write to the side at the same time, because the writing bar is being replaced by it. 7- Our answers would be better if the answer key was on the same page. it's hard to look back at the answer key and write back *(Case I, Section I, G3)*
1045	*"*1-Gruptaki herkesin her hafta rollerinin değişmesi gerektiği, 2- Ortak kararlar vererek çalışmamız 3-Herkesin daha çabuk ve hızlı karar vererek etkinliğe başlaması 4-Rol dağılımı yapmadan herkes yapabileceği yapamayacağı şeyleri söylemeli. 5-İlk önce iletişimin aramızda iyi olması lazım birbirimizin söylediklerini dikkate almalıyız. Etkinlikleri bu şekilde daha çabuk yetiştirebiliriz. 6-Mümkün olduğunca çok hızlı olmalıyız klavye de. 7-Zamanı hatırlatan arkadaşımız sık sık yapsın hatırlatmayı"	1-Roles should be exchanged among the members in each week. 2- We should discuss on having joint answers. 3- We should decide on roles faster to start discussion. 4- Without making any distribution of roles, everyone should say what they cannot do. 5- First of all, we should take into consideration what each other says. In that way, we can complete the activity more quickly. 6- We should use the keyboard as fast as possible. 7- Our friend, who reminds us of the time, should often remind the time remaining. *(Case I, Section II, G4)*
1046	"1-Görev paylaşımı 2-Soru çözümüne geçiş 3-Soruların kontrolü 4-Değerlendirme 5-Kaydetme ve gönderme 6-Sürekli olarak süre kontrolü"	1- Role distribution 2-Discussing questions 3-Checking answers 4-Evaluation 5-Writing and sending the joint answers 6-Cheking time continuously *(Case II, Section I, BS)*
1047	"1- rollerin belirlenmesi 2- soruları kavrayabilme 3- tartışma 4- ortak cevabı verebilme 5- cevabı ekrana yazabilme"	1- Role distribution 2- Comprehending the questions 3- Discussion 4- Deciding joints answers 5-Writing the answers *(Case II, Section II, Tİ)*
1048	Değerlendirme yapmak, hatalarımızı ve eksikliklerimizi görmemize ve bunları arkadaşlarımızla değerlendirmemize olanak sağlıyor.	Making evaluation allows us to see our mistakes and deficiencies and to evaluate them with our friends." *(Code1048: Case I, Section I, G5), (Case I, Section II, G5), (Case I, Section II, G1)*

Design II Evaluation Phase

Code#	Original Statements	Translations
1049	"Daha iyi oldu. Soruların cevaplarını görmüş olduk ve anında dönüt aldık."	It was better. We saw the answers to the questions and received immediate feedback. *(Case II, Section I, HE)* *(Case II, Section II, Tİ)* *(Case II, Section II, FK)*
1050	"Değerlendirmeyi bir kişi değil bütün takım yapmalı. Bir kişi hem bütün sorulara bakıp hem cevapları geçiremiyor. Sorular paylaşılarak kontrol edilirse daha çabuk olunur. Sadece biri kısa değerlendirme yaptığı için o bakıyor diğerleri görmüyor yani bu şekilde bize katkısı pek olmuyor."	The whole team do make the evaluation not a person. One person can't look at all the questions and get the answers. If the questions are shared and checked, it will be faster. If only a member reviews that only s/he sees the answers, but others does not see so this way it does not contribute to us a lot. *(Case I, Section I, G3)*
1051	"Cevap anahtarını kullanırken zorlanıp zaman kaybediyoruz. Cevap anahtarı Word dosyasında değil de ekranımızda olsa karşılaştırmamız daha kolay olur ve o kısımda çok zaman harcamamış oluruz. Sürekli ekrandan ayırılınca derste kopukluk yaşamış oluyoruz."	We're wasting time using the answer key. If the answer key is not in a separate Word file, it will be easier to compare and not spend a lot of time in that part. When we move from the screen to another screen, we have experienced disconnection. *(Case I, Section II, G4)*

M. Quotations from One to One Interviews

Students' Perceptions on Planning Phase in Case I

Code#	Original Statements	Translations
1053	"İlk başta soruyu cevaplamadan önce değerlendirme sorumlusu, iletişim sorumlusu, teknoloji sorumlusu bunlara karar vermek bizim işimizi çok rahatlattı"	"At first, before answering the question, deciding on technology, communication, and evaluation roles facilitated the working process." *ZA*
1054	"Soruları karışık yapmayalım. Birinci sorudan başlayalım. Sohbette yazılarımız karışmasın ki cevabı yazan kişi için kolaylık olsun."	"We shouldn't solve the questions in mixed order. We should start with the first question. If we do not mix the order, it becomes easy to transfer answer to the note field." *EÇ*
1055	"Herkes rolünü bilip ona göre sen şu görevdesin gibi bir şey muhakkak olmalı diye düşünüyorum. "	Everybody should know his/her role and must know the underlying tasks. *AS*
1056	"Konuya hazırlıklı değilse onu etkinliklere sadece dışarıdan seyretmesi için"	If someone is not prepared for the event, s/he should only watch the events from the outside. *AsK*
1057	"Dikkatli okumak gerekiyor, okuduğunu anlamak gerekir ..ne istendiğine anlaşılarak yapılması gerekiyor."	We need to read carefully, perform the task after understanding the requirements. *BSG*
1058	"..nasıl cevap vereceğimize kaç soru olduğuna bakabiliriz."	We can decide how to answer the questions and see how many questions there are. *AyK*
1059	"Herkes bir ağızdan konuşmamalı herkes sürekli bir şey yazmamalı …" "… link gönderiyordunuz onu kontrol ediyorduk. Bir de ne var gibi onları konuşuyorduk"	Not everyone should write simultaneously. *ZA* We checked the link you shared and talked what we have for the activity. *AyK*

Students' Perceptions on Planning Phase in Case II

Code#	Original Statements	Translations
1060	"Kimin hangisini alması için hani rolü üstlenmesi için belirlemeye çalışıyorduk."	We've been trying to distribute who gets what role. *RK*
1061	"Yapacağı işi konuşması gerekiyor."	We need to talk about the work we required to do**. *EA***
1062	"Sürenin nasıl kullanılacağını konuşabiliriz."	We can talk about how to use time. *MVO*
1063	"Göz gezdirmek gerekiyor kabaca sorulara."	We should skim the discussion questions. *Aİ*
1064	Sorulara aynı anda gidilmesi konusunda bir fikir birliğine varılması gerekiyor. Mesela biri daha ilerden gitmesin herkes aynı şekilde belli bir programda olarak ilerlemeli."	A common decision should be made to resolve the questions in order. For example, one cannot solve the next question. everyone should proceed in the same way in a certain order. *Tİ*
1065	Mesela grup içerisinde biz tamamız başlayabiliriz dedikten sonra etkinlik başlayabilir"	The activity may start after we all say we can start. ***SU***
1066	"Mesela o gün biri çalışamıyor ya da ikisi bu kişilerin yani daha çok yazan rolünde olup diğer çalışanların bilgi aktarma rolünü üstlenmesi için bir iletişim sağlanabilir grup üyeleri arasında."	If a member is not prepared for the task, we can decide that s/he can be given a communication responsibility instead. *MK*

Students' Perceptions on Monitoring in Case I

Code#	Original Statements	Translations
1067	"Bilmedikleri zaman cevap vermediler yazmadılar hiçbir şey. Ben uyardım niye yazmıyorsunuz falan"	"If they did not write, that means they did not know nothing. I warn them and warned them why they didn't write anything." *BSG*
1068	"Mesela kitabın tıptapını yazınca düşünüyorsun hani diyorsun hani kitaptan bakıp da yazıyor diye düşünüyorsun."	"When someone wrote the same information in the lecture book, and I thought that s/he's writing from the book." *BA*
1069	"Ben de yanlış yazabiliyordum. Birbirimizi düzelttik diyebilirim."	"I could write wrong answer. We corrected each other's mistakes." *AyK*
1070	"…ya daha çok kısa bir cümle yazıyor oradan anlıyorum."	"… when s/he writes a short sentence." *İÇ*
1071	"Zaten kendileri söylüyorlardı."	They themselves were already saying. *İÇ*
1072	"Daha hızlı yazıyor mesela"	When s/he typed faster… *PY*
1073	"Çalışan kişi gayet vakıf bir şekilde güzel cümleler kuruyor oradan Anlaşılıyor"	The working person is able to establish well established sentences. *HŞ*
1074	"Yazılana evet ben de katılıyorum bu da böyle olabilir dediğiniz doğru gibi şeyler söylediği zaman"	I understand it when someone confirm or agree with us. *ZA*
1075	"Herkesle aynı anda yazıyorsa ya da hemen hemen birbirinden arkasında yazıyorsa bu kişi çalışmıştır"	"The person has worked if s/he writes at the same time as everyone, or if s/he writes after someone...". ZÇ

Students' Perceptions on Monitoring in Case II

Code#	Original Statements	Translations
1076	"Kimileri sessiz kalıyordu. Sessiz kalmasından anlıyorum kesinlikle."	Some friends were quiet. I could see they didn't know the subject because of their silence. BS
1077	"Bir konu hakkında fikir veriyorsa diğerleri vermiyorsa ya olayı fazla ciddiye almıyor ya da çalışmamış veya bilgi eksikliği var diye düşünüyorsun"	If someone shares an idea about a topic, when others don't, it means that s/he doesn't take the event too seriously or s/he doesn't work or there's a lack of information. HE
1078	"Yeterince yazmayan bir kişi için onun daha az bilgi birikimine sahip olabileceğini düşündüm.	For a person who doesn't write enough, I thought s/he might have less knowledge. Tİ
1079	"Sonradan doğru çıkınca bildiğini anlıyorsun."	When the answer is correct in the evaluation section, you understand that the respondent knows it. EK
1080	"Soruları cevaplarken daha emin konuşuyor mesela"	The person who knows is more confident in answering the questions. EK
1081	O öyle değil şöyle olmalı gibisinden düzeltici şekilde bir tepkide bulunuyorsa yani bu sefer onun daha çok çalışıp daha böyle uğraştığını hissedebiliyorduk. "	If one reacted in a corrective way then we could feel that s/he had worked harder. MK
1082	Zaten hiç düşünmeden şu şu şu diyebiliyor".	S/he can answer quickly without thinking. FK
1083	Sadece verilen bir görev varsa o görevi yerine getirmişlerdir grupta."	They only performed a given responsibilities. MVO
1084	"Püf noktalardaki kelimeler varmış ben onlara hiç dikkat etmemiştim. Onlar bu geçerse burada budur dediler. Şuna dikkat etmen lazım dediler. Ondan dolayı da daha bilgili diye düşündüm."	There were important points. I never paid any attention to them. They have said tricks. They said you should pay attention. So, I thought this such a person was more knowledgeable. SAE

Code#	Original Statements	Translations
1085	"Sorumluluk almayı öğrendik"	We learned to take responsibility. ZÇ
1086	"Roller gerekliydi çünkü zaman sınırlaması vardı. Zamanında tamamlamak için roller gerekliydi."	Roles were necessary because there was a time limit. Roles were required to complete on time. PY
1087	"Olan rollerin yapılıp yapılmadığını belirten bir uyarı olsaydı bence daha iyi olurdu."	I think it would be better if there was a warning that the roles were done or not. BA
1088	"Çok fazla kişi olmadığı için bazen tam 3 kişiye 3 görev denk geliyordu. Bizim için sıkıntı olmuyordu."	Because there were not so many people in the group, roles matched with 3 members. There was no problem for us. ZA
1089	"Benim bilgisayarında sıkıntı varsa başka bir teknoloji sorumlusunun olması gerekiyordu . bana bırakılsaydı Biz grupça çok kötü olacaktık."	If there was a problem with my computer, there had to be another technology responsible. If I were alone, we would be unsuccessful. HŞ
1090	"rotasyon şeklinde her hafta herkes sırasını bilecek"	There will be rotation in the roles and every week everyone will know the order. İÇ
1091	"Yazan da oluyor gönderen de oluyor. Başka ne olabilir ki."	There were technology and communication responsibility. What else could be. EÇ
1092	Bence iletişim sorumlusu Hani olmasa da olurdu çünkü biz birbirimize grup içerisinde birbirimize kendimi iletişim sağlıyorduk"	I don't think someone would be in charge of communication responsibility. Because we were communicating within the group by ourselves. AyK
1093	en son değerlendirmeden sonra da yorumlayıcı olmalıydı."	There should have been the interpreter/reflection responsible after the last evaluation part. MD
1094	Başkası da diyordu ben de olurum, yazıldığı takdirde başkası da senin yerine yapıyordu internet koptuğunda yine faydalı oldu"	Other friends were also saying they can substitute roles, which was useful again when the internet broke. FZG
1095	Süre takibine gerek yok diye düşünüyorum. Yani hocanın yapması daha iyi, bizi uyarması, başla ya da bitir şeklinde mesajlar gelmesi daha iyi.	I don't think we need to follow time. So, it is better for the teacher to do it for us, to warn us with start or finish messages. AyK

Students' Perceptions on Role Distribution in Case II

Code#	Original Statements	Translations
1096	"Mutlaka rollere bölünmesi en sağlıklısı. çünkü bu sefer çok büyük bir karışıklık olur zaman yetmez. Birinin bunu gözetliyor olması bir yandan öteki grup üyelerini de rahatlatıyor. iş yükünü azaltıyor."	It is absolutely logical to share roles. If not, this time a huge confusion might happen and time may not be enough. The fact that someone is observing us relieves the other group members. It also reduces the workload. MK
1097	"Daha hızlı olmamızı sağlamıştı."	It made us faster. EK
1098	"Roller olmayınca yük hemen hemen bir kişinin üzerinde biniyordu ama rolleri paylaşınca herkes orantılı olarak bir şeyle meşguldü."	With no roles, the load rode almost over one person, but when we shared the roles, everyone was engaged in proportionally. FK
1099	"Grup çalışması olduğu için iş paylaşımı olması güzel birşey bence. Mantıklı birşey. Çünkü roller olmazsa Ortaya ortak birşey çıkmayacaktı."	I think it's logical to have work sharing because it's group work. Because if there were no roles, nothing in common would come. RK
1100	"Tek sıkıntı şöyle daha kalabalık sınıflar için söylüyorum 3 rol vardı ya bazen 1 rolü iki kişi paylaşmak durumunda kalıyorduk."	For the more crowded classes I'm telling this. There were 3 roles, but sometimes we had to perform a role as two people. Tİ
1101	"Çünkü o an mesela birine rol verilmiş oluyordu ama o kişi cevap vermiyor oluyordu."	For example, someone was given a role, but he was not responding. SU
1102	"…O an İnternetten kaynaklı problemler olabilir hani onun görevini bu sefer başka birisi üstleniyordu."	There could be problems from the Internet. Then someone else would do his/her duty. SU
1103	"Bence şöyle bir rol daha olabilir. Bu rolü dağıtacak bir başkan ya da rol dağılımında hani geri dönüt verebilecek bir başkan gibi bir rol daha olabilir."	There may be another role like a moderator to distribute the roles or someone who can give feedback in the role division. AS
1104	"Şimdi notları oraya yapıştırma açısından gayet güzel oldu. Tamamen rol dağılımını uyguladık mı derseniz, rol dağılımını yaptık ama cevapları beraber tartıştık."	It was very nice to copy/paste the notes there. … we did the role distribution but we discussed the answers together. EA
1105	"Teknoloji sorumlusu orada daha fazla görev aldı."	The technology responsible took up more duties there. EA

Students' Perceptions on Collaboration Steps in Case I

Code#	Original Statements	Translations
1106	"Benim için kimin ne iş yapacağı belirlenmeli kesinlikle."	For me, who should decide what we certainly have to do. BA
1107	"…Yazdığımız şeyleri kontrol etmemiz gerekiyor."	We need to check what we were writing.İÇ
1108	"…soru soru çözümü aşaması... "	… the question solution phase. ZÇ
1109	"Biz 1. sorudan başlarken, Bazı arkadaşlarımız direkt 2. 3. soruya geçebiliyordu. Bu da bizim soruyu dikkate almamanıza sebep oluyordu."	When we started with first questions, some of our friends could go directly to the 2nd, 3rd question. This made us ignore the question. AyK
1110	"Birinci soruya başlayıp beraber herkes kendi fikrini sunup ondan sonra sunulan fikirlerin arasından hepimizin fikirlerinin sentezleyerek bunun içinden bir cevap oluşturmak"	Everybody should start with the first question and present their opinions. After that we have to create an answer by synthesizing all of our ideas. ZA
1111	"süreyi kontrol etmemiz."	…check the time… FZG
1112	"Fikir alış-verişinde bulunmak gerekiyor. "	We need to exchange ideas. AsK
1113	"En sonunda da vakit bittiği zaman değerlendirme yapmalıyız."	Finally, when the time is over, we must evaluate. EÇ
1114	"…Saygı duyulması gerekiyor verdiğimiz cevaplara"	Our answers need to be respected. ZA
1115	"Bazıları hazırlıksız oluyor bazıları mesela orada bir kişi tek cevap veriyor."	Some friends come as unprepared. So only one-person answers. HŞ
1116	"Yani ilk önce hocanın verdiği sorulara bakalım."	So first we have to look at the questions given by the teacher. ÇÇ
1117	"Aynı cümleleri yazmamaya özen gösterdik..."	We tried not to write the same sentence. YU
1118	"Arkadaşlara sormak gerekli onların bilgilerinden faydalanmak gerekli gerektiğinde."	We should ask to our friends when needed to take advantage of their information. ÇÇ
1119	"Konuyu anlamak gerekiyor. Ne yapmamız istendiğini hızlıca kavramamız gerekiyor."	We need to understand the subject. We need to quickly understand what we're asked to do. İB

Students' Perceptions on Collaboration Steps in Case II

Code#	Original Statements	Translations
1120	"Öncelikle sorumluluk paylaşım..."	First of all, sharing responsibility is very necessary. BS
1121	"Süreyi etkin bir şekilde kullanmak gerekiyor."	We need to use the time effectively. FK
1122	"Grubun koordineli bir şekilde tartışarak süreci yürütmesi gerekiyor. Yani grubun işbirlikli çalışması gerekiyor."	The group needs to discuss the process in a coordinated manner. So, the group needs to work collaboratively. EA
1123	"Mutlaka uygulamadan önce sorulara biraz göz gezdirmesi gerekiyor diye düşünüyorum konulara."	I think we should have a look at the questions before discussion. FK
1124	"Herkesin rolüne uygun davranması gerekiyordu."	Everyone had to act according to his/her role. Tİ
1125	"Aynı anda yazmaya çalışıyorduk. Birinin yazdığını diğeri silebiliyordu."	We were trying to write at the same time. Someone might wipe the other one' post. EK
1126	"İletişim halinde hızı bir şekilde davranılmalı."	We must be in touch and fast. Aİ
1127	"Verilen cevap doğru mu ya da cevabımız ortak mı gibi bazen müdahale etmek gerekir"	We need to intervene as the answer was correct or sometimes as if the answer was common or not. MVO
1128	"…bazen bir iki kişi etkin oluyor o da grubun başarısının biraz düşük olmasına sebep oluyor."	…sometimes a couple of people are active, which makes the group's success a bit lower. EA
1129	"İşte doğru mu arkadaşlar cevabınız gibi müdahale etmek gerekti" MVO	"We need to ask whether the given answer is right."
1130	"O görevde nasıl başarılı olacağını bilmemiz gerekiyordu"	We had to know how to succeed on the mission. HE
1131	"Birbirimize her şekilde yardımcı olmaya çalışıyorduk"	We were trying to help each other in every way. HE
1132	"Moderator gibi sohbeti yönetecek kişi gerekiyor. Çünkü internet üzerinden bir tartışma yapıyoruz ve Hani sözcükler karışabilir"	A person like moderator is needed to manage the chat. Because we're having a discussion over the internet, and the words can be mixed. BS

Students' Perceptions on Script Structure in Case I

Code#	Original Statements	Translations
1133	"Notlar bölümüne yazı yazan kişi mesaj yazarken başka bir kişi daha dahil olunca notlar karışıyor. O engellenebilir mi bilmiyorum."	"When a member writes to the Notes section and another person is included, notes are mixed. I don't know if it can be prevented." İB
	"İletişim, teknoloji ve değerlendirme sorumlusuna ayrılarak grup içinde çalışmamızı sağladı."	"The system has enabled us to share our communication, technology and evaluation to work within the group." FZG
	"4 kişi olup 4 sorumluluk olabilirdi. 1 kişi boşta kalmayabilirdi."	"There could be 4 responsibilities for 4 people. A person could not be idle in this way." MD
1134	"Yani her hafta aynı kişilerin aynı rolü alması şeklinde değil de rotasyon olursa daha iyi olur."	"Every week, it is better if the same people don't take the same role, but there should be in a rotation." İÇ
1135	"Geriye doğru bir saat gibi bir şey olsa sen 30 dakika 29 28 giden bir şey olsa olabilirdi …"	"There could be something like a stopwatch." AyK
1136	"Bence hepsi gerekliydi. Olması gerektiği gibiydi. Olan herşey bir amaca hizmet ediyordu"	"I think it was all necessary. It was like it was supposed to be. Everything was serving a purpose." BSG
1137	"Notlar bölümüne ünitenin tekrarlanması yazılabilirdi."	"Repeating the unit could be written in the Notes section."PY
1138	"… arkadaşların etkinlikten genel anlamda memnun olup olmadıkları eklenebilir."	"There might be a part like group members are generally satisfied with the event or not." AsK
1139	"Grup üyelerinin isimleri olabilir."	"The names of group members can be written." ZÇ
1140	"Konunun ne kadar anlaşıldığını ve anlaşılmayan noktaları not alabilirdik. "	"We could note how much the subject was understood and the points that were not understood." AsK
1141	"Şu değerlendirme kısımlarına ne yazılması gerektiği, mesela en çok biz onu karıştırdık."	"Mostly, we have had trouble on what to write at Evaluation section." ZÇ
1142	"Sorunun zorluk derecesi eklenebilir." A	"The difficulty level of the problem can be added."AsK
1143	"Hem sohbet bölümüne hem notlar bölümüne aynı anda yazma olabilir"	"Simultaneous writing to both chat and notes section feature can be added." İB

Students' Perceptions on Script Structure in Case II

Code#	Original Statements	Translations
1144	"Gayet açık net olduğunu düşünüyorum ben."	"I think it's pretty clear." SU
1145	"Hemen hemen her alanla ilgili kopyalayıp gönderecek kişi, cevaplayacak kişi yazacak kişi yazıcısı filan o güzel olmuştu."	"Almost every task, there were roles such as a person to copy or send, it was good." RK
1146	"Rol paylaşımı gruplar kurulmadan önce yapılmış olsaydı daha faydalı olurdu diye düşünüyorum."	"I think it would be more useful if role sharing was done before groups were set up" RK
1147	"… yazıyordum hani önceki harfler kayboluyordu. Bir tek öyle bir sıkıntıyı çektim."	"… The previous letters disappeared while writing. I've only suffered such a problem." Tİ
1148	"Mesela bir okuduğum şeyi anlamıyordum ikinci kez okuyordum. Bazen üçüncü kez okuduğum da oluyordu."	"For example, I didn't understand what I read. I was reading for the second time. Sometimes I read the third time." RK
1149	"Değerlendirme anında olabilir. Biz cevabı oraya yazdığımız anda cevabımız doğru yanlış mı diye değerlendirilebilir."	"Evaluation can be instant. When we write the answer, our answer can be evaluated as correct or incorrect." FK
1150	"Bence 40 dakikalık bir etkinlikse mesela, 10 dakika geçmiştir ya da 20 dakika kalmıştır ya da son kalan sürelerde uyarı olabilir."	"I think, if it's a 40-minute event, for example, 10 minutes have passed or 20 minutes left or the last remaining time may be notified." MVO
1151	"Şimdi birden fazla soru olunca şöyle bir sorun oluyor. Sırayla 1B 1C diye gidiyoruz diyelim. Aynı zamanda 2A 2B 2C var. Biri A'yı yapıyorum dediğinde hangi sorunun şıkkı olduğu anlaşılmıyordu."	"If there were more than one question, there were such a problem. Let's just say we're going as 1B 1C. There also were 2A 2B 2C. When someone said 'I'm doing A', it was not clear which question's options it was." BS

Students' Perceptions on Evaluation in Case I

Code#	Original Statements	Translations
1152	"Genelde çoğunluğa bakıp karar veriyorlar. 3-5 kişi de aynı cevabı söyleyince farklı doğru cevap olabileceğini düşünmüyordum."	"They usually look at the majority's asnwer and decide. When 3-5 people said the same answer, I didn't think there would be a different right answer." AsK
1153	"…hem bana arkadaşım X doğru söylüyorsun diyordu. Ben de diyorum ki senin söylediğin de doğru. ben o zaman cevabı yazayım diyordum."	"Both my friend X said my answer was right, and I'm just saying you're right, too. Then I was writing the answer." İB
1154	"Hani bunun cevabı bu olacak şundan dolayı diye açıklama yaptığımız zaman zaten herkes kabul ediyor."	"When we said this is the answer because of this reason, everyone was accepting." İÇ
1155	"Mesela ben çok ısrar etmiştim benim cevabım doğru diye. Arkadaşlar itiraz etmediler eklediler cevabımı." "Herkes cevabının bir kısmının ortak cevaba eklenmesini istiyor." "Herkes tekrar yazdığı cevabı kontrol ediyordu. Herkes bir daha o soru hakkında düşünsün deniyordu., öteki soruya geçip en son o soruya cevap veriyorduk."	"For example, I insisted that my answer is correct. Friends did not object and added my answer." PY "Everybody wants a part of their answer to be added the common answer." ZÇ "Everybody was checking their answer again. Then everyone was asked to think about that question again, we would go to the other question and turn back it later." FZG
1156	"Nerede eksik yazmışız, nerede fazla yazmışız onları görüyorduk."	"In this section, we noticed where we wrote less or where we overwrote." BSG
1157	"Cevapları okuyunca a bunu da yazabilirmişiz aa bu da varmış diyoruz."	"When we read the answers, we though that we could write this or there is such a point." İÇ
1158	"Bazı soruların cevabı çok uzundu. Cevaplara beraber bakmak daha iyi oluyordu süre açısından."	"The answers to some questions were too long. It was better to look at the answers together due to time limitation." BA
1159	"En azından kendi cevaplarımı kontrol ettim. Ortak verilen cevaplar zaten doğrudur diye düşünüyorum."	"At least I checked my own answers. I think the common answers are already true." AsK
1160	"Ben sınavda o yanlış yazdığımız kelimeyi, terimi gördüm. Biz bunu etkinlikte yanlış yazmıştık diye hatırladım."	"I remembered the word we wrote wrongly in the exam. We remembered that we wrote it wrong in the activity." İB
1161	"Benimkinin yanlış olduğu da oldu yani. "Ya keşke eklemeseydik bak P'ninki yanlış oldu dediler."	"My answer was wrong as well, and they said they did not add my answer." PY
1162	"Tekrar etme imkânı sağladı."	"It allowed us to do repetition" HŞ

Code#	Original Statements	Translations
1163	"Herkes doğruluyordu. O cevap direkt oraya ortak cevap olarak geçiriliyordu."	"Everybody confirmed the answers. Then, that answer was written directly as a common answer." MK
1164	"Doğru cevabı olduğuna emin olan kişi mesela bazen diretiyordu hani bende de oluyordu"	"If someone was sure of his/her answer, s/he insisted that his/her answer be written. I did the same." FK
1165	"Gerekçesi en mantıklı olan yazılıyordu. Gerekçesi çok mantıklı gelmeyen cevap eleniyordu."	"The answer having the most logical rationale was written, whereas if the reason for the answer is not logical, it was eliminated." AS
1166	"Çoğunluk hani şu dediğinde o kararı alıyorduk."	"We wrote the majority's answer." EA
1167	"X arkadaşımızın cevabını dikkate alıyorduk. Aktif olarak öğretmenlik yaptığından dolayı cevabına güveniyorduk."	"We took into account the answer of our X friend. We were relying on his/her answer as s/he was working as a teacher." RK
1168	"Olumlu etki sağladı tabi ki. Kendi yanlışımızı kendimiz görüyoruz."	"Of course, it's made a positive impact. We realized our own mistakes" EK
1169	"Gerçi birçoğu yanlıştı bizim yaptıklarımızın. Doğruyu öğrendik en azından."	"Although many of our answers were wrong, we learned the correct one, at least." RK
1170	"… çok güzel bir uygulama olduğunu düşünüyorum. Cevap anahtarı paylaşıldıktan sonra tartışma yapıyorduk."	"I think it is a very nice implementation. After the answer key was shared, we were having discussion on it." AS
1171	"O dönütler de sınavda işimize yaradı. Mesela orada yanlış bir cevabımız olmuştu. ANOVA dememiz gereken cevaba başka bir şey demiştik. O yüzden ANOVA aklımda kaldı. "	"The feedback helped us on the exam. For example, we had a wrong answer. While ANOVA was the answer we have said something else, so it helped me to remember ANOVA." EA

Students' Perceptions on Cognitive Presence in Case I

Code#	Original Statements	Translations
1172	"Mesela bir şey yazdıklarında "a diyorum bak bu da varmış" diyorum."	"When they wrote something, I see a different point." BA
1173	"Herkes patır patır tüm cevapları söylüyordu."	"Everyone was telling all the answers immediately." ZÇ
1174	"Arkadaşlarım yazdıklarında benim yanlış ders notuna bakıyormuşum onu fark ettim ya da arkadaşlarım cevapladığında onlarla aynı şeyi düşündüğüm oldu mesela."	"When my friends wrote something, I realized I was looking at wrong lecture notes, or when my friends answered, it was exactly the same as I thought about the answer. " FZG
1175	"Soruda benim takıldığın olduğu zaman, o soruya 2 kişi cevap verdiğinde ben o zaman onları söylediklerinden yola çıkarak bu cevap doğruymuş diyebiliyordum. En son bittikten sonra kontrol ettiğimizde de o zaman daha çok sağlaması oluyor kafamda"	"When I stumbled upon the question, when 2 people answered the question, I learnt correct answer based on what they said. Then, when we check out at evaluation phase, then I made sure of the answer." ZA
1176	"Benim eksik kaldığım yerde yeri geliyordu diğer arkadaşım tamamlıyordu."	"When I couldn't complete the answer, one of my friends were doing so." İB
1177	"Tabi ki orada mesela sorular üzerinden konuştuğumuzda mutlaka birbirimizden bir şeyler öğreniyorduk."	"Of course, when we were talking about questions there, we were learning something from each other." HŞ

Students' Perceptions on Cognitive Presence in Case II

Code#	Original Statements	Translations
1178	"Mesela ben bir konuya hakimim ya da bir konuyu bilmediğimde diğer arkadaşım kendisi yazıyor, diğer arkadaşlar da öyle."	"For example, if I know a subject well or I don't know it, my friend wrote it…"
1179	"Birinin verdiği cevap benim cevapla çelişiyorsa ister istemez düşünüyorsun acaba o da olabilir mi diye. Yani olabilir mi diye onun kendini düşünme şekline bakıyorum. Kafamda çelişiyorsa ya o öyle değil de böyle olur ya da sizin dediğiniz doğru dediğimiz oluyordu yani."	"If someone's answer contradicted with my answer, I thought whether it might be correct. I was thinking on the way s/he thinks. If it contradicted in my head, I said the answer was not like that, or was true." HE
1180	"Yazan metinleri nasıl incelemek gerekiyor, hangi yönden bakılması gerekiyor, bunları etkinliklerde öğrendim."	"I learned how to examine the texts, from which perspectives to look at them during the activities." MK
1181	"Herkesin bakış açısı farklı olduğu için başkası cevap verdiğinde siz de öğrenmiş oluyorsunuz."	"Since everyone's perspective is different, I learn when someone else give answer." Aİ
1182	"Herkes birbirini destekledi. Ortak bir karar öyle çıktı. Tek bir kişiden değil de onaylayarak hepimizin bilgisi vardı."	"Everyone supported each other, so we decided on a common decision. The knowledge of all of us was combined, not the answer of a single person." Tİ
1183	"İkilemde kaldığım durumlar oldu. Başkası benim düşünceme ters şeyler yazdıklarında kendi yanlış algılamalarımı düzeltme şansım oldu."	"There were situations in which I remained in dilemma. I had a chance to correct my own misconceptions when someone else wrote the opposite things to my mind." MVO

Students' Perceptions on Social Presence-Communication in Case I

Code#	Original Statements	Translations
1184	"Herkesin aynı anda farklı soruları çözmesi sorun olmuştu."	"It was a problem that everyone was solving different questions at the same time." İB
1185	"Mesela etkinlik sırasında terimler yazılacaksa ilgili terim yazılmıştı. Fakat biri aynı terimi tekrar yazınca neden aynısını yazdın gibi cümleler kurabiliyorlardı."	"For example, if the terms were required to be written during the event, someone wrote them. But when someone wrote the same term again, we said why you wrote the same." PY
1186	"Mesajlar ileri gidiyordu. İletişim sorumlusu kişi Yazdığımız cevabı tekrar soruyordu, o sıkıntı oluyordu."	"Messages were scrolling, so the person in charge of communication was asking the answer again, it was a problem."
1187	"Hani mesela diyelim ki birine bir şey danışmak istiyorum. Bilmediğini bildiğim kişiye danışmayınca ayıp olabiliyor."	"Let's say I want to ask something to a specific person. It's not appropriate when you don't consult with the person doesn't have information." ZG
1188	"Bazen klavyeden dolayı ne dediğimi değil de ne yazdığım anlaşılmamıştı."	"Sometimes my group mates couldn't understand what I wrote, not I mean, because of the keyboard." BSG
1189	"Bazen ortam yumuşasın diye espriler de yaparım. Ben yazarken acaba aba altından sopa mı gösteriyorum diye çok ince eler sık düşünürüm."	"Sometimes I make jokes to soften the environment. I mostly monitor myself as I seem to imply something or threaten somebody."AsK
1190	"Yazdığımı mikrofonda söyleyemem tabii ki. Yazarak iletişim kurmanın daha iyi olduğunu düşünüyorum"	"Of course, I can't say the same what I wrote, on the microphone. I think it's better to communicate by typing." PY
1191	"Mesela kucağımda çocuğum olduğunda yazamıyorum."	"For instance, I can't write when I have a child in my lap." BA
1192	"Düşünceni toplayabiliyorsun yazarken. En azından bir bütünlük sağlayabiliyorsun parça parça anlatmaktansa."	"I can overcome a confusion while writing. At least writing provides an integrity rather than saying what I say piece by piece." YU
1193	"Birbirimizin yüzüne bakarak konuşmak farklı oluyor. Yan yana olmak farklı oluyor. Mesajları mesela kısa kısa yazıyoruz."	"It's different talking to each other. Being physically side by side is different. For example, we try to write short messages while typing."
1194	"Birkaç kişinin o grupta olmak istemediğini biliyorum. Sevmediğim biri olunca ne ben o grupta olmak istiyorum ne de o olmak istiyor."	"I know a few people don't want to be in the group. When I 'm in a group with someone I don't like, neither I, nor s/he want to be in it." HŞ
1195	"Tepkisiz kalanlara bir şey diyemedik. Sadece kendi kendimize sinirlendik."	"We couldn't say anything to those who were unresponsive. We just got angry instead." MD

Students' Perceptions on Social Presence-Communication in Case II

Code#	Original Statements	Translations
1196	"Mikrofon olursa bir karmaşa olacağını düşünüyorum. Çünkü herkes aynı anda konuşacak."	"I think the microphone would create a mess Because everyone will speak at the same time." BS
1197	"Tekrardan da okuma şansımız var ya yazılanı."	"We have a chance to read the posts again." BS
1198	"Biri fikrini yazmadığında tabii ki doğal olarak onlarla iletişim sorunu yaşıyoruz. Ona ne düşündüğünü sormak zorunda kalıyoruz."	"When someone doesn't write his/her opinion, of course, we naturally have trouble communicating with him/her. We have to ask him/her what s/he thinks." EA
1199	"Ben yavaş yazdığımdan dolayı daha hızlı yazan bir arkadaş benim yazacağımı benden önce yazdı."	"Because I wrote slowly, someone wrote faster than me before I wrote." HE
1200	"Bazen yazıyla tam ne demek istediğinizi anlatamıyoruz. Yanlış anlayabiliyor bazen arkadaşlar."	"Sometimes we can't tell exactly what we mean by writing, so it creates misunderstanding." SU
1201	"Sınıf olarak mikrofonu sevemedik. Yazılı olarak ben kendimi gayet iyi anlattığımı düşünüyorum."	"We couldn't love the microphone as a class. I think I express myself very well by testing FK
1202	"Kiminle grup olmak istediğimi sorarsanız 4 kişiden 3 tanesi yine kendim seçeceğim kişilerdendir."	"If you asked who I wanted to be a group, 3 of the 4 people would be among the ones I would choose myself." Aİ
1203	"Herkesin bağlantı düzeyi mükemmel olmadığı için bazen biri doğru bilgiyi yazıyor fakat yazdığı geç geliyor."	"Because everyone's Internet connection is not perfect, sometimes someone writes the correct answer, but it appears lately." AS

Students' Perceptions on Social Presence-Motivation in Case I

Code#	Original Statements	Translations
1204	"Aktif olduğumuz zamanlar bilgisayarı mutlu kapattık. O zaman kendimizi iyi hissediyorduk."	"When we were active, we closed the computer happily. We felt good." İÇ
1205	"Internet bağlantısı sorunu motivasyonumu düşüren bir etken oldu."	"Internet connection problem has been a factor reducing my motivation." ÇÇ
1206	"Verilen süreden daha az önce bitirmemiz değerlendirmesi kısmına geçtiğimizde motivasyonu yükselten şeydi."	"It was a motivating factor to finish the activity in time and then move to the evaluation section." PY
1207	"Bildiğim soruların çıkması (gülüyor) o zaman çoğunlukla motivasyonu yükseltti."	"Asking the questions, I know (laughs) mostly increased motivation." BSG
1208	"Yanlış cevap verdiğimizde onlar adına kendi adına da üzülüyordum."	"When I gave the wrong answer, I was sorry on behalf of myself and my group." İÇ
	"Hani bu kadar çaba gösterip de X'in benden yüksek puan alması beni delirtti açıkçası."	"I've been trying so hard and the fact that X got a higher score than me made me crazy." MD
	"Yanlış cevap verdiğimde ve insanlar tabi beni eleştirdiğinde…"	"When I give the wrong answer and people criticize me…" İÇ
	"Herkesten önce dosyayı sisteme yüklemek motivasyonu yükselten bir etkendi."	"Uploading the file to the system before everyone was a motivating factor." PY
	"Bir kere derse ben geç gelmiştim, 10 dk falan geçmişti. Siz grupları ayarlamıştınız. Herkes soruları cevaplamaya başlamıştı."	"Once I was late, and 10 minutes had passed. You've set up groups. Everyone started answering questions." ZA
	"Gayet güzel ve keyifli bir etkinlik geçirdim. Çok güzeldi benim açımdan."	"I had a very nice and enjoyable event. It was very nice for me." AsK
	"Dışlanmak demeyeyim de fikrim sorulmayınca…"	"I should not say exclusion, but when my opinion was not asked…" ZÇ
	"Planlama başlamadan önce, hiç kimse bir şey yazmadan birinin cevabı dikkate alındığı zaman motivasyonumu düşürüyor."	"Before planning begins, my motivation falls when only one's answer is taken into consideration before anyone writes something." BSG
	"Ben cevabı yazarken bir kişinin biliyormuş gibi tüm her şeyin cevabını vermesi benim motivasyonumu düşürüyordu."	"The difficulty of the subject affects my motivation. I thought we couldn't finish them or nor. I was in a hurry." BA
	"Konunun zorluğu etkiliyor. Yetiştirecek miyim yetiştiremeyecek miyim? Bunun telaşına düştüm ister istemez."	
1209	x	

Students' Perceptions on Social Presence-Motivation in Case II

Code#	Original Statements	Translations
1210	"Herkesin sürece katılım sağlaması motivasyonumu olumlu yönde etkiledi."	"Everyone's participation in the process has had a positive impact on my motivation." MK
1211	"Süre sıkıntısı olduğu için hani o motivasyonu etkiledi. Yetiştiremeyebiliriz kaygısı oluyor. Aslında süre yeterli ama psikolojik olarak etkiliyor."	"Time shortness affected motivation. We've worried about whether we can finish the activity on time or not. Actually, time is enough but it affects psychologically." SU
1212	"Bazı arkadaşlarımızın iyi hazırlandığını gördük. Bu sefer kendimizde eksik aramaya başladık. Konuya çalışmamışım falan diye. Eksiğimi kapatma konusunda bana artı bir şey sağladı."	"We saw some of our friends prepared well, so we realized our lacks. I thought I didn't work on the subject. It gave me a plus to turn off my deficiency." AS
	"Benim dediğim cevap doğru çıktı ama ortak cevaba yazmadık tabi. O zaman motivasyonum düştü."	"The answer I said was true, but we didn't write it to the shared answer. So, my motivation has decreased." MVO
	"Sorulara bir an önce cevap vermek ve doğru cevap vermek motivasyonumu arttırıyordu."	"Answering the questions as soon as possible and giving the right answer increased my motivation." EA
	"Hocanın sizi izliyorum ve takip ediyorum motivasyonumu olumlu yönde etkiledi."	"When the teacher said that I was watching you and following, it increased my motivation." FK
	"Küçük çocuklar var yanımızda onlardan dolayı sorun oldu. Ben yazacakken çocuğun ağladığı zamanlar oldu."	"There were children with us. There were times when the child cried when I was going to write." HE
	"O konuyla ilgili bir fikir sorulduğunda a evet bu böyleymiş işte arkadaşımızın söylediği doğruymuş deyince daha bir mutlu olup daha güzel bir şekilde yazdığımız zamanlar oldu."	"When I was asked for an idea on the subject, or when our friend was saying my answer was true, it encouraged me to write and made me happier." HE
	"Rol dağılımı olmadığı zaman, kim ne yapacağını bilmediğim için moral anlamında ne diyeyim düşüş yaşadık."	"When there was no role distribution, we didn't know what to do we became demoralized." RK
1213	"Bağlantıdan dolayı problem yaşamıştık. O da ister istemez moralimize etki etmişti."	"We had a problem with the connection. It inevitably affected our motivation."

Students' Perceptions on Teaching Presence in Case I

Code#	Original Statements	Translations
1214	"Zaten anlatıyorsunuz siz bize. Etkinlik bunları yapmamız gerekiyor diye. Biz de yapmaya çalışıyorduk zaten, çözmeye çalışıyorduk."	"You're telling us what we were supposed to do. We were just trying to figure it out." AsK
1215	"Hani hocanın az da olsa ders anlatması isterdim bir özet geçmesini."	"I would like to have a little lecture, I at least as a summary." FZG
1216	"Sorun olduğu zaman bilgilendiriyordunuz bizi."	"You were informing us when there was a problem." İB
1217	"Orada yapılacak bir şey yoktu zaten. Biz kendimiz değerlendiriyorduk."	"There wasn't anything to do there. We were evaluating ourselves." PY
1218	"Tüm grup üyelerinin kafası karıştığında size soru sormak…"	"Asking questions when all group members are confused…"YU
1219	"Hocam aktif olmayanları uyarırsanız çok mutlu oluruz"	"We would be very happy if you warned passive members." MD
1220	"Etkinlikten sonra, hocanın üstten böyle bir özet geçmesini beklerdim mesela."	"After the event, I would expect the teacher to have such a summary." ZÇ
1221	"Çocuklar şurada hata yaptınız buna dikkat edin bu böyle olacak denebilir. Yapılan hatalar üzerinden konuşabilir."	"Teacher can say "Kids, you've made a mistake there, so be careful". We can talk about mistakes." BA
1222	"Hocanın dersin en sonunda cevapları vermesi…"	"Teacher can give the answers at the end." HŞ
1223	"Mesela şu konuyu çalışın gelin demesi, konuyu hatırlatması benim için faydalıydı."	"For example, it was helpful for me when the teacher said" study on this topic or remind the subject." ZA

Code#	Original Statements	Translations
1224	"Öğretmen, bir hafta öncesinden ya da birkaç gün öncesinden etkinlik olacağını hatırlatmalı. Etkinliğin öneminden bahsedebilir kısaca. Almamız gereken rolleri, yapılması gerekenleri yapabilir."	"The teacher should remind that there would be an activity before a week or a few days before. S/he can talk about the importance of the event, the roles we have to take, what needs to be done." SU
1225	"Bir ön bilgilendirme konuyla ilgili ders içeriğiyle ilgili grupla ilgili değil de olabilir."	"A preliminary information, not related to the group work, but related to content, subject would be shared." BS
1226	"Tartışma başladığı zaman önce hocanın bir müdahalesinin olmaması gerekiyor ki müdahalesi de olmuyordu zaten."	"When the discussion began, the teacher should not have an intervention, as s/he has already do not so." BS
1227	"Hocanın sadece ben izleyen rolünde olmasını isterim, zaten o şekilde oldu. O şekilde de kalmasını tercih ederim."	"I just want the teacher to be as observer as s/he did so. I'd rather stay it that way too." AS
1228	"Hoca yönlendirici …	"Teacher as guide." Tİ
1229	"Yani bir problem olduğunda o problemin çözülmesine yardımcı olmalıdır."	"So, when there is a problem, s/he should help solve it." MK
1230	"Yanlış söylediğimizde biraz daha düşünün şu şekilde de olabilir diyebilir."	"When we say something wrong, s/he can encourage us to think of it a little more or show us a different point." HE
1231	"Grup etkinliğinden sonra yaptığımız yanlışlarla ilgili fazla açıklama yapabilirdi."	"After the group activity, s/he could explain more about our mistakes." FK
1232	"Belki tekrardan o konular üzerinden bir ders işlenebilir."	"After the activity, we could repeat the lesson focusing on mistakes. S/he could give more explanation." AS
1233	"Sonrasında geri dönüt olarak değerlendirme olması bence gayet iyiydi."	"I think it was good to have feedback as evaluation phase." RK

N. Exemplary Collaboration Utterances

Code	Original
Orientation-Planning of Collaboration	• "Değerlendirme sorumlusuna seni yazıyorum Bxxx?" • "Arkadaşlar rolleri dağıtalım. kim ne olmak ister."
Orientation-Planning of Comprehension	• "Soruları anladık mı arkadaşlar:) fikir belirtelim"
Monitoring of Collaboration	• "Değerlendirme kısmı kaldı." • "Süre azaldı."
Monitoring of Comprehension	• "Bu üçü terimin anlamını yazalım yeterli birinci soruda" • "pardon pardon ikiden fazla ise anovaydı." • "değiştirelim…(*cevabı*)"
Evaluation-Reflection of Collaboration	• "Güzel etkinlikti"
Evaluation-Reflection of Comprehension	• "Birinci soru tamamen doğru" • "sadece 1 yanlışımız var ondada arada kalmıştık."
Cognitive Presence	• "convolsion : istem dışı kronik şekilde kasların kasılması" • "bağımlı değişken öğrenci motivasyonu bağımsız değişken etkinlik tabanlı grup çalışması" • "negatif bir kolerasyon gibi"
Social Presence	• "hepimizin :) bende teşekkür ederim" • "benim yüzümden üzgünüm:(" • "merhabaa arkadaşlar " • "yupppiiiii"
Teaching Presence	• "ekrana yazmak çok zor oluyor yetkililere sesleniyorum ekrana yazı yazamıyoruz harfler karışıyor :)" • "çalıştık o kadar hocam"

O. Community of Inquiry Questionnaire

Teaching Presence
1. Öğretmen, dersin önemli konularını açıkça belirtmiştir.
2. Öğretmen, dersin önemli hedeflerini açıkça belirtmiştir.
3. Öğretmen, ders etkinliklerine nasıl katılacağımıza ilişkin açık bir yönerge sunmuştur.
4. Öğretmen, öğrenme etkinlikleri için önemli olan tarihleri/takvimi açık olarak belirtmiştir.
5. Öğretmen, öğrenmeme yardım eden ders konularına ilişkin fikir birliği ve fikir ayrılığı olan noktaları belirterek öğrenmeme yardım etmiştir.
6. Öğretmenin ders konularının anlaşılmasındaki rehberliği, görüşlerimin netleşmesinde yardımcı oldu.
7. Öğretmen derse katılan öğrencilerin derse katılımına ve üretken bir iletişim sürecini devam ettirmelerine yardımcı oldu.
8. Öğretmenin sınıfın dersle ilgili çalışmalara odaklanmasını sağlaması öğrenmeme yardımcı oldu.
9. Öğretmen, derse katılan öğrencileri dersle ilgili yeni kavramları/fikirleri keşfetmeleri için cesaretlendirmiştir.
10. Öğretmen, derse katılan öğrenciler arasındaki "biz" hissinin gelişmesini güçlendirmiştir.
11. Öğretmen, dersle ilgili konuları tartışmaya odaklanmamızda yardımcı olmuştur.
12. Öğretmen, dersin hedeflerine ilişkin güçlü ve zayıf yanlarımı anlamamda yardımcı olarak bana geri bildirimler vermiştir.
13. Ders öğretmeni zamanlaması iyi geribildirimler vermiştir.
Social Presence
14. Dersin diğer katılımcılarının olduğunu bilmek, kendimi bu derse ait hissetmemi sağlamıştır.
15. Derse katılan bazı öğrencilerle ilgili belirgin izlenimler edindim.
16. Çevrim içi ya da web-temelli iletişim, sosyal etkileşim için mükemmel bir ortamdır.
17. Çevrim içi ortamlar yoluyla konuşurken kendimi çok rahat hissettim.
18. Ders tartışmalarına katılırken kendimi çok rahat hissettim.
19. Dersin diğer öğrencileri ile etkileşim kurarken kendimi rahat hissettim.
20. Dersin diğer katılımcılarının görüşlerine katılmadığımda bile kendimi rahat hissettim, üstelik bu durumda bile gruba karşı güvenim sürmekteydi.
21. Kendi bakış açımın dersin diğer katılımcıları tarafından kabul edildiğini hissettim.
22. Çevrim içi tartışmalar, başkalarıyla iş birliği yaptığım hissinin gelişmesine yardımcı oldu.
Cognitive Presence
23. Ortaya atılan soru/sorunlar ders konularına olan ilgilimi arttırdı.
24. Ders etkinlikleri beni meraklandırdı.
25. Dersle ilgili soruların yanıtlarını bulmak için kendimi güdülenmiş hissettim.
26. Bu dersle ilgili soru/sorunları çözmek için çeşitli bilgi kaynaklarını kullandım.
27. Beyin fırtınası yapmak ve ilgili bilgileri bulmaya çalışmak içerikle ilgili soruları yanıtlamamda yardımcı oldu.
28. Çevrim içi tartışmalar, farklı görüşleri anlamama yardım ederek değerli bir katkı sağladı.
29. Karşılaştığım yeni bilgi/fikirler ders etkinliklerindeki soruları yanıtlamamda bana yardım etti.
30. Öğrenme etkinlikleri, açıklamalar ve çözümler oluşturmamda bana yardım etti.
31. Ders kapsamındaki tartışmalar ve ders içeriğine ilişkin düşüncelerim bu dersteki temel fikirleri anlamama yardım etti.
32. Bu derste oluşturulan bilgileri uygulamak ve sınamak (test etmek) için çeşitli yollar tanımlayabilirim.
33. Derste ele alınan sorunlara, gerçek yaşamda uygulayabileceğim çözümler geliştirdim.
34. Bu derste oluşturulan bilgileri, ilerde işimde ya da dersle ilgili olmayan diğer etkinliklerde kullanabilirim.

P. Online Learning Readiness Scale

Computer/Internet Self-Efficacy
1. Microsoft Office Programlarının temel işlevlerini (Word, Excel ve PowerPoint) kullanmada kendime güvenirim.
2. Çevrim içi öğrenme yazılımlarını (Uzaktan Eğitim Yönetim Sistemi) nasıl kullanacağım konusunda sahip olduğum bilgime ve becerime güvenirim.
3. Çevrim içi öğrenmede bilgiye ulaşma sürecinde interneti kullanma konusunda kendime güvenirim.
Self-Directed Learning
4. Kendi çalışma planımı uygularım.
5. Öğrenme problemleri ile karşılaştığımda destek (yardım) ararım.
6. Zamanı iyi yönetirim.
7. Kendi öğrenme hedeflerimi belirlerim.
8. Öğrenme performansım konusunda daha yüksek beklentilerim vardır.
Learner Control
9. Çevrim içi ortamda kendi öğrenme sürecimi yönlendirebilirim.
10. Çevrim içi öğrenirken diğer çevrim içi faaliyetlerden (anlık mesajlaşma, internette dolaşma) dolayı dikkatim dağılmaz.
11. İhtiyaçlarıma göre çevrim içi öğretim materyallerini tekrar ederim.
Motivation for Learning
12. Çevrim içi ortamda yeni fikirlere açığım.
13. Çevrim içi ortamda öğrenmeye yönelik motivasyonum vardır.
14. Çevrim içi ortamda hatalarımdan ders alırım.
15. Çevrim içi ortamda düşüncelerimi diğerleri ile paylaşmayı severim.
Online Communication Self-Efficacy
16. Diğerleri ile etkili iletişim kurmak için çevrim içi araçları (e-mail, tartışma ortamları) kullanma konusunda kendime güvenirim.
17. Yazılı iletişimde kendimi ifade etmede (duygular ve espri) kendime güvenirim.
18. Çevrim içi tartışma ortamlarında soru yöneltmekte kendime güvenirim.

Q. Case I Interviewee Information

	Interviewee	*Group*	*Gender*	*Age*	*Job Experience (year)*	*Participation (N/13)*	*CISE*	*SDL*	*LC*	*MFL*	*OCSE*	*OR*
1.	AyK	A	F	23	0	11	5.00	5.00	4.33	4.00	3.33	4.39
2.	BSG	B	F	33	10 (Medical secretary)	11	5.00	4.80	5.00	5.00	5.00	4.94
3.	ZÇ	B	F	20	0	13	5.00	4.20	4.33	4.25	3.67	4.28
4.	BA	A	F	22	0	10	3.67	4.20	3.00	3.50	3.33	3.61
5.	ÇÇ	B	F	X	X	10	X	X	X	X	X	X
6.	İÇ	A	F	30	0	3	4.00	4.00	4.00	4.00	4.00	4.00
7.	PY	B	F	36	15 (Medical secretary)	8	4.33	5.00	4.67	4.75	4.67	4.72
8.	AsK	A	F	20	0	9	4.33	3.60	4.00	3.75	3.67	3.83
9.	İB	B	F	20	0	11	3.67	3.80	3.33	3.75	4.50	3.76
10.	ZA	A	F	19	0	12	3.33	3.80	3.33	3.50	3.33	3.50
11.	FZG	A	F	20	0	12	5.00	5.00	5.00	5.00	5.00	5.00
12.	HŞ	B	F	31	3 (Accountancy)	4	4.00	3.60	3.33	3.75	3.50	3.65
13.	EÇ	A	F	18	0	13	3.33	4.00	4.00	3.50	4.00	3.78
14.	MD	A	F	19	0	8	4.33	4.20	3.67	4.00	4.00	4.06
15.	YU	B	F	32	10 (Secretary)	4	5.00	4.60	4.00	5.00	4.50	4.65

CISE: *Computer/Internet Self Efficacy* ***SDL:*** *Self-Directed Learning* ***LC:*** *Learner Control* ***MFL:*** *Motivation for Learning* ***OCSE****: Online Communication Self-Efficacy* ***OR:*** *Online Readiness*

R. Case II Interviewee Information

Interviewee	*Group*	*Gender*	*Age*	*Job Experience (year)*	*Participation (N/13)*	*CISE*	*SDL*	*LC*	*MFL*	*OCSE*	*OR*
BS	CEIT	M	25	5 *(Teacher)*	9	3.00	3.00	3.33	4.25	4.67	3.61
SU	CEIT	M	X	X	11	X	X	X	X	X	X
Aİ	CEIT	M	37	7 *(Social service expert)*	10	4.00	4.20	3.67	4.00	4.00	4.00
RK	CEIT	M	33	12 *(Official)*	12	5.00	5.00	3.00	4.00	5.00	4.44
AS	CEIT	F	37	10 *(Teacher)*	9	4.33	4.40	4.00	4.75	4.33	4.39
MK	CEIT	M	26	2 *(Teacher)*	12	5.00	5.00	4.67	5.00	5.00	4.94
EA	CEIT	M	29	0	4	5.00	4.00	3.67	4.25	4.33	4.22
HE	CEIT	M	25	4 *(Teacher)*	12	5.00	4.60	5.00	5.00	4.33	4.78
MVO	FT	F	35	7 *(Teacher*	12	4.00	4.20	3.67	4.00	4.00	4.00
EK	FT	F	27	4 *(Teacher)*	12	4.00	3.80	4.00	4.00	4.00	3.94
FK	FT	M	27	2 *(Teacher)*	12	4.33	4.00	4.00	5.00	4.00	4.28
Tİ	FT	F	24	3 *(Teacher)*	9	4.67	4.60	4.33	5.00	5.00	4.72
SAE	FT	F	35	13 *(Teacher)*	12	4.33	4.00	4.33	4.25	4.00	4.17

CISE: *Computer/Internet Self Efficacy* ***SDL:*** *Self-Directed Learning* ***LC:*** *Learner Control* ***MFL:*** *Motivation for Learning* ***OCSE****:Online Communication Self-Efficacy* ***OR:*** *Online Readiness*

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PUBLICATIONS

Articles, Book Chapters & Thesis

1. **Atas, A. H.,** & Çelik, B. (2019). Smartphone Use of University Students: Patterns, Purposes, and Situations. *Malaysian Online Journal of Educational Technology*, 7(2), 59–70. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&AuthType=ip&db=eric&AN=EJ1214011&site=eds-live.

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Projects

Applied Entrepreneurship and Informatics Training for Youth
Date: Sept., 2018 – July, 2019
Funded by Erasmus+ Youth Key Action-3 Support for Policy Reform
Role: Researcher

Online Training for Psychological Counselors for Disaster Psychological Support
Date: Jan., .2016 – Oct., 2018
Funded by TUBITAK ARDEB, SOBAG - Sosyal ve Beşeri Bilimler Araştırma Destek Grubu, 115K451,1001
Role: Researcher

Teaching Theory Development Study: Question-Answer Based Teaching Theory
Date: Jan., – Dec., 2017
Funded by METU BAP-05-05-2017-003.
Role: Researcher

Earthquake Awareness Simulator
Date: Feb 2017 – Oct 2017
Funded by TÜBİTAK 1511-BİLİM MERKEZLERİ-2014-BM-01 AGY111-02 1150200
Role: Instructional Technologist

Hezarfen Delta Wing Simulator
Date: Jan 2017 – Oct 2017

Funded by TÜBİTAK 1511-BİLİM MERKEZLERİ-2014-BM-01
AGY111-02 1150199
Role: Instructional Technologist

Development of Mobile Supported Continuous Learning Applications and Evaluation of Efficiency in the Framework of Cognitive Load Theory
Date: Jan 2012 – Dec 2013
Funded by METU BAP-05-05-2012-001.
Role: Researcher

Licenses & Certifications

Logical and Verbal Reasoning Training
METU CEC
Issued Mar 2018
Credential ID ODT.K180013.1144

Robotics Trainer Training
METU CEC
Issued Oct 2017
Credential ID ODT.K170035.2174

Introduction to Editorship
METU CEC
Issued Oct 2016
Credential ID ODT.K160039.1291

Learning to Learn with Mind Mapping Technique
METU CEC
Issued Jul 2015
Credential ID ODT.K150017.648

Cisco Certified Network Associate -CCNA-Training
METU CEC
Issued Oct 2012
Credential ID ODT.K130020.186

Java Programming Training
METU CEC
Issued Feb 2012
Credential ID ODT.K120003.192

Other Activities

Erasmus+ Staff Training Week on Digital Internalizations- Strategies for International Offices, International E-learning formats, and new approaches for administration: examples and best practice, Dec. 2- 5, 2019, University of Konstanz, Germany

European Educational Research Summer School (EERSS 2019):
Quantitative and Mixed Methods Research Designs: From designing to publishing, July, 8-12, 2019, Masaryk University in Brno, the Czech Republic.

European Educational Research Summer School (EERSS 2016):
Methods and Methodology in Educational Research, 11-16 June, 2016, Johannes Kepler University in Linz, Austria.

Erasmus Intensive Program for Pervasive Networks and Service Infrastructures (PERSEUS), July, 13-26, 2013, Greece.