THE EFFECT OF SCRATCH ON CHILDREN'S ENGLISH LANGUAGE AND COGNITIVE DEVELOPMENT

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ABSTRACT

THE EFFECT OF SCRATCH ON CHILDREN'S ENGLISH LANGUAGE AND COGNITIVE DEVELOPMENT

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This study integrated Scratch into language teaching for children, investigated the effects on language and cognitive skills, and explored the benefits and challenges from the students' and teachers' viewpoints. The study consisted of two sub-studies. Study A was designed as an intervention study in which ten students and one teacher participated. We collected quantitative data through the exit test of the coursebook, OYLPT, MAIN, Wisconsin CST, and Design Scenarios. Based on the results, Scratch had a significant effect on children's listening and computational thinking skills, yet not on academic achievement, language use, narrative skills. However, the experimental group showed a clear trend by outperforming the control group in nine out of 13 components. We believe that this finding might be significant with more participants. For the executive function skill, no trend or a significant result was found. In Study B, we collected qualitative data via journals and evaluation forms from 56 students and five teachers. We found that the students had a positive attitude towards Scratch. They believed the lessons with Scratch were fun, they enjoyed creating projects and pair-work. The challenges were mostly about the disagreements between

the pairs and not enjoying the roles in the pair work. On the other hand, the teachers found Scratch beneficial for improving language skills, motivation, and collaboration. Regarding the challenges, their opinions were mostly related to the students and consistent with the students' answers. Overall, the benefits of Scratch outnumbered the challenges. Finally, the findings indicated some suggestions for the teachers.

Keywords: Technology in English language teaching for young learners, coding with Scratch, effect of coding on language and cognitive development, benefits and challenges of using Scratch in ELT

ÖZ

SCRATCH'İN ÇOCUKLARIN İNGİLİZCE VE BİLİŞSEL BECERİLERİ ÜZERİNE ETKİSİ

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Bu çalışma, çocukların dil öğretiminde Scratch kullanmanın dil ve bilişsel beceriler üzerindeki etkilerini ve öğrenciler ile öğretmenler açısından yararları ve zorluklarını incelemiştir. Araştırma nitel ve nicel olmak üzere iki çalışmadan oluşmuştur. Nicel çalışma (A Çalışması) deneysel araştırma olarak tasarlanmış ve bu çalışmaya on öğrenci ve bir öğretmen katılmıştır. Ön ve son test tasarımı uygulanan bu çalışmada ders kitabının bitirme sınavı, Oxford Yerleştirme Testi, Çokdilli Anlatı için Değerlendirme Aracı, Wisconsin Kart Sıralama Testi, ve Scratch Dizayn Senaryoları aracılığıyla nicel veri toplanmıştır. Bulgular, Scratch aktivitelerinin çocukların dinleme ve bilgi işlemsel düşünme becerileri üzerinde önemli bir etkiye sahip olduğunu gösterirken, akademik başarı, dil kullanımı, anlatı becerileri üzerinde bir etki bulamamıştır. Ancak, deney grubu öğrencileri 13 test ögesinin dokuzunda daha iyi performans göstererek bu becerilerin son testlerinde yükselme eğilimi göstermiştir. Sonuçlar yürütücü işlev becerileri için hiçbir önemli etkiye işaret etmemiştir. Nitel çalışmada (B Çalışması) ise beş öğretmen ve 61 öğrenciden günlükler ve değerlendirme formları kullanılarak nitel veri toplanmıştır. Araştırmanın sonuçları

öğrencilerin Scratch'e karşı olumlu bir tutum sergilediklerini, Scratch ile derslerin eğlenceli olduğuna inandıklarını, Scratch ile proje oluşturmayı ve ikili çalışmayı sevdiklerini göstermiştir. Bu deneyimin zorlayıcı kısımlarının çoğunlukla öğrenciler arasında zaman zaman gerçekleşen anlaşmazlıklar ve ikili çalışmadaki rollerinden zevk almamalarıyla ilgili olduğu görülmüştür. Bir diğer yandan, öğretmenlerin Scratch'i öğrencilerin yabancı dil, motivasyon ve işbirliği becerilerini geliştirmek için yararlı buldukları açığa çıkmıştır. Öğretmenlerin paylaştığı zorlukların çoğunlukla öğrencilerle ilgili ve onların cevaplarıyla tutarlı olduğu görülmüştür. Genel olarak, Scratch'i dil öğretimine entegre etmenin faydalarının zorluklardan üstün geldiği gözlemlenmiştir. Son olarak, bu çalışma öğretmenler için bazı önerilere işaret etmiştir.

Anahtar Kelimeler: Çocuklar için İngilizce öğretiminde teknoloji, Scratch ile kodlama, kodlamanın dil ve bilişsel gelişim üzerindeki etkisi, İngilizce öğretiminde Scratch kullanmanın faydaları ve zorlukları

To my dearest family

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CHAPTER 1

INTRODUCTION

This chapter presents the background of the study, statement of the problem, research questions, and significance of the study respectively.

1.1 Background of the Study

English is the dominant language of international business and communication, the official language of over 60 countries, and the third most common native language in the world (as cited in Baker et al., 2015; Crystal, 2003). As it is also known, the number of non-native speakers has doubled the number of native speakers. All this information brings out the need for learning English and continuous development in the field of English Language Teaching (ELT).

Language teaching has always been affected by the changes and improvements happening in the world. One of the major areas that have a considerable influence on the field throughout the years is technology. Language teachers have always looked for ways to improve their teaching and their learners' performance by using different methods and techniques. As Martins (2015) stated, the emergence of the concept of CALL (Computer Assisted Language Learning) is a remarkable example of the language teachers' and researchers' growing interest and effort. CALL can be defined as the use of computer and computer-based resources in language teaching and learning. Warschauer and Healey (1998) divide the development of CALL into three historical phases:

1) Behaviorist/Structural CALL (the 1960s-70s)
2) Communicative CALL (the 1970s-90s)
3) Integrative CALL (from the 1990s onwards)

The first phase is referred to as Behaviorist/Structural CALL. The two pedagogical approaches adopted by language teachers here were grammar-translation and audio-visual approach. Through the use of the mainframe computers, the language teachers aimed to help students gain accuracy in their language use and grammar by heavily relying on drill and practice. The computers were seen as mechanical tutors that allowed students to work at an individual pace and never became tired of repeating the same thing over and over again.

The second phase is referred to as Communicative CALL. During this phase, language teachers adopted the communicative approach, and the emphasis was on the effective use of language. By making use of the PCs, the aim was to encourage students to generate original ideas and produce the language through role-play, simulation, and textual reconstructions. Although student involvement increased, the computers remained the main source of knowledge (Hidayati, 2016).

In the next phase, Integrative CALL, teachers adopted the content-based learning approach and used multimedia and web-based applications. The use of authentic social contexts and exercises combining the four skills (listening, reading, writing, speaking) were promoted to train students to search and use the information to perform tasks in various ways (Hidayati, 2016). During this phase, the emphasis was on teaching students to learn how to use various technological tools in their language learning process (Warschauer and Healey, 1998). Table 1 from Martin's (2015) study outlines all three phases.

Table 1: Different Stages of CALL by Warschauer and Healey (1998)

Stage	Technology	Pedagogical Approach	Computer Use	Teacher Role
Behaviourist Structural	Mainframe	Grammar translation Audio-visual	Translation exercises Drill-and-practice	Only source of information Instructor
Communicative	Personal computer	Communicative	Role-plays Textual reconstruction Simulations	Activator Facilitator
Integrative	Multimedia Web-based applications	Content-based learning	Authentic social contexts Exercises combining reading, writing, listening, speaking	Supervisor Mentor

Even though Warschauer and Healey (1998) did not propose a fourth phase, they predicted that the next stage would be the phase of Intelligent CALL. According to them, this phase would aim to prepare students to be beneficial to the new global and networked society; hence, there would be a greater emphasis on the incorporation of Intelligent CALL into the classroom. Warschauer & Healey (1998) estimated this to be true especially for English language classrooms since it would likely to remain the lingua franca of the new global society.

Nowadays, this prediction has turned out to be true. Bellanca and Brandt (2010) stated that only those who could adapt to a constant change and reinvent themselves for new situations would be successful in today's world. When considering this matter for the field of education, this development requires schools to prepare students for their unpredictable future. Stevens and Verschoor (2017) describe this unpredictability as follow, "In an era where schools realize they are training students to excel in jobs that have not been invented yet, employers are looking for students who can learn on the job, and who have a skill set that includes the three C's: creativity, communication, and collaboration" (p.4). In order to elaborate on these skills that are essential for the next generations, the concept of *21st Century Skills* has been proposed. Defined as the demands of the new economy, these skills include abilities like innovation, creativity, critical thinking, computational thinking, and problem-solving (Casner-Lotto & Barrington, 2006; Lichtenberg, Woock, & Wright, 2008).

Trilling and Fadel (2009) states that the leading education organizations, the business community, policymakers, reality checks with parents, frontline K-12 and postsecondary educators, and community organizations have contributed to the constitution of this extensive and purposeful framework for the 21st century. The framework is shown below.

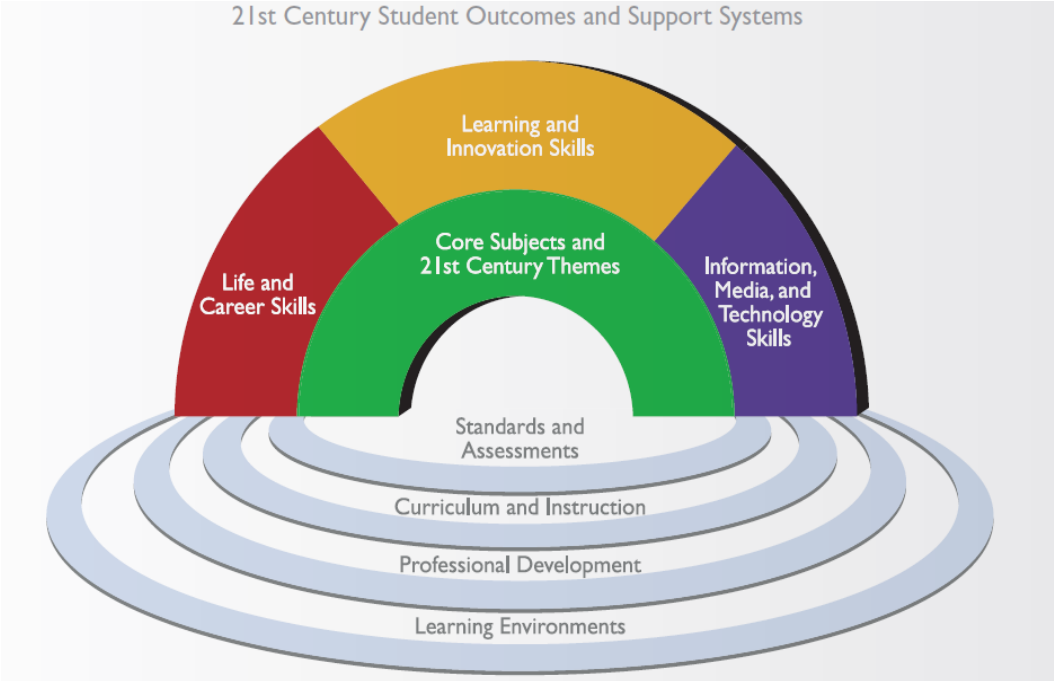

Figure 1: The 21st Century Skills Framework

According to this framework, mastery of core subjects and 21st century skills is essential. Core subjects are listed as English, reading or language arts, world languages, arts, mathematics, economics, science, geography, history, government and civics. The 21st century interdisciplinary themes are suggested to be integrated into core subjects. These themes are as follows: global awareness, financial, economic, business and entrepreneurial literacy, civic literacy, health literacy and environmental literacy.

It is also important to equip students with skills for life, career, learning, innovation, information, media, and technology. Life and career skills are necessary to navigate the complex work and life environments as they require far more than thinking skills

and content knowledge. These skills include flexibility, adaptability, initiative, self-direction, social and cross-cultural skills, productivity, accountability, leadership, and responsibility.

Information, media, and technology skills are defined as the ability to collaborate and make individual contributions and exhibit a range of functional and critical thinking skills (The Partnership for 21st Century Skills, 2009). They included information literacy, media literacy, ICT (Information, Communications and Technology) literacy.

Lastly, learning and innovation skills are listed as creativity, innovation, critical thinking, problem solving, communication, and collaboration.
Table 2 below summarizes these skills.

Table 2: The 21st Century Student Outcomes

Learning and Innovation Skills	**Life and Career Skills**	**Information, Media and Technology Skills**
Creativity and innovation	Flexibility and adaptability	Information literacy
Critical thinking and problem solving	Initiative and self-direction	Media literacy
Communication	Social and cross-cultural skills	ICT (Information, Communications and Technology) literacy
Collaboration	Productivity and accountability Leadership and responsibility	

If a school or a district builds on this foundation with the necessary support systems, assessments, curriculum and instruction, professional development and learning environments, it is possible to create an opportunity for students to be more engaged in the learning process and be successful in work and life. (The Partnership for 21st Century Skills, 2009).

For the present study, the emphasis will be on learning and innovation skills. A brief description of these skills provided by The Partnership for 21st Century Skills (2009) are presented below.

Creativity is defined as the use of a wide range of idea creating techniques such as brainstorming to generate new and useful ideas, and the ability to elaborate, refine, analyze and evaluate these ideas.

Critical Thinking is the ability to analyze and evaluate major alternative points of view, synthesize and make connections between information and arguments, interpret them and come up with conclusions.

Problem Solving is being able to reflect critically upon learning experiences, solve different kinds of unfamiliar problems in various ways. Also, identifying, and asking significant questions that clarify various points of view and lead to better solutions.

Communication is defined as the ability to articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts for a range of purposes such as to inform, instruct, motivate, persuade, etc. Also, it includes the ability to listen effectively to comprehend the meaning.

Collaboration is the ability to work effectively and respectfully with other people by showing flexibility and willingness to be helpful to reach a common goal. Besides, it is the ability to value the individual contributions made by each team member.

Another skill that Papavlasopoulou et al. (2018) consider to be important is computational thinking. Jeanette Wing (2011) defines computational thinking as "the thought processes involved in formulating problems and their solutions so that the solutions are represented in a form that can be effectively carried out by an information-processing agent" (p.1). The core concepts and skills of the computational thinking process have been defined variously in the literature.

As shown in Table 3 below, Altıok and Yükseltürk (2018) put them together in their study.

Table 3: Core Concepts and Skills of Computational Thinking

Expert	Number of Core Concepts	Core Concepts and Skills of Computational Thinking
Barr & Stephenson, 2011	6	Abstraction, algorithms and procedures, automation, problem decomposition, parallelization, simulation
Lee et al., 2011	3	Abstraction, automation, analysis
Selby & Woollard, 2013	5	Abstraction, algorithms or algorithmic thinking, decomposition, evaluation, generalization
Angeli et al., 2016	5	Abstraction, algorithms or algorithmic thinking, decomposition, debugging, generalization
Wing, 2006; 2008; 2011	5	Abstraction, algorithm, automation, decomposition, generalization

For this research study, the computational practices by Brennan et al. (2014) will be followed. Table 4 presents the concepts with their definitions.

Table 4: Core Concepts and Skills of Computational Thinking

Concept	Definition
Experimenting and iterating	Developing a little bit, then trying it out, then developing some more
Testing and debugging	Making sure things work- and finding and solving problems when they arise
Reusing and remixing	Making something by building on existing projects or ideas
Abstracting and modularizing	Exploring connections between the whole and the parts

In recent years, educators have been seeking out ways to develop 21st century skills in students in an effective way. One possible way to achieve this is through *coding* (Şimşek, 2018). Altıok and Yükseltürk (2018) states that coding is the most functional way to support the cognitive tasks involved in computational thinking and develop higher order thinking skills along with algorithmic problem-solving skills (Grover & Pea, 2013; Özden & Tezer, 2018; Weintrop et al., 2016). In addition to enhance students' 21st century skills, coding brings a new perspective on technology. Stevens and Verschoor (2017) states that learning to code encourages students to become creators of the technology that they use, not just consumers. In a significant number of countries, changes have been made to integrate coding as part of the curriculum. These countries include Bulgaria, South Cyprus, the Czech Republic, Denmark, Estonia, Greece, Ireland, Italy, Litvania, Poland, Portugal, and England (Özden & Tezer, 2018). On the other hand, some countries are still at the planning stage such as Spain, Belgium, Finland, France, Luxemburg, Holland, and Turkey.

When considering English and coding, one characteristic seems common: they are both languages. According to Harris (2018), there are two main things natural languages and programming languages have in common. Firstly, they both possess the main function of communication. In addition to this, programming languages also involve syntax and semantics like natural languages. Each programming language is written with a certain definition or purpose (semantics) in mind while following certain rules (syntax). Therefore, there might be a way to integrate them to develop students' 21st century skills while teaching them a foreign language. However, it is not possible to achieve this in a traditional classroom where teachers "teach", and students "learn" only by passively listening. In order to create an ideal learning environment, the constructionist theory of learning by Papert (1980) is taken as a baseline in this study. This learning theory builds on the constructivist theory of Piaget (1977). Papert (1991) defines constructionism as follows:

> Constructionism—the N word as opposed to the V word— shares constructivism's view of learning as "building knowledge structures" through progressive internalization of actions… It then adds the idea that this happens especially felicitously in a context where the learner is consciously engaged in constructing a public entity, whether it's a sandcastle on the beach or a theory of the universe. (p.1)

The constructionist theory fits well with the purposes of this research study since the design features inherent in this approach would automatically enhance 21st century skills. According to Papert (1980), the most successful learning takes place by active construction of knowledge, especially if they are socially and personally meaningful to the learners. What is more, it is also important that knowledge is formed through social interaction and they help thinking about one's own thinking. Based on Papert's constructionist theory, Brennan (2013) proposes four key design features to be considered while planning learning environments: (i) designing, (ii) personalizing, (iii) sharing, and (iv) reflecting.

Firstly, designing activities promote students iterative thinking, problem-solving, and critical creativity, and therefore function as the foundation of learning. This way, students have the opportunity to take an active role in their learning process rather than just listening to what is said.

Next, personalizing is important to provide students with opportunities to engage in personally meaningful activities so that they can form personal connections with what they are learning. On the other hand, sharing supports the student's interaction with others and contributes to the social nature of learning. As Bruckman (2006) noted, students' capacities for creative work are promoted greatly if the students have access to the others for support.

Finally, Brennan (2013) states that when students take part in the activities of designing, personalizing, and sharing, they start thinking about the way they do things and the way they think about things. This is referred to as reflecting, and it allows students to engage in metacognitive processes.

The integration of coding into English language teaching might be an important step in this new era in order to promote 21st century skills, especially if the process starts from an early age. One promising tool for language teachers who wish to implement this in their language classrooms is Scratch (Stevens & Verschoor, 2017). Scratch is a visual programming tool developed by MIT Media Lab for children of 8-16 ages. It is based on the ideas of the constructivist learning and Logo project (Papert, 1980).

In addition to the development of the above-mentioned 21st century skills, we believe that Scratch might be useful to improve students' language skills as they create projects in pairs about different topics by using different language targets that they covered in the classroom. To exemplify, by using the "say…" or "speak…" block, they can practice spelling and writing skills. Also, they can develop their pronunciation and speaking skills with the use of the recording tool. Most importantly, Scratch may create an opportunity for the development of all these skills in a personally and socially meaningful way for children. Based on these, the current study aims to integrate Scratch into teaching English to children and explore the outcomes in terms of children's language and cognitive development.

1.2 Statement of the Problem

Scratch seems to be a useful tool to develop students' 21st century skills such as information and communication technology, problem-solving, creative thinking and collaboration. Considering the importance of English and these skills to prepare students for their future, this study aims to integrate Scratch coding into teaching English for young learners, investigate how integrating Scratch influences children's language and cognitive abilities and explore the benefits and challenges of the process from the viewpoint of teachers and students.

1.3 Research Questions

The following research questions were formulated to investigate in this study:

1. Does integrating Scratch into the production stage of language instruction increase student achievement with respect to the students':
   a. scores in the exit test of the coursebook?
   b. language use skills?
   c. listening skills?
   d. speaking and narrative skills?
   e. executive function skills?
   f. computational thinking skills?

2. What are the benefits and challenges of integrating Scratch into language instruction from the perspective of students and teachers?

1.4 Significance of the Study

There are numerous studies related to the integration of technology into English language teaching. These studies have provided valuable implications for the language teachers and learners. However, few researchers have attempted to integrate coding into foreign language teaching.

One strength of the study is that it examines the issue from various aspects. First, Scratch activities were integrated into language instruction via novel tasks during the course of 13 weeks. A set of language and cognitive skills of ten participants were measured via pre- and post-tests (i.e., before and after the integration of coding skills into the classroom activities).

What is also novel is that this study integrated coding into teaching of all four skills, instead of targeting a specific skill in isolated way. Previous work by Ihmaid (2017) only focused on the vocabulary skill and a preliminary study by Costa et al. (2018) integrated Scratch into all four skills but failed to reach conclusive results since the study was called off.

Finally, there was no systematic studies to date obtaining qualitative data both from the students' and the teachers' perspective comprehensively. This study investigated the benefits and challenges of the process from the viewpoint of five teachers and 56 students through evaluation forms and journals.

1.5 Key Terms

The following terms are frequently used in this thesis:

ELT: English Language Teaching

Coding: To write instructions for a computer

21st Century Skills: A list of competencies that are expected to be equipped by the students to be successful in today's worl

Executive Functions: A necessary skill set to cognitively control our behaviors such as flexibility, working memory, and inhibition

Computational Thinking: A series of techniques to solve a problem including decomposition, pattern recognition, abstraction, and algorithm

CHAPTER 2

LITERATURE REVIEW

This chapter presents the relevant studies from the literature about the use of technology in English language teaching, the coding program Scratch, and the integration of Scratch into language teaching.

2.1 Benefits and Challenges of Using Technology in ELT

The rapid advancement in technology taking place over the last several decades has had strong implications in language teaching. Prior research has shown that technology impacts language curricula, teaching methodology, and learning (Chapelle & Voss, 2016). These impacts resulted in a growing number of research studies in the field.

There are numerous research studies in the literature revealing the benefits of integrating technology into teaching English. Hismanoğlu (2011) states that previous studies showed the integration of technology positively affected students by increasing their enthusiasm, achievement and making them stay longer on the task (Moseley et al., 1999). Yang and Chen (2007) list other benefits as follows: the innovative ways of learning, active learning styles, interactivity, self-control, motivation, and immediate feedback, and the opportunity to gain more diverse and practical knowledge. In addition, Pun (2013) reported developing communicative competence, enhancing knowledge about the target culture, improving teaching efficiency, enhancing interaction among the students and the teacher, creating a conducive teaching environment, and providing opportunity to teach outside of the classroom as the benefits of integrating technology.

On the other hand, some challenges of integrating technology have also been observed by researchers (Standholdz et al., 1996; Johnson, 1998; Lankshear, 2000; Torgerson et al., 2002). Hismanoğlu (2011) listed some of them as follows: the cost of technology, parents' concerns about the amount of technology use, insufficient time allocation due to the pre-arranged syllabus, lack of technical support, and teachers' lack of competence for their few skills on the new technologies. Another study by Solano et al. (2017) reported that integrating technology was time-consuming and it required a big effort to find authentic materials and effective ways of using them. Moreover, O'Donoghue et al. (2014) stated that some students did not have access to technology as one of the challenges.

The rationale for integrating technology into language classrooms at all levels is obviously due to its assisting role despite some of the drawbacks stated above. Kadi (2018) notes that the successful integration of technology can only be achieved if there is a balance between pedagogy and technology. He also adds, without 'scope and sequence,' this might become misleading or maybe a recipe for disaster in some contexts (Lewis, 2015; Chun, Kern & Smith, 2016; Webb, 2014; Motteram, 2013). This balance is essential because meaningful learning happens when students learn with computers, not just about or from computers (Jonassen, 2000). Likewise, Raihan and Lock (2012) stated, "when students learn with computers, technology is viewed as a resource to help them develop, among other things, higher-order thinking, creativity, and research skills" (p.26). In this study, by integrating coding into English language instruction, our only aim is to use Scratch as a tool to teach the language. The ultimate aim can never be to "teach coding" since this is not a language teacher's job.

2.2 Scratch

Scratch is a programming tool which is used to create projects that include media and scripts (Maloney et al., 2010). The program allows users to create images and sounds by using a paint tool and voice recorder or import them from the computer.

The programming is carried out by the colorful command blocks to control sprites (2D graphical objects) on a background called the stage (Maloney et al., 2010). The users can save their projects either to the computer or share them on the website with the other users. The screenshot of example projects from the website is below.

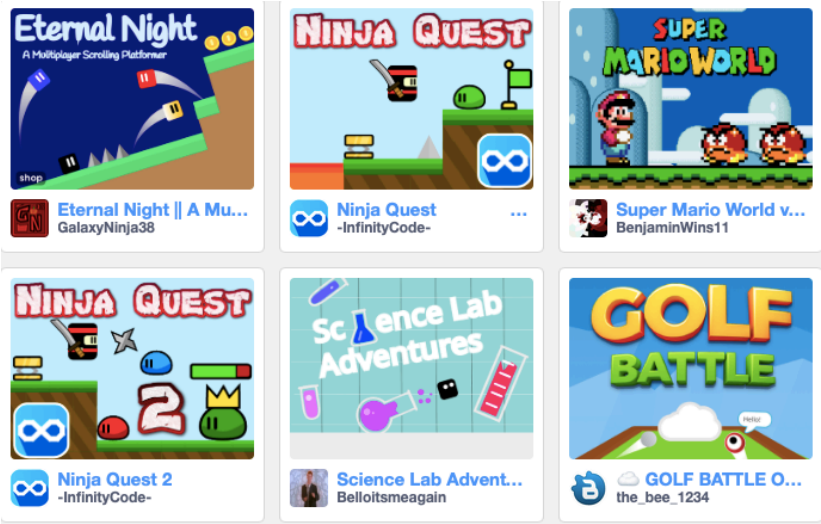

Figure 2: Screenshot of Example Projects from Scratch

Scratch is very easy to use even for people with no coding experience because it was developed initially for children. It just works by dragging and dropping blocks. This visual programming tool facilitates programming and algorithm processes because it allows users to create interactive media projects such as games, stories, animations, and simulations with limited or no coding background (as cited in Altıok & Yukselturk, 2018; 2016).

Scratch seems to be a very appropriate tool to promote students' 21st century skills. Pinto and Escudeiro (2014) explained this issue in their study in detail. In terms of the development of information and communication skills, they stated that through the incorporation of a variety of media, students learn to choose, create, and manage various media types such as texts, pictures, animations, audio recordings. Therefore, they become competent in expressing themselves creatively and persuasively.

Next, they continued by stating how Scratch might help to develop thinking and problem-solving skills. According to Pinto and Escudeiro (2014), the students need to

organize timing and interactions between several "sprites" to create projects. This way, they are provided with direct experience with sensing, feedback and other fundamental concepts of the system. In this meaningful design context, Scratch encourages problem finding and solving, and promotes creative thinking skills.

Lastly, their explanation comprised interpersonal and self-directional skills. They stated that the visual objects and modular code of Scratch promotes collaboration and allows students to work together on projects while exchanging objects and codes. On the other hand, it encourages the discussion of important issues with other users since the projects are shareable.

Scratch has been subject to many studies throughout the literature. In their systematic literature review, Moreno-León and Robles (2016) listed the subjects into which programming with Scratch was integrated other than ICT. These were Mathematics (Ke, 2014; Levis & Shah, 2012; Zavala et al., 2013), Science (Baytak & Land, 2011; Lai & Lai, 2012), Arts (Levis & Shah, 2012), Writing (Burke & Kafai, 2010; Burke, 2012), English as a second language (Moreno-León & Robles, 2015). Overall, the results of these studies pointed out that Scratch enhanced learning outcomes of these subjects and enabled students to develop other skills and capabilities beyond coding skills (Moreno-León & Robles, 2016). They also noted that the participants' age varied from 8 to 18, which was considered to be a big diversity. In addition, their analysis revealed that two of these studies were conducted as outside of school activities (after school and summer camp), while the rest was conducted within the curriculum.

Most of the studies found in literature about Scratch focused on the development of the skills such as creativity, problem-solving, logical, critical, and computational thinking (Kalelioğlu & Gülbahar, 2014; Kobsiripat, 2015; Korkmaz, 2016; Lai & Yang, 2011; Lee, 2011; Oluk & Korkmaz, 2016; Seo & Kim, 2016; Siegle, 2009; Stevens & Verschoor, 2017). Below, findings from these studies are presented in detail.

Seo and Kim (2016) examined the effects of coding education on elementary school students' computational thinking and creativity skills. The coding education program

focused on geometry and lasted for seven days with 28 classes. This was an experimental study with pre- and post-test design. The participants were 44 students from the third, fourth, and fifth grades. Half of them were placed in the control, and the other half were placed in the experimental group. The participants' computational skills were measured by Computational Cognition Tests A and B, which was developed by the researcher. On the other hand, Torrance Tests of Creative Thinking (TTCT) was used to assess their creativity. The results of the analyses revealed that the groups did not perform significantly different from each other in terms of the two skills in the post-tests. Yet, when the results were compared within each group, the experimental group significantly increased their computational thinking performances. No significant improvement was observed for the control group. As for creativity, the within-group analyses showed that the experimental group performed significantly better in the following areas: creativity index, creativity average, fluency, and originality. In comparison, the control group performed significantly better in the areas of originality and resistance to premature closure.

Ceylan's (2020) study explored the effect of the Scratch curriculum, which was developed with Goal-Based Scenario Learning design on participants' computational thinking skills in an IT course. In his quasi-experimental study, an eight-week intervention program was applied to six grade students. Totally, there were 122 participants. Sixty-three of them were in the experimental, 59 of them were in the control group. The data collection tools were Computational Thinking Self-Assessment Rubric, Scratch Project Assessment Rubric, and Academic Success Test. The tests were administered before, after and six weeks after the implementation to check permanency. Based on the results, the experimental group performed significantly better in terms of academic success. However, the results did not indicate a significant difference in average scores of the two groups for computational thinking abilities. There was only a significant difference between the performances of two groups in terms of abstraction subscale.

Another study by Oluk & Korkmaz (2016) examined the effect of Scratch on children's computational thinking skills. They also compared the participants' scores in terms of gender and the amount of computer use. The participants were 31 fifth

grade students. The participants took part in Scratch activities for six weeks. While the results indicated that Scratch significantly improved the children's computational thinking skills, no effect of gender or the amount of computer use was found.

In 2015, Kobsiripat conducted a study to investigate the participants' creativity after the implementation of programming activities with Scratch. The target group was sixty elementary school students. The data was collected through Torrance Tests of Creative Thinking. Similar to the results of Seo and Kim's (2016) study, the participants significantly developed their creativity skills after Scratch integration.

Korkmaz (2016) conducted a quasi-experimental study that sought to address the effect of Scratch and Lego Mindstorm EV3 programming activities on Turkish students' academic achievement in computer programming, problem-solving, and logical-mathematical thinking skills. The study implemented a pre- and post-test design. The participants were 75 university students. There was a total of three groups: students being taught using Scratch, students being taught using Lego Mindstorms EV3, and a control group being taught using traditional C++ editor-based teaching activity. The data was obtained through an academic achievement test consisting of 30 multiple-choice items, and the logical-mathematical intelligence subscale developed by Yeşil and Korkmaz (2010). The results reported that Lego Mindstorms Ev3 activities helped students develop their problem-solving skills more than the Scratch group and the control group. On the other hand, Scratch activities were found to be more effective in terms of developing logical-mathematical thinking among students. In addition, it was found out that Lego was the most effective program that contributed to the students' academic achievements, then Scratch and traditional method, respectively.

In another study, Lai and Yang (2011) questioned the effect of Scratch programming on the participants' problem-solving and logical reasoning skills. Their study adopted a quasi-experimental pre- and post-test design. The participants were 130 six grade students (69 male, 69 female). Ninety-six of them were in the experimental, and 34 of them were in the control group. They took part in the Scratch programming course for over one semester. The data was gathered through logical reasoning test SPM

(Standard Progressive Matrices) and Problem Solving Inventory. The results of the study revealed no significant effect of Scratch on logical reasoning skills. However, it was found out that the participants in the experimental group showed significantly higher problem-solving skills on the subscale of reason of prediction, and total measurement in the post-test phase.

Kalelioğlu and Gülbahar (2014) conducted a study to examine the effect of Scratch on problem-solving skills of fifth-grade students and their opinions about programming. Totally, 49 participants took part in the study. Twenty- two of these were female, and 27 were male. Both quantitative and qualitative data was collected for five weeks. The quantitative data was collected through the Problem Solving Inventory, while the qualitative data was obtained by observations and focus group interviews. Based on the results, no significant difference in the problem-solving abilities of the participants was found. Only a non-significant increase was observed in the participants' self-confidence in their problem-solving ability. The qualitative analyses showed that most of the participants found Scratch easy to use, and all of them enjoyed programming and wanted to improve their skills. The students stated their favorite parts of the program as follows: giving a command to a character, creating a game, adding a variable to a program, sharing their projects, and creating their own world. On the contrary, their least favorite parts were being unable to apply a special effect to a character, the way of deleting blocks, the complexity of long blocks, not being able to find the desired commands, limited characters and backgrounds (Kalelioğlu & Gülbahar, 2014).

2.3 Scratch and Language Teaching

In the literature, there have been very few studies that attempted to integrate Scratch and language teaching. One of these studies was by Papatga and Ersoy (2016). In their study, they questioned the effectiveness of Scratch in developing reading comprehension skills of fourth graders in Turkish, which was their native language. The study was designed as a quasi-experimental study. There was one group consisting of eight students. It was carried out within a 15-week process at an elementary school. The researchers used various data collection tools. To collect quantitative data, the

Informal Reading Inventory, readability assessment rubric, participant selection form, and identification forms were used. As for the qualitative data, the tools were observation notes, a researcher diary, video recordings, teacher and student observation notes, and the students' Scratch projects. The results of the quantitative data showed that Scratch was effective in improving the reading comprehension skills of all participants. The qualitative data was also supportive of this finding.

Another study belongs to Ihmaid (2017). In his study, the focus was on the integration of Scratch into the English language teaching process. The aim was to investigate the effectiveness of integrating Scratch in developing sixth-graders' English vocabulary, its retention, and self-efficacy. The participants were 44 EFL male students. Twenty-two of them were in the experimental group, and 22 of them were in the control group. The vocabulary was taught in a traditional manner to the control group, while Scratch was used with the experimental group. The data collection tools were an achievement test of four questions and a self-efficacy scale. The tests were applied as pre- and post-tests. The findings showed that the experimental group performed significantly better in learning English vocabulary and its retention than the control group. The results for the self-efficacy levels of the students were also in favor of the experimental group.

Burke and Kafai (2010) stated, "writing to program can also serve as programming to write, in which a child learns the importance of sequence, structure, and clarity of expression—three aspects characteristic of effective coding and good storytelling alike" (p.2.). Starting from this, they designed a study that questioned the impact of writing computer programs on children's storytelling and creative writing skills. In their study (2012), ten children whose ages were between 12 and 14 took part. They attended eleven programming sessions for two months. By the end of the program, each student was asked to produce their own story using Scratch to be shared with the others on the last day. In addition to those eleven projects (one participant created an extra story), a computer science attitudes survey, ten hours of video recording, post-interviews, and daily field notes were used as tools to obtain data. The researcher stated that they assessed the participants' stories in terms of plot, character development, and resolution. When the projects were examined, it was seen that nine out of ten projects were complete digital stories including multiple characters, settings, and plot stages

with a number of key coding concepts (Burke and Kafai, 2012). The findings of the study indicated that programming with Scratch was helpful in terms of developing students' story writing skills and their digital literacy as well. Eighty percent of the students believed that their storytelling abilities improved with Scratch, and almost all of them stated that they enjoyed during their experience.

Another study that integrated coding with Scratch and language teaching was of Moreno-León and Robles (2015). They conducted a preliminary study to investigate whether the integration of computer programming was beneficial in English classes in terms of students' achievement and motivation. Totally 65 fourth and fifth-grade students participated in the study. Thirty-three of these were in the control, and 32 of them were in the experimental group. In each age level, two groups were formed as control and experimental group. The experimental process was designed for one unit and lasted for 12 sessions. The data was gathered through questionnaires designed to measure the participants' English skills and motivation level. The descriptive analysis of the study showed that the experimental group students showed more improvement than the control group who were taught by traditional methods. When the initial and final scores of the groups were compared, they reported a difference of 0.23 points. However, when they analyzed each group individually, they pointed out a more significant difference. Based on the results, the fourth-grade experimental group improved their scores by 3.93 points, and his was attributed to the teacher who had previous coding experience and showed more improvement than the other teachers in the training. However, these results were stated to be non-significant due to the limited scope of the study. In terms of motivation, the findings revealed that all students enjoyed the classes with Scratch. In addition, almost all students stated that coding had a positive impact on their English skills and also other skills such as working collaboratively with their friends and learning to search for information on the Internet.

Lastly, Costa et al. (2018) reported the initial results of their ongoing projects that focused on the integration of coding with Scratch and teaching English as a second language. A total of 33 third grade students took part in their study. Sixteen of these were placed in the experimental group and participated in several Scratch activities during the 2015/2016 school year, while seventeen of them were in the control group.

Throughout the year, there were 46 English lessons, 17 of which were with Scratch. They obtained data through initial satisfaction questionnaires, initial placement tests, written tests to assess listening, reading, and writing skills and two oral production activities for speaking skills. Firstly, the students were assigned to initial satisfaction questionnaire before starting the English classes to measure students' motivation to learn English and their general opinions about the use of English in everyday life. The findings revealed that the experimental group was less motivated to learn English than the control group in the pre-test. However, all students enjoyed games and they were willing to use the computer in the lessons. After highlighting that all the results were still preliminary, they stated that programming with Scratch had a positive impact in the development of reading and writing skills. Considering listening and speaking skills, they did not observe any improvement.

CHAPTER 3

METHODOLOGY

This chapter presents the methods of the current thesis which was composed of two studies. It presents the design, setting, participants, data collection tools, data collection procedure, and data analysis for each of these studies.

3.1 Design of the Study

The current study was designed as a quasi-experimental mixed-method research study. A mixed-method design is defined as the process in which researchers collect, analyze and mix quantitative and qualitative methods in a single study or a series of studies to better understand a research problem (Creswell & Plano Clark, 2011). Creswell (2012) states that, "the collection of qualitative data during an experiment may be to understand the "process" the participants are going through, whereas the quantitative data assesses the impact of the treatment on the outcomes." He also added that by assessing both outcomes of the study with quantitative data and the process with qualitative data, it is possible to develop "a complex" picture of social phenomenon (Greene & Caracelli, 1997, p. 7). With that purpose, we designed Study A as an intervention study with Scratch activities. We employed a pre- and post-test design and investigated the outcomes of Scratch integration on students' language and cognitive skills. In Study B, we explored the benefits and challenges of Scratch integration from 56 students' and five teachers' perspective in two phases. It is important to note that these two studies are not independent from each other. In fact, five of the participants from Study A took part in Study B as well to examine the students' points of view about Scratch activities. However, we labeled these studies this way for the sake of coherence.

Table 5 presents the design of the Study A in detail.

Table 5: The Design of Study A

QUANTITATIVE			
Participants	**Pre-Test**	**Intervention**	**Post-Test**
Experimental Group (N=5)	Smiles 2 Exit Test	Scratch	Smiles 2 Exit Test
	Oxford Young Learners Placement Test		Oxford Young Learners Placement Test
	Multilingual Assessment Instrument for Narratives		Multilingual Assessment Instrument for Narratives
	Wisconsin Card Sorting Test		Wisconsin Card Sorting Test
	Scratch Design Scenarios		Scratch Design Scenarios
Control Group (N=5)	Smiles 2 Exit Test	No Scratch	Smiles 2 Exit Test
	Oxford Young Learners Placement Test		Oxford Young Learners Placement Test
	Multilingual Assessment Instrument for Narratives		Multilingual Assessment Instrument for Narratives
	Wisconsin Card Sorting Test		Wisconsin Card Sorting Test

Table 6 presents the design of the Study B.

Table 6: The Design of the Study B

QUALITATIVE	
Time	**Participants**
Phase I	Researcher
	5 Students
Phase II	4 Teachers
	51 Students

3.2 Research Setting

This research study was conducted at a language learning center in the 2019-2020 academic year in Ankara, Turkey. The institution aims to teach English to young Turkish learners aged 6-12 through hands-on experience with games, activities, dramas, and field trips. In addition, the language center aims to integrate coding into ELT to create an opportunity for learners to learn meaningfully by creating their own stories, music, and games. To mention briefly, the students come to the institution after school. The education starts in the kitchen, where students have snack time before their class. After 15 mins of snack time, each group has two lesson hours (45 mins each). In the institution, there are two age groups as elementary school and middle school students. These students can enroll in a group based on the intensity of the program by their choice. There are four groups according to the intensity of the program as

following: five days a week, three days a week, two days a week, and one day at the weekend. Weekday groups have two hours a day, whereas weekend groups have four hours. The students' assignments to the appropriate classrooms are finalized after the teachers' observation of their language levels.

3.3 Studies

3.3.1 Study A: Quantitative Study

3.3.1.1 Aim

Study A investigated the outcomes of Scratch integration into the production stage of language teaching for children in various aspects such as coursebook achievement, language use, listening, executive function, narrative, and computational skills.

3.3.1.2 Participants

The participants were selected by convenience sampling method. Totally ten students participated in the study. Table 7 presents the details about the participants.

Table 7: Overview of the Participants' Demographic Information

Variables		N	%
Age			
	8	8	80
	9	2	20
Gender			
	Female	4	40
	Male	6	60
School			
	State School	10	100
Grade			
	2nd	8	80
	3rd	2	20
Have a computer			
	Yes	10	100
Have internet connection			
	Yes	10	100
Coding experience			
	Yes	2	20
	No	8	80

As depicted in the table, ten elementary school students who were going to state schools participated in the study. There were five students in the control and five in the experimental group. The students were assigned to the groups using an online random group generator tool. The participants' native language was Turkish, and they were learning English as a foreign language. Four of them were female, and six of them were male. The mean age of the group was 8.2 (SD= .422). Two of them were third graders, while the rest was second graders. All participants had computer and internet access at home. Only two of them stated they had a little coding experience. One of these students was placed in the experimental; the other one was in the control group to control for this extraneous variable. They were coming to the institution for five days a week. They had two lesson hours a day, which made ten hours of English lessons a week. They were the students of the researcher for two years. The previous year, the group completed the book Smiles 1 and half of the Smiles 2. In the 2019-2020 academic year, they completed Smiles 2 and started Smiles 3.

The parents were also asked to provide information about the participants' daily computer use and the amount of time (hour) they spent studying English on a weekly basis. Only six of the parents stated that they spent time studying English with their children at home. However, one parent did not answer the question about the amount of time.

Table 8: Hours Spent Using Computer and Studying English

Variable	N	M (h)	SD	Min	Max
Time spent using PC	10	1.5	1.26	0.00	4.00
Time spent studying English	5	3	2.34	1	7.00

3.3.1.3 Integration of Scratch Activities

Before the implementation, all of the teachers attended approximately 15 meetings with the founding manager. In these meetings, the rationale behind Scratch integration into language teaching, teaching theories, some activity plans, and lesson plan designs were discussed together. Following these meetings, preparations were made for the integration process. These preparations constituting the fundamental stages of the Scratch design are summarized below.

Prior to the planning of Scratch activities, the researcher carefully examined the lesson plan of the coursebook. Since the aim was to increase student performance in the production stage of language learning, Scratch activities were located accordingly. To exemplify, the coursebook had a writing activity in the second lesson of Unit 4. The aim of this activity was to write about houses. To integrate a Scratch activity into this production part, the researcher prepared a lesson plan both for the experimental group and for the control group. While the students in the experimental group created a Scratch project in the lab to practice their writing skills about their houses, the students in the control group used paper and pencil to practice writing on the same topic.

Introduction

The researcher prepared an introductory session to familiarize students with the tool. The lesson started with an overview video of Scratch. After watching it a couple of times, the teacher asked, "What do you think you can do with this program?" The whole class discussed, and the teacher asked the students to draw what they want to create using Scratch. Below is an example from one of the students in the experimental group.

Figure 3: Example Student Drawing from the Introductory Session

After each student shared their ideas with the whole class, the Scratch interface was introduced. The target vocabulary items included code, block, coding area, stage, sprite, and backdrop. After the presentation, some games were played to consolidate these items. Figure 4 shows the Scratch interface.

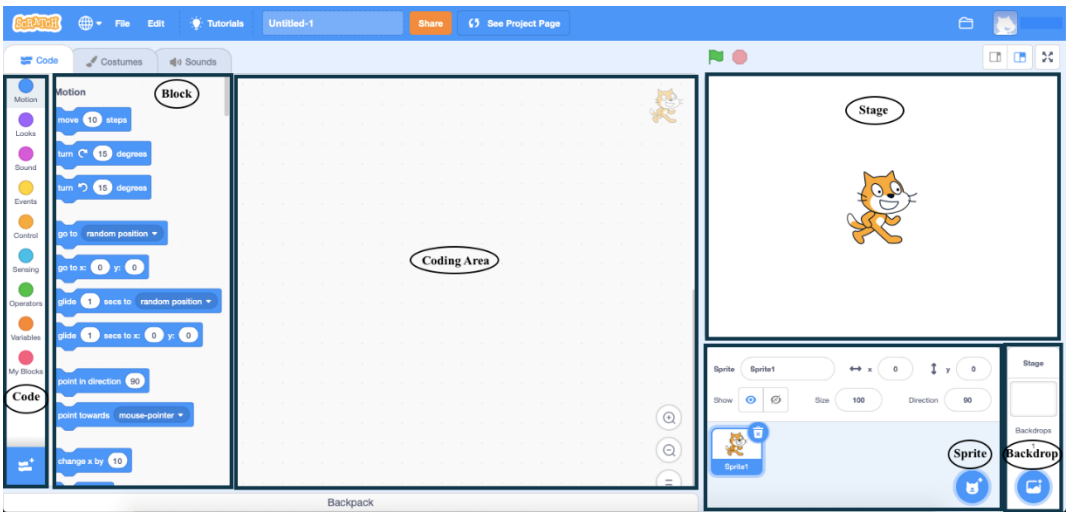

Figure 4: Screenshot of Scratch Interface

As the next step, the teacher created an example project using one sprite and one motion code. The motion code was chosen intentionally in order to attract students' interests with some action like making a character turn around. In the next lesson, the students were introduced to two concepts: driver and navigator. The term driver was used to refer to the student who controlled the mouse, and the navigator was the student guiding the driver (Lewis, 2011). In order to promote the students' communication and collaboration skills, the students were asked to work in pairs in each Scratch activity. However, to avoid having one student tell the other what to do all the time, the students switched roles after 20 minutes. The driver and navigator analogies were used in order to help students understand how to work in harmony in pairs. After the students had a general idea of the two concepts, the students did an example project in pairs with one sprite and one code to have hands-on experience.

Design Notebooks

The next step was the preparation of the Scratch design notebooks. The Scratch design notebooks were aimed to provide students with an opportunity to imagine and plan

their projects, then actualize these in the lab with their friends. In these notebooks, the students were provided with the language target of that lesson and a blank area to write or draw. The students were asked to plan what they were going to do in the lab before each Scratch activity. Since they were second and third graders, they were allowed to express themselves by writing or drawing to avoid putting pressure. Before the integration of Scratch activities, the students were asked to prepare the cover of their Scratch design notebooks to make these personal and increase their motivation. Some examples of the students' design notebook covers are shown below.

Figure 5: Example Design Notebook Cover

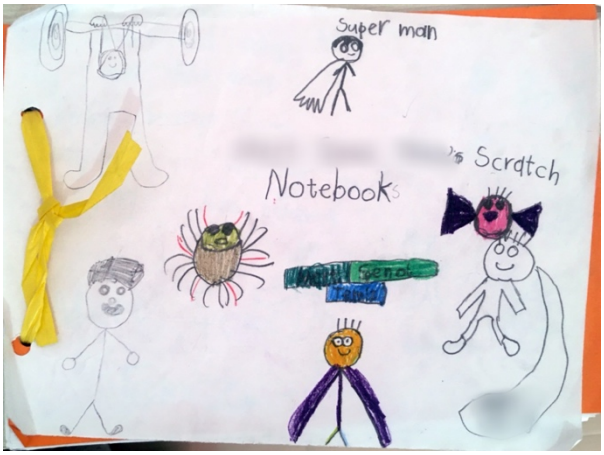

Figure 6: Example Design Notebook Cover

When the preparations were complete, and the students had the background information, the implementation started.

Lesson Plans

In each lesson plan with Scratch, students were introduced to a new feature (a new code, a new block, a set of blocks for a new action). The purpose was to foster student interest and to help students achieve a cumulative set of abilities to use the tool effectively. Below, Table 9 presents a part of the block list as an example. This list included the block names used in Scratch activities prepared for Units 1-4 in Smiles 2. It was created by the researcher considering the following criteria: (i) the content of the coursebook, (ii) the aim of the coursebook, (iii) students' age, (iv) students' cognitive development, and (v) language level.

Table 9: Block List Used in Scratch Activities for the Units 1-4

Unit	**How to…**	**Codes**	**Coding Blocks**
1	Make a sprite talk	*Text to Speech*	✓ Set voice to…
			✓ Speak…
		Events	✓ When green flag clicked
2	Make two sprites talk	*Text to Speech*	✓ Set voice to…
			✓ Speak
		Sound	✓ Play sound … until done
		Events	✓ When … key pressed
			✓ Set voice to…
3	Make sprites glide to random positions	*Text to Speech*	✓ Set voice to …
			✓ Speak …
		Sound	✓ Play sound … until done
		Motion	✓ Glide 1 secs to a random position
			✓ Go to x: … y: …
		Events	✓ When green flag clicked
			✓ When this sprite clicked
4	Make a sprite jump	*Text to Speech*	✓ Set voice to …
			✓ Speak …
		Motion	✓ Change y by …
		Control	✓ Wait … secs
			✓ Repeat …
		Events	✓ When green flag clicked
			✓ When … key pressed

Similar to Burke and Kafai's (2012) study, certain blocks –Variables and Operators were not largely used since they were above the level of participants' understanding for that time being.

As noted before, a class of 10 students was divided into two groups to have a control (N=5) and an experimental (N=5) group. Therefore, while preparing a lesson with a

Scratch activity for the experimental group, the researcher also prepared a modified lesson plan for the control group. To give more details, for one Scratch activity, the researcher prepared two different lesson plans. One of these lesson plans was for the Scratch activity; the other one was the modified version without Scratch for the control group. These two lesson plans were the same in terms of their language focus, target vocabulary, and aims. The only difference was the tool since the experimental group students were using Scratch to practice the target. As the participants took part in 20 Scratch activities, a total of 40 lesson plans were prepared. Table 10 provides an example lesson plan without a Scratch activity.

Table 10: Example Lesson Plan without Scratch

LESSON PLAN FOR UNIT 4 ACTIVITY 1 (WITHOUT SCRATCH)				
		CONTENTS / CTIVITIES	**MATERIALS**	**STUDENTS WILL……**
1st Lesson	45’	1. Warm up 2. Asking students to name rooms (*bathroom, bedroom, kitchen, living room, garden)* and things (box, chair, armchair, sofa, clock, bed, bath, bookcase) in a house. 3. Revising the target structure “t*here is/there are*” with examples. 4. Students write about their houses using the target structure “*Hello. I am Liam. This is my house. There is a living room, a kitchen, … My bedroom is cool. There is a big bed, a chair, …”.* 5. Encouraging students to share their writings in the class. 6. Checking other students’ comprehension through some questions. (e.g.: How many bedrooms are there in Lilly’s house? What is in Liam’s bedroom?)	A piece of paper and a pencil.	1. Be able to explain how they feel and talk about daily issues such as the date and weather with the teacher and each other. 2. Be able to name rooms (bathroom, bedroom, kitchen, living room, garden) and things (box, chair, armchair, sofa, clock, bed, bath, bookcase) in a house. 3. Be able to recall the target structure “there is/there are” with the help of the examples. 4. Be able to write about their houses. 5. Be able to present their writings with the class. 6. Be able to show their understanding about their classmate’s writings through answering the teacher’s questions.

Table 11 presents an example lesson plan with Scratch activity.

Table 11: Example Lesson Plan with Scratch

LESSON PLAN FOR UNIT 4 SCRATCH ACTIVITY 1				
		CONTENTS /ACTIVITIES	**MATERIALS**	**STUDENTS WILL……**
1st Lesson	45’	1. Warm up 2. Organizing the pairs to work on the Scratch program as driver and navigator for the day’s session. 3. Students will start to work on their projects designed to consolidate ***“there is/are”*** and **rooms *(bathroom, bedroom, kitchen, living room, garden)*** and **things in a house *(box, chair, armchair, sofa, clock, bed, bath, bookcase).*** 4. Each project will include 1 main sprite talking about his/her house using B*edroom* backdrop. 5. Each project will be designed by making use of 4 codes: *Text to Speech, Motion, Control, Events.* (See Appendix A below). 6. Each project will be designed by making use of 7 coding blocks: *Set voice to …, speak …, change y by …, wait … secs, repeat …, when green flag clicked, when … key pressed.* 7. In this project, how to make a sprite jump will be presented.	Scratch Desktop	1. Be able to explain how they feel and talk about daily issues such as the date and weather with the teacher and each other. 2. Be able to work on the Scratch program collaboratively with their pairs as driver and navigator. 3. Be able to work collaboratively in pairs to design a project to consolidate ***“there is/are”*** and **rooms *(bathroom, bedroom, kitchen, living room, garden)*** and **things *(box, chair, armchair, sofa, clock, bed, bath, bookcase)*** in a house. 4. Be able to describe a house and a room by designing a project. 5. Be able to use *Text to Speech, Motion, Control, Events* codes. 6. Be able to use *Set voice to …, speak …, change y by …, wait … secs, repeat …, when green flag clicked, when … key pressed* coding blocks. 7. Be able to make a sprite jump.

As can be seen from the lesson plans, each Scratch activity session lasted for one lesson, which was 45 minutes. While the researcher was with the experimental group in the lab during the first lesson hour, a substitute teacher was in the classroom with the control group. In the second lesson, the researcher and the substitute teacher switched groups. Therefore, the researcher was with the control group, while the

substitute teacher was with the experimental group in the next lesson. In this way, the control group did not participate in the Scratch activities.

While the researcher prepared two different lesson plans for a Scratch activity, the substitute teacher prepared a single lesson plan that she would implement in both of the groups. The rationale behind implementing the same lesson plan for both control and the experimental group was to make sure that the groups did not receive a different treatment other than the integration of Scratch that would affect the results of the study.

When the substitute teacher was with the experimental group in the first lesson, the group completed their Scratch design notebooks in the first 10 minutes to be prepared for the upcoming Scratch activity. In the rest of the lesson, they followed the lesson plan. An example design notebook entry is presented below. This entry was what the student had planned before going to the computer lab for the above-presented lesson plan for Unit 4.

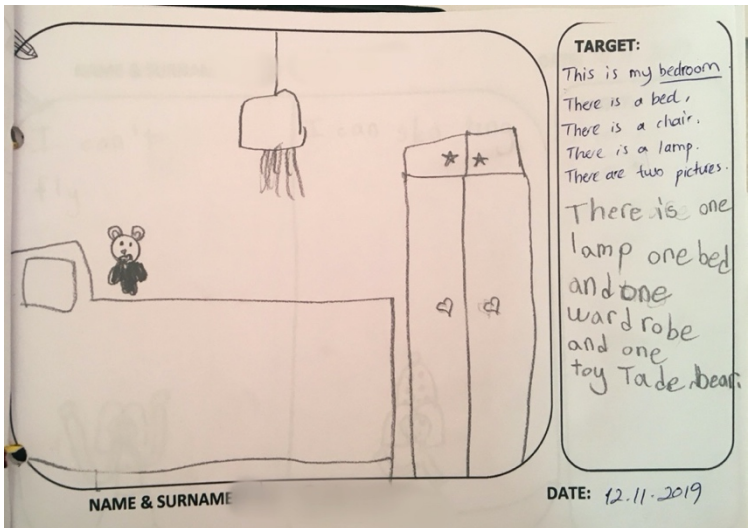

Figure 7: Example Student Entry in the Design Notebook

To sum up, in the first lesson, the researcher implemented the modified lesson plan (without Scratch) with the control group, and the substitute teacher implemented her lesson plan with the experimental group. In the second lesson, the researcher implemented the lesson plan with Scratch with the experimental group, while the

substitute teacher implemented the same lesson plan with the control group. Figure 8 depicts this process.

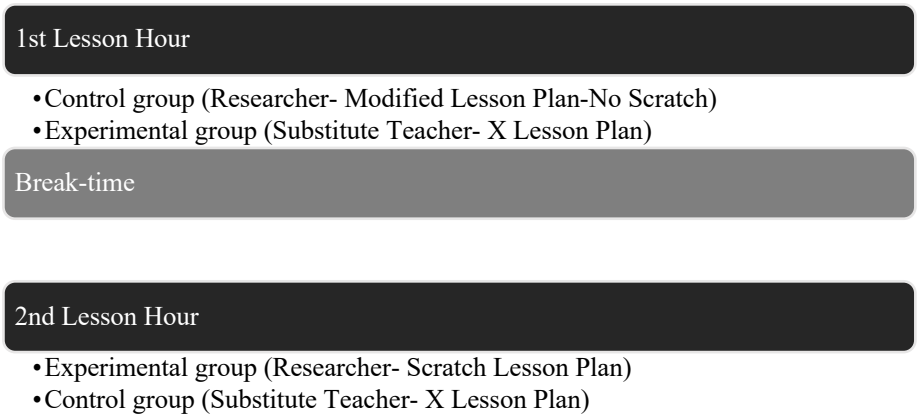

Figure 8: Distribution of the Class During Scratch Activities

Implementation

The integration of Scratch activities into the production stage of language instruction took part in the first semester. The intervention lasted 13 weeks. Totally, the students participated in 20 lab sessions, including the introductory one. At the beginning, the students created their projects simultaneously with the researcher after deciding on the backdrop and the sprites as pairs. To exemplify, the researcher was dragging one block to the coding area, and then the students were doing the same. This was the case for each block until all the target blocks were used. The reason behind this was to prevent students from feeling lost while using Scratch since they were young learners. The researcher guided the students this way until they were confident using the program. Then, the researcher started to show an example project at the beginning, then closed it and asked students to create their projects using the language target with the target blocks.

3.3.1.4 Data Collection Tools

Various data collection tools were used in this research study. First of all, a demographic questionnaire was used to obtain information about the participants. In order to collect the quantitative data, the exit test of the coursebook, Oxford Young

Learners Placement Test (OYLPT), Multilingual Assessment Instrument for Narratives (MAIN), Wisconsin Card Sorting Test, and Scratch Design Scenarios were used.

Demographic Questionnaire

A demographic questionnaire was prepared by the researcher to gather information about the participants. Firstly, the parents filled out the parts in which basic information about the participants was asked, such as their name, age, school, and grade. Totally, the questionnaire consisted of 11 questions. These were related to the participants' access to a computer and the internet, their use of them, the amount of time they spent studying English, and their previous coding experiences.

Smiles 2 Exit Test

The exit test of the coursebook was used in order to address the first research question, which was aiming to find out whether integrating Scratch into the production stage of language instruction increases student achievement with respect to the students' scores in the exit test of the coursebook. The test consisted of three parts as vocabulary, grammar, and communication. Totally, there were 45 questions to be answered. The vocabulary part had 20 two-choice questions in which students looked at the pictures and chose the correct answer. In the next part, there were 20 two-choice questions that measured their grammar knowledge. Finally, there were five questions in which students chose one of the two options to answer a question in a dialogue as a measurement of their communication skills.

Oxford Young Learners Placement Test (OYLPT)

Oxford Young Learners Placement Test was implemented to answer the research questions 1b and 1c, which aimed to find out if integrating Scratch into the production stage of language instruction increases student achievement with respect to their language use and listening skills. OYLPT was chosen as a tool because it was a standardized test to measure the language abilities of children between 7 and 12 years

old online. It measured their language abilities at four CEFR levels as pre-A1 (A0), A1, A2, and B1. Totally, the test was composed of six parts. Three of these focused on language use and three on listening skills. The language use part measured vocabulary, functional language, and grammar with multiple-choice questions. In the listening part, the participants' listening for the gist, listening for details, and extended listening skills were measured. However, the test did not provide the scores for each of these components separately.

Multilingual Assessment Instrument for Narratives (MAIN)

The participants' narrative skills were measured by the Multilingual Assessment Instrument for Narratives (Gagarina et al., 2012) to answer the next research question investigating whether integrating Scratch increases student achievement with respect to their speaking and narrative skills. The tool was designed by a group of researchers in order to assess the narrative comprehension and production skills of children from 3 to 10 years old. The tool assessed the students' narratives in terms of macrostructure and microstructure.

The macrostructure includes three components as story structure, structural complexity, and internal state terms. Story structure is the story elements in the episodes, and these were initiating events, goals, attempts, and reactions. Structural complexity is the ability to produce well-formed episodes. To exemplify, a narrative including GAO (goal, attempt, outcome) is considered a complete episode, while AO (attempt, outcome), G (goal), GA (goal, attempt), GO (goal, outcome) are partial event sequences. Finally, internal state terms are defined as the awareness of others' states of mind, which indicates a cognitive ability to interpret intentionality and make inferences (Gagarina et al., 2012). Some examples can be the use of metalinguistic verbs (shout, say), metacognitive verbs (think, wonder), and emotion words (angry, sad, happy).

The microstructure also includes three components, and these were maze use, number of different words, and communication units. The children's maze use is calculated via dividing the total number of tokens with mazes (TNT) by the total number of

tokens without mazes (TNTm) and indicates the ability to speak fluently. By assessing the number of different words used in a narrative, the aim is to measure the lexical diversity. Lastly, the use of communication units indicates children's ability to produce meaningful and grammatical utterances.

The MAIN tool contained four carefully designed parallel stories, and each of them consisted of a six-picture sequence. Gagarina et al. (2012) stated that the stories were controlled in terms of their cognitive and linguistic complexity, parallelism in macrostructure and microstructure, and cultural appropriateness and robustness. For the purposes of this research study, two stories were used. These were the Cat story and the Birds story. The Cat story was used for the retelling part where the students listened to the researcher and then retold the story. On the other hand, the Birds story was used for the telling part where the student told the story without showing the pictures to the researcher. Figure 9 and 10 presents the story pictures.

Figure 9: Birds Story Pictures

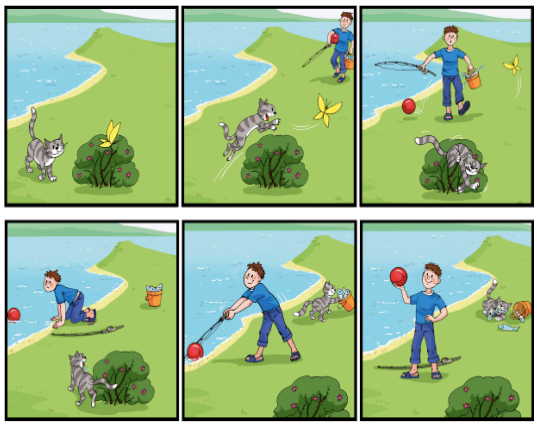

Figure 10: Cat Story Pictures

Wisconsin Card Sorting Test

The computer-based version of the Wisconsin Card Sorting Test was used to measure the participants' executive function skills to answer whether integrating Scratch into the language instruction increases student achievement with respect to their executive function skills. The tool was initially developed by Berg (1948) and had four stimulus cards with 60 response cards. In the computer-based version that was used in this study, there were again four stimulus cards but 64 response cards. In the task, the

participants were asked to match the response cards with one of the stimulus cards by a particular rule (color, shape, number). After some time, the rule changed, and the participants tried to find out the new role and sort the next card accordingly. The computer provided immediate feedback about whether the answer was correct or not. For the analysis, four of the scores were used: number of correct responses, perseverative errors, non-perseverative errors, and failure to maintain the set. The number of correct responses indicates overall problem-solving skills on the task. The participants make a perseverative error if they apply the previous matching rule while sorting the new response card after the rule is changed, and this reflects inflexibility. Non-perseverative errors are the remaining incorrect responses and represent the deficient attentional set shifting. Finally, failure to maintain task is when the participants have difficulty applying a matching rule over an extended time, which is an indicator of reduced sustained attention. Figure 11 presents a screenshot of the tool.

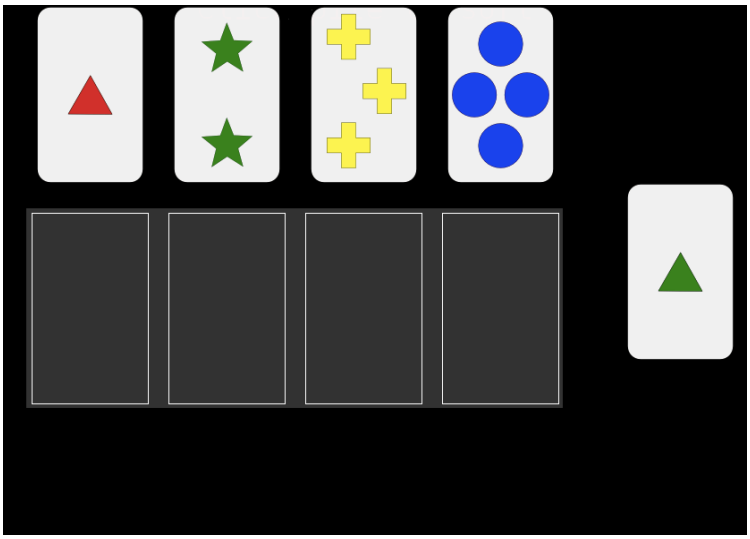

Figure 11: Screenshot of the Wisconsin Card Sorting Test

Scratch Design Scenarios

Scratch Design Scenarios were used to answer whether integrating Scratch into the language instruction increase student achievement with respect to their computational thinking skills. The design scenarios were developed in collaboration with researchers at the Education Development Center (EDC) as part of the National Science

Foundation (NSF) grant. The aim was to develop a tool to measure the development of computational thinking skills via Scratch programming activities (Brennan, K. & Resnick, M., 2012). The design scenarios consisted of three sets with increasing difficulty. In each set, there were two options for the students to choose from. After the students chose a project from each set, they answered four questions (see Appendix D). First, they were asked to explain what the project did and describe how it could be extended. Then, they fixed a bug and remixed the project by adding a new feature. Through the use of design scenarios, the tool measures computational concepts such as sequence, loops, parallelism, and events in addition to computational practices like critiquing, extending, debugging and remixing. Figure 12 shows a screenshot of the projects.

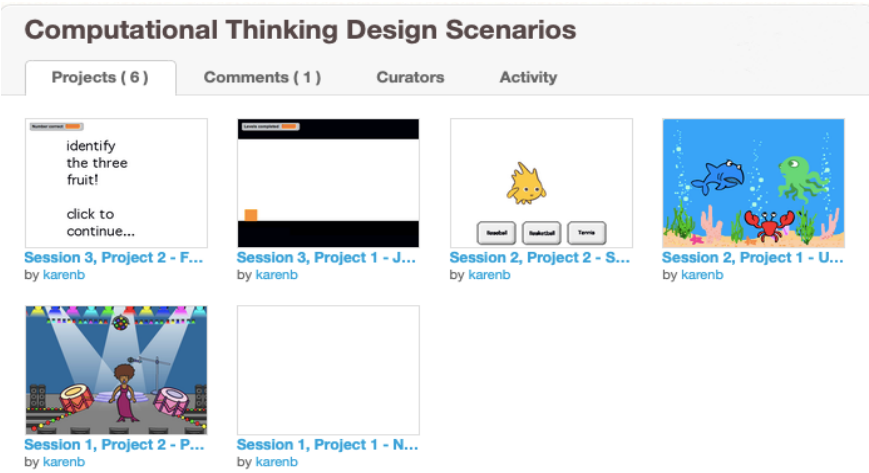

Figure 12: Screenshot of the Scratch Design Scenarios

3.3.1.5 Data Collection Procedure

The data collection procedure started after receiving the approval of the Human Subjects Ethics Committee (see Appendix A). The figure below summarizes the procedure.

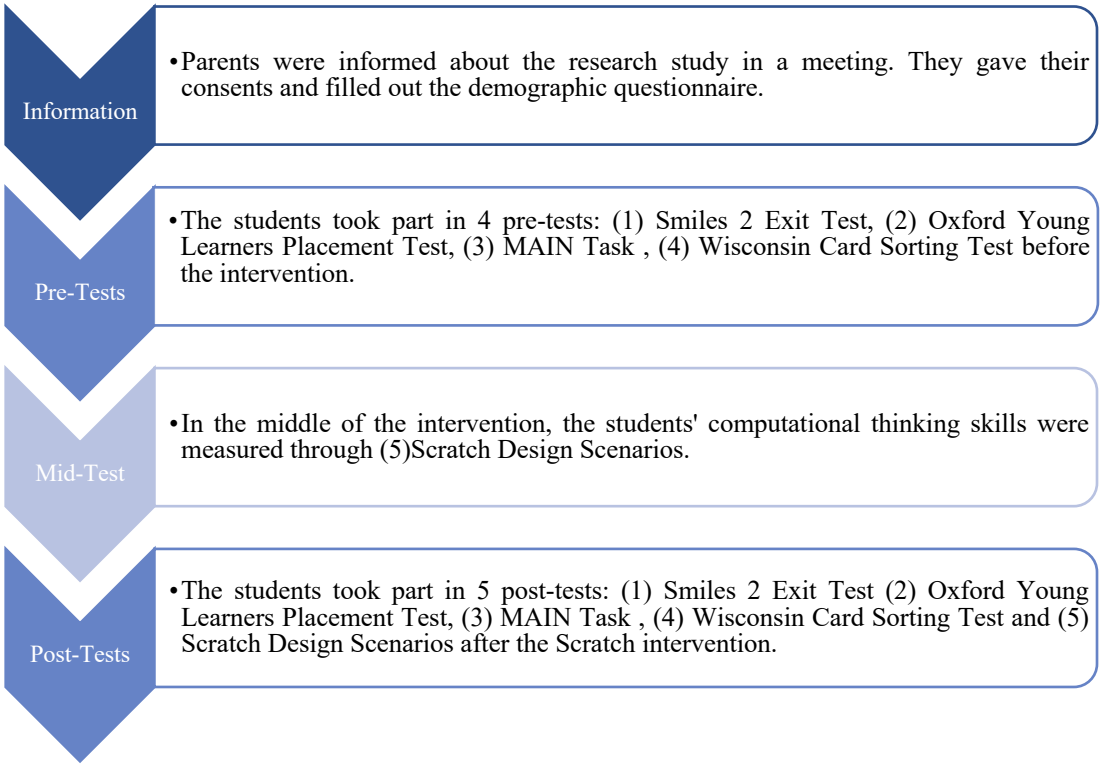

Figure 13: Data Collection Procedure

As it is seen in the figure, firstly, the researcher informed the parents about the research study in a face-to-face meeting. Then, they filled out the consent form (see Appendix B) and the demographic questionnaire (see Appendix C), which was prepared to collect background information about the participants. After receiving the parents' consent, the data collection started. The participants took all of the tests in the institution during the regular lesson hours. The assessments took place either in the computer lab or in the class with their teacher. Therefore, the participants were in their usual environment, and there was no factor for them to feel uncomfortable. Conducting all the pre-tests took almost one and a half weeks. Careful attention was paid to avoid exhausting the participants.

Firstly, the participants took OYLPT. The test was conducted in the computer lab under the supervision of the researcher. The researcher checked the computers' internet connection, sound, headphones, and computer mice before the test. In the process, the guidelines of the OYLPT Teacher's Handbook were followed. No assistance was provided to the participants unless they encountered a technical

problem. The participants completed the test in approximately 35-40 minutes. The second tool was the exit test of the coursebook. The test was given to the participants in the classroom during lesson hours. The researcher did not provide any assistance, and it took 20-30 minutes for participants to complete the test.

Next, the participants took the MAIN Task and the Wisconsin Card Sorting Test. These tests were implemented individually with each student. In the Wisconsin Test, the researcher gave the instructions in the participants' native language. The participants were told that matching the first five response cards would be a trial. During the task, the participants pointed out the answer on the screen, and the researcher did the matching because almost all of the participants were not accustomed to using a computer. The test lasted for approximately ten minutes. For the MAIN Task, the researcher followed the guidelines provided by Gagarina et al. (2012) in every phase, from preparing the materials to scoring and evaluating the data. The measurement lasted for 10-15 minutes, including the warm-up. The participants' narratives were audio-recorded.

Upon the completion of the pre-tests, the integration of Scratch activities into language instruction started. In the middle of the process, when the participants participated in 10 Scratch activities, their computational thinking skills were measured via Scratch Design Scenarios. Only the participants in the experimental group were tested because the measurement was through Scratch activities.

After the implementation, the participants completed the post-tests of the five tools: (1) Smiles 2 Exit Test, (2) Oxford Young Learners Placement Test, (3) Wisconsin Card Sorting Test, (4) MAIN Task, and (5) Scratch Design Scenarios.

The researcher aimed to continue data collection from the target group in the second semester as well. However, this was called off due to COVID-19 pandemic.

3.3.1.6 Data Analysis

To address the first research question and its sub-questions, the participants' scores were calculated. The scores of the Smiles 2 Exit Test were calculated manually by the

researcher. As for the Oxford Young Learners Placement Test, the system automatically calculated the scores after the students submitted their tests online. During the analysis of the data obtained from the MAIN Task, five undergraduate students provided help as volunteers. Firstly, the recordings were transcribed by the research assistants. Then, these transcriptions were crosschecked by the researcher. After the transcriptions, two different analyses were conducted: macrostructure and microstructure. The research assistants worked on the assigned narratives in pairs. Firstly, they did the analyses individually and then compared their findings. If there was a conflict, they discussed and reached an agreement. Subsequently, the researcher checked their mutual analysis. In case of disagreement, the researcher and the pair made discussion until they reached a consensus. This procedure was followed for both macrostructure and microstructure analyses.

The scores of the Wisconsin Card Sorting Test were calculated automatically by the program and were provided in the output file. Lastly, the researcher prepared a scoring rubric to analyze the participants' performances in the design scenarios. The rubric was prepared by modifying the student assessment of computational practices rubric from Brennan et al. (2014). The rationale behind the modification was to eliminate the items that were not assessed by the Scratch Design Scenarios. Also, the items in the rubric were replaced with the four questions that the researcher asked during the assessment. After the scores of each test were obtained, a two-way repeated ANOVA was conducted to explore the effects of group and time on the test scores of the participants.

3.3.1.7 Results

This study investigated the effect of Scratch integration on children's coursebook achievement, language use, listening, executive function, narrative, and computational skills. Firstly, we conducted a descriptive analysis for the performances of all participants in pre-tests and post-tests to see their overall performance.

Based on the results, the experimental group showed better performance in the post-tests in terms of coursebook achievement and language skills. Table 12 presents the findings.

Table 12: Exit Test and OYLPT Scores of the Participants at Time I and Time II

Tests	Time	Group	N	M	SD	Min	Max	Skew.	Kurt.
Smiles 2 Exit Test	I	Experimental	5	80.80	5.404	72	86	-1.339	2.021
		Control	5	82.40	9.737	70	92	-.570	-2.564
	II	Experimental	5	91.60	8.989	76	98	-1.930	3.804
		Control	5	89.60	7.537	78	96	-1.144	.021
OYLPT									
Language Use	I	Experimental	5	26.80	6.140	16	31	-2.053	4.354
		Control	5	3280	13.609	17	54	.892	1.675
	II	Experimental	5	44.80	6.419	35	53	-.611	2.123
		Control	5	40.00	9.975	25	50	-.793	.182
Listening	I	Experimental	5	34.40	12.462	18	45	-.704	-2.534
		Control	5	43.20	11.122	34	62	1.682	2.936
	II	Experimental	5	60.40	11.014	48	78	1.078	2.192
		Control	5	45.60	2.510	42	48	-.828	-1.217

As for the participants' scores in the MAIN Task, the experimental group showed a better performance in the post-tests of all components except for the structural complexity. Table 13 presents the findings.

Table 13: Narrative Scores of the Participants at Time I and Time II

Test	Time	Group	N	M	SD	Min	Max	Skew.	Kurt.
MAIN Task									
Macrostructure									
Story Structure	I	Experimental	5	10.80	3.114	7	14	-.437	-2.681
		Control	5	10.00	5.339	3	16	-.427	-1.767
	II	Experimental	5	13.40	2.702	11	18	1.704	3.372
		Control	5	12.80	3.493	9	16	-.544	-3.224
Structural Complexity	I	Experimental	5	1.00	.707	0	2	.000	2.000
		Control	5	1.40	1.342	0	3	-.166	-2.407
	II	Experimental	5	2.40	1.140	1	4	.405	-.178
		Control	5	3.00	1.225	1	4	-1.361	2.000
Internal State Terms	I	Experimental	5	6.40	5.857	0	13	.234	-2.754
		Control	5	7.00	5.745	0	15	.369	-.355
	II	Experimental	5	8.20	2.950	5	13	1.235	2.533
		Control	5	5.80	2.168	3	8	-.559	-2.368
Microstructure									
TNT/TNTm	I	Experimental	5	63.76	14.215	47.02	80.49	-.223	-2.257
		Control	5	63.06	20.066	31.19	82.86	-1.125	1.447
	II	Experimental	5	70.92	10.078	60.43	86.99	1.164	1.607
		Control	5	66.11	8.984	50.79	73.33	-1.758	3.247
NDW	I	Experimental	5	39.60	14.622	22	59	.270	-1.138
		Control	5	42.80	20154	19	61	-.542	-3.087
	II	Experimental	5	46.40	6.580	39	54	.076	-2.554
		Control	5	44.60	18.796	25	70	.339	-1.476
C-Units	I	Experimental	5	19.20	5.762	11	26	-.420	-.185
		Control	5	18.00	8.944	8	27	-.367	-2.999
	II	Experimental	5	22.00	2.236	19	25	.000	.200
		Control	5	21.20	7.694	12	32	.332	-.310

Regarding the executive function skills, the results were inconsistent. The analysis showed that the control group performed better than the experimental group in their correct responses and non-perseverative errors. However, the experimental group scored higher in their perseverative errors. Surprisingly, both groups failed to improve their maintain the set scores in the post-test but experimental group performed better than the control group. Table 14 presents the scores.

Table 14: Wisconsin CST Scores of the Participants at Time I and Time II

Test	Time	Group	N	M	SD	Min	Max	Skew.	Kurt.
Wisconsin CST									
Number of Correct Responses	I	Experimental	5	38.20	11.756	18	47	-1.814	3.533
		Control	5	35.00	12.470	25	51	.685	-2.787
	II	Experimental	5	43.80	8.585	29	50	-1.864	3.574
		Control	5	44.60	6.731	37	53	.287	-2.140
Perseverative Errors	I	Experimental	5	7.80	5.891	0	15	-.101	-.980
		Control	5	6.60	5.814	0	16	1.142	2.626
	II	Experimental	5	7.00	3.317	4	12	.822	.140
		Control	5	8.20	2.387	6	12	1.264	1.099
Non-Perseverative Errors	I	Experimental	5	13.00	15.732	4	41	2.180	4.799
		Control	5	17.40	13.557	2	34	.165	-2.209
	II	Experimental	5	8.20	6.723	2	18	.667	-.511
		Control	5	6.20	4.817	0	10	-.674	-2.734
Failure to Maintain Set	I	Experimental	5	1.20	1.095	0	3	1.293	2.917
		Control	5	1.20	.447	1	2	2.236	5.000
	II	Experimental	5	2.00	1.871	0	4	.382	-2.898
		Control	5	1.80	.447	1	2	-2.236	5.000

As for the computational thinking skills, only the participants from the experimental group (N=5) took the assessment. One of the student's score was replaced with the mean score of the group since the researcher missed one question in the assessment and it was not possible to exclude him due to the limited number of participants. The results of the descriptive analysis showed that they performed better in the post-test. The scores for the Scratch Design Scenarios are presented in Table 15.

Table 15: Scratch Design Scenario Scores of the Participants at Time I and Time II

Test	Time	Group	N	M	SD	Min	Max	Skew.	Kurt.
Scratch Design Scenarios	I	Experimental	5	11.000	2.1213	9.0	14.0	.524	-.963
	II		5	16.740	2.9475	12.0	20.0	-1.136	2.272

Overall, the results showed that the experimental group outperformed the control group in nine out of 13 test components. To see if this trend is statistically significant, we conducted further analysis with ANOVA.

3.3.1.7.1 Achievement in the Coursebook

To investigate whether integrating Scratch into the production stage of language instruction increased the achievement in the exit test of the book, we conducted a two-way repeated ANOVA to compare the effects of group and time on the participants' exit test scores. According to this, there was no main effect of group or no significant interaction between time and group. However, the results revealed a statistically significant main effect of time on the participants exit test scores, $F(1,8)= 32.143$, $p= .001$. Therefore, both groups significantly increased their performance in their achievement in the coursebook.

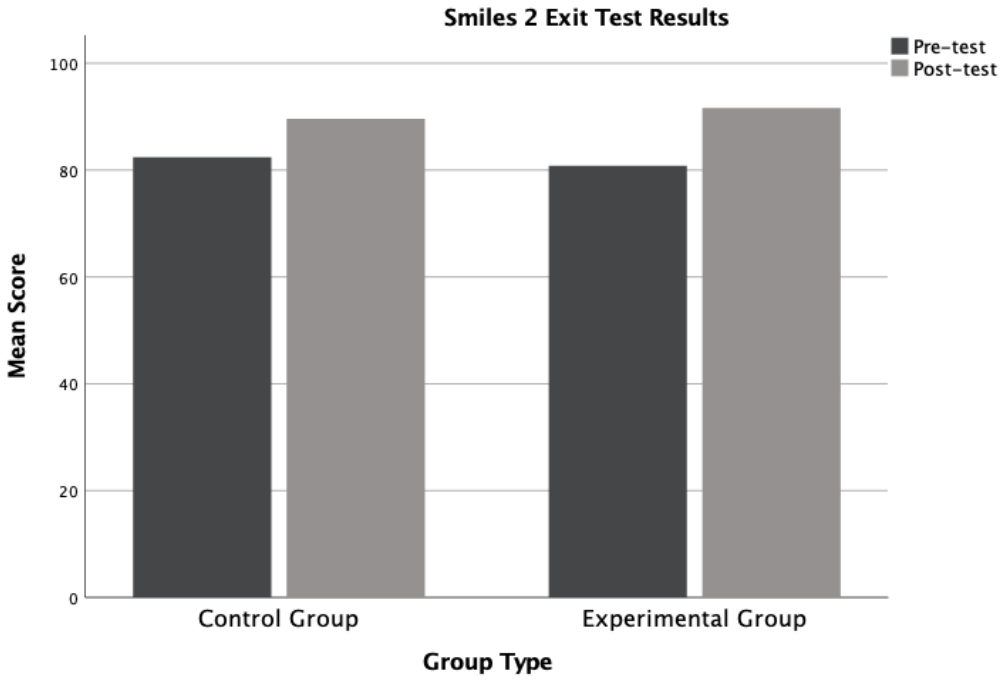

Figure 14: Mean Scores for the Coursebook Achievement

3.3.1.7.2 Language Use Skills

To explore whether integrating Scratch into language instruction improved students' language use skills, we conducted a two-way repeated ANOVA to examine the group and time effect on the language use scores. The results demonstrated no significant main effect of group or no interaction between time and group. Yet, there was a statistically significant main effect of time on participants language use scores, $F(1,8)= 6.028$, $p= .040$. Therefore, both groups significantly improved their language use skills from the pre-test to the post-test.

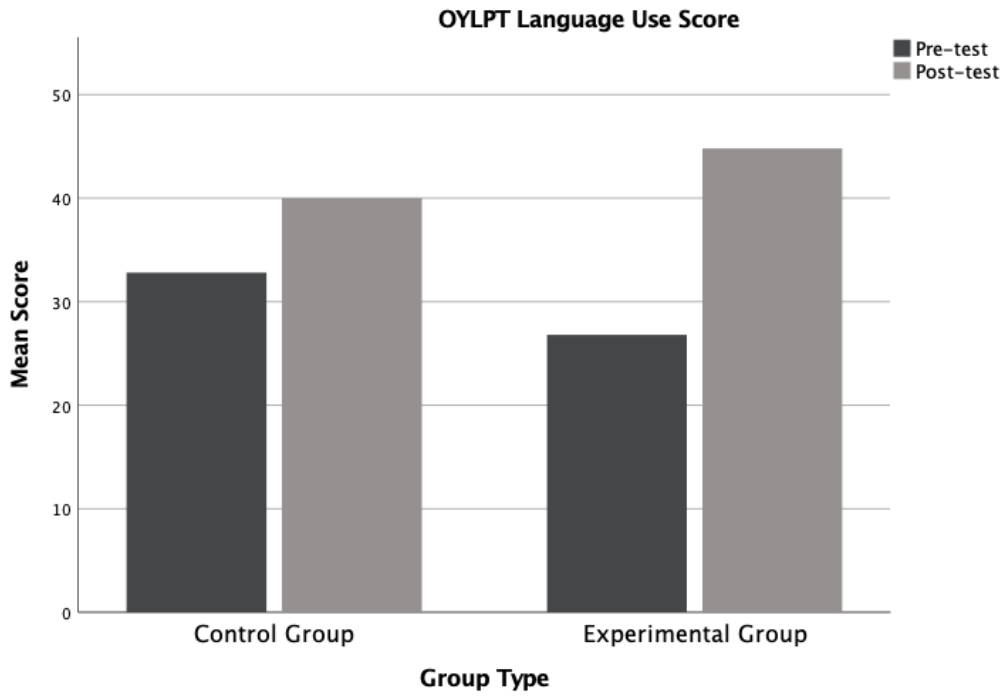

Figure 15: Mean Scores for the Language Use

3.3.1.7.3 Listening Skills

Next, to investigate whether integrating Scratch into language instruction increased student's listening skills by using OYLPT ,we conducted a two-way repeated ANOVA to examine the group and time effect on the listening scores of the participants. The results demonstrated no significant main effect of group. Yet, there was a statistically significant main effect of time on participants language use scores [$F(1,8)= 18.601$, $p <.05$] and significant main interaction between time and group [$F(1,8)= 12.845$, p

<.05]. To unpack the source of this interaction, we ran a Wilcoxon Signed-Rank Test. According to the results, the experimental group [T= 15, z= -2.02, p <.05] significantly increased their scores from the pre-test to the post-test by 75.7% while the control group [T= 6 , z= -.36, p >.05] did not.

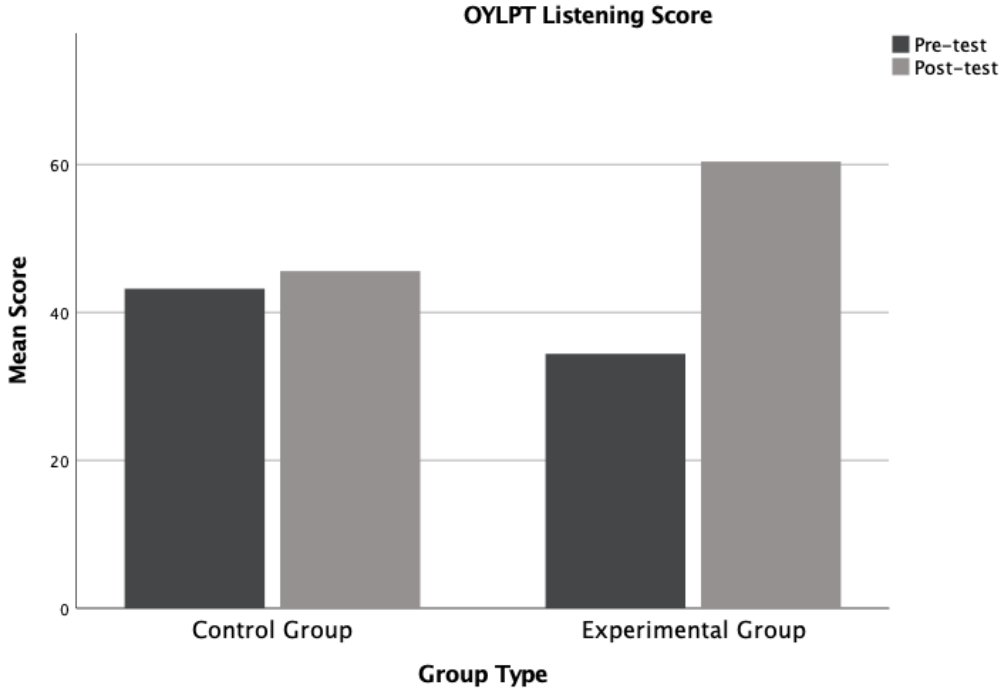

Figure 16: Mean Scores for the Listening

3.3.1.7.4 Speaking and Narrative Skills

To examine whether integrating Scratch improved the students' speaking and narrative skills from pre-test to post-test, we used the Multilingual Assessment Instrument for Narratives (Gagarina et al., 2012) that measures the students' macrostructure and microstructure in children. The macrostructure skills included three components as story structure, structural complexity, and internal state terms.

Firstly, we conducted a two-way repeated ANOVA to examine the group and time effect on the story structure scores of all participants. The findings revealed no main effect of group or no significant interaction between time and group. However, there was a significant main effect of time, $F(1,8)$= 8.100, p <.05. Therefore, both groups improved their story structure components in the narratives.

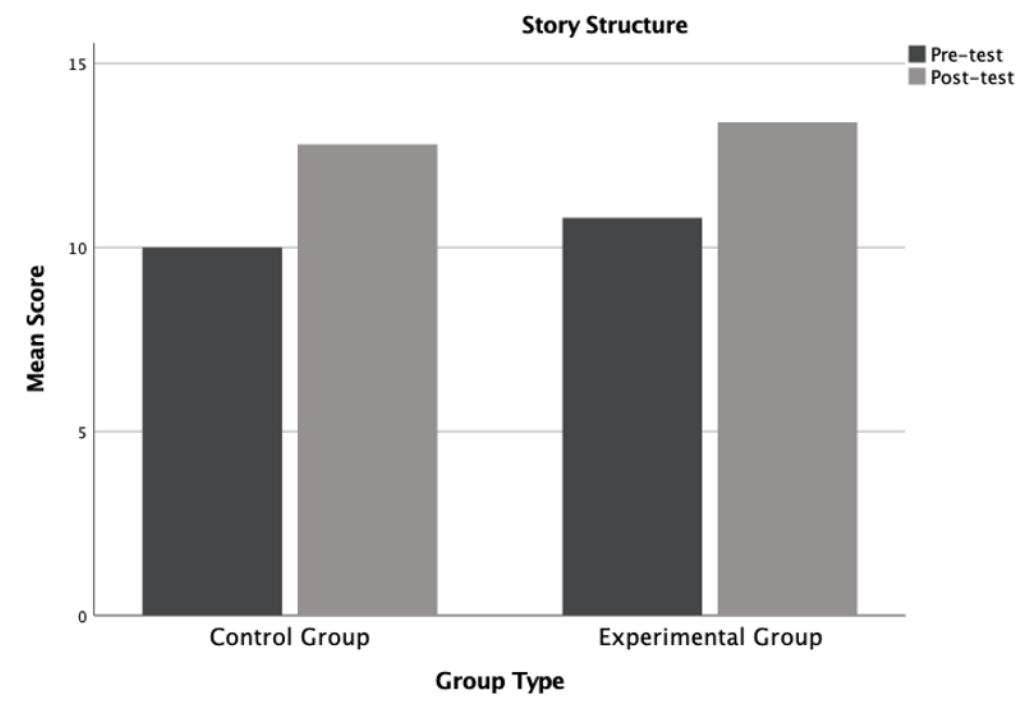

Figure 17: Mean Scores for the Story Structure

To analyze the participants' narratives in terms of their structural complexity, we conducted a two-way repeated ANOVA to examine the group and time effect on the structural complexity scores of all participants. According to the results, there was no main effect of group or no significant interaction between time and group. However, there was a significant main effect of time, $F(1,8)= 14.516$, $p <.05$. Therefore, narrative complexity measure of both groups increased significantly.

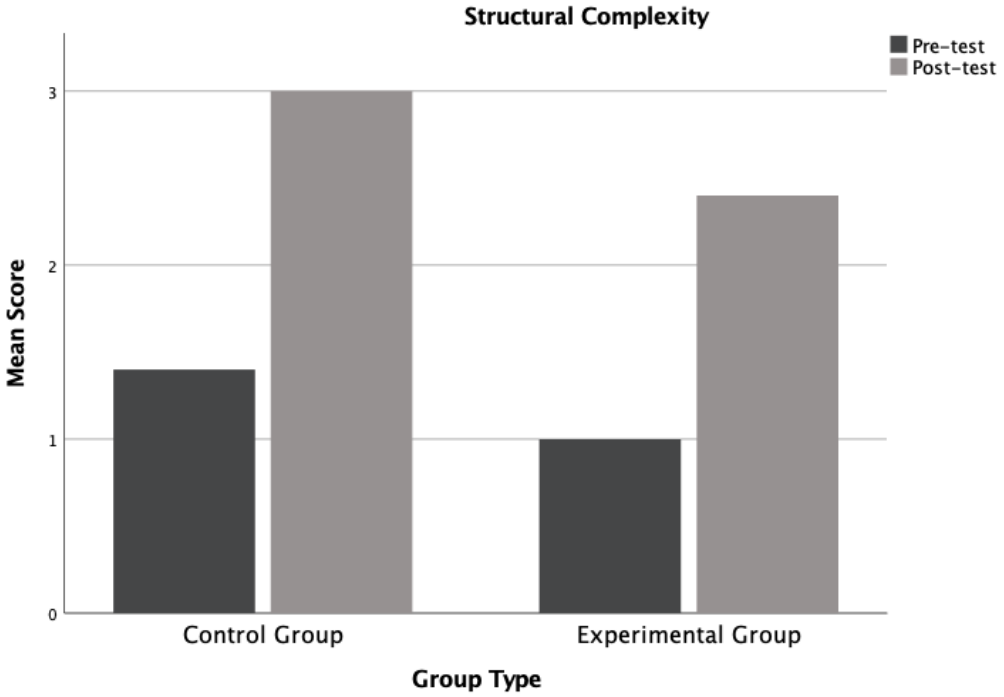

Figure 18: Mean Scores for the Structural Complexity

The last component of the macrostructure analysis was the internal state terms. We conducted a two-way repeated ANOVA to examine the group and time effect on the internal state term use of all participants. The findings revealed no significant main effect of group or time or no significant interaction between time and group.

Next, we examined the children's microstructure skill under three components as maze use (TNT/TNTm), the number of different words (NDW), and communication units (C-units). According to the results of a two-way repeated ANOVA, there was no significant main effect of group or time or no significant interaction between time and group for none of these components.

3.3.1.7.5 Executive Function Skills

To investigate whether integrating Scratch into the production stage of language instruction increased students' executive function skills from the pre-test to the post-test, we used the Wisconsin Card Sorting Test before and after the integration of Scratch activities.

Firstly, the mean scores for the number of correct responses were analyzed. We conducted a two-way repeated ANOVA to examine the group and time effect on the correct responses of the participants. According to this, there was no main effect of group or no significant interaction between time and group. However, there was a significant main effect of time, $F(1,8)= 19.585$, $p= <.05$. Therefore, both of the groups significantly increased the number of correct responses from the pre-test to the post-test.

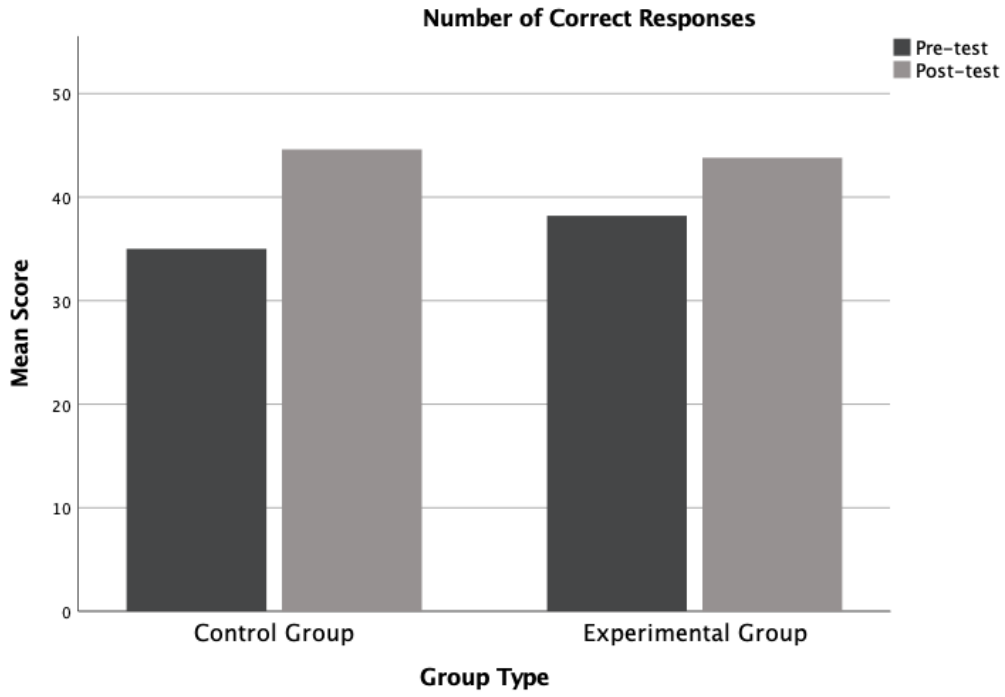

Figure 19: Mean Scores for the Number of Correct Responses

Next, we conducted a two-way repeated ANOVA to examine the group and time effect on the perseverative error means of the participants. The findings revealed no main effect of group or time or no significant interaction between time and group.

Next, the participants' performances were analyzed in terms of their non-perseverative errors. We conducted a two-way repeated ANOVA to examine the group and time effect on the participants' non-perseverative errors. According to this, there was no main effect of group or no significant interaction between time and group. However, there was a significant main effect of time, $F(1,8)= 6.568$, $p <.05$. Therefore, both

groups significantly improved their performances in their non-perseverative error scores.

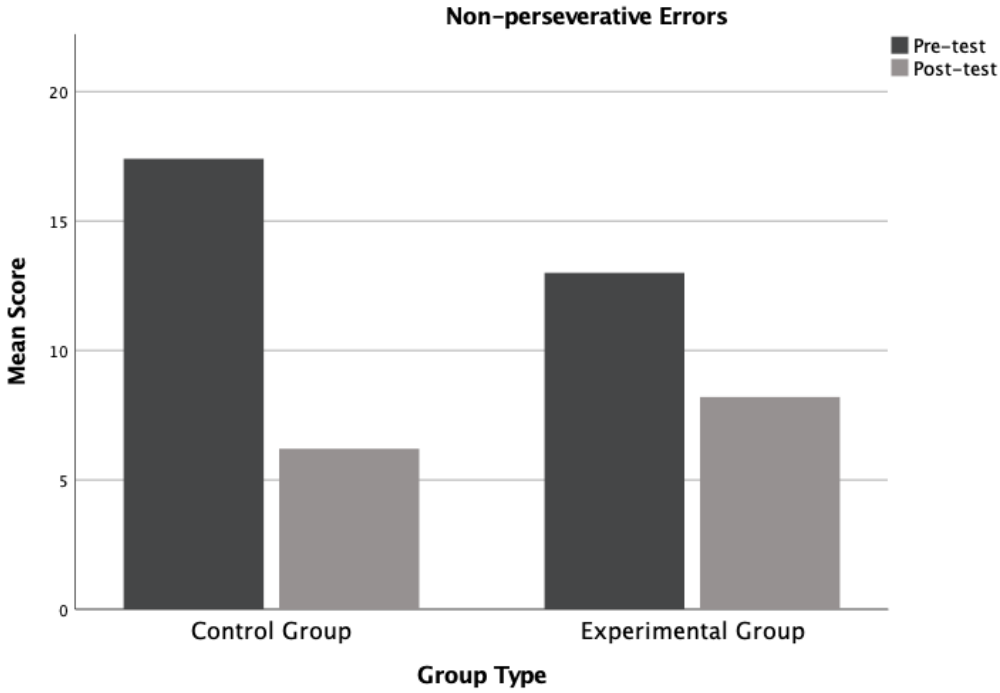

Figure 20: Mean Scores for the Non-Perseverative Errors

The final component to be examined was the failure to maintain the set score. We conducted a two-way repeated ANOVA to examine the group and time effect on the failure to maintain set scores of the participants. The findings showed that there was no main effect of group or time or no significant interaction between time and group. Contrary to expectations, both groups failed to improve their performances from the pre-test to the post-test in terms of maintaining the set.

3.3.1.7.6 Computational Thinking Skills

A Wilcoxon Signed Ranks Test was run to see whether there was an increase in the participants' computational thinking abilities from the mid-test to post-test. According to this, the participants performed significantly better in the post-test (*M*= 16.74, *SD*=2.94) than in the mid-test (*M*= 11.00, *SD*= 2.12), (Z= -2.023, p= .043). These findings are demonstrated in Figure 21.

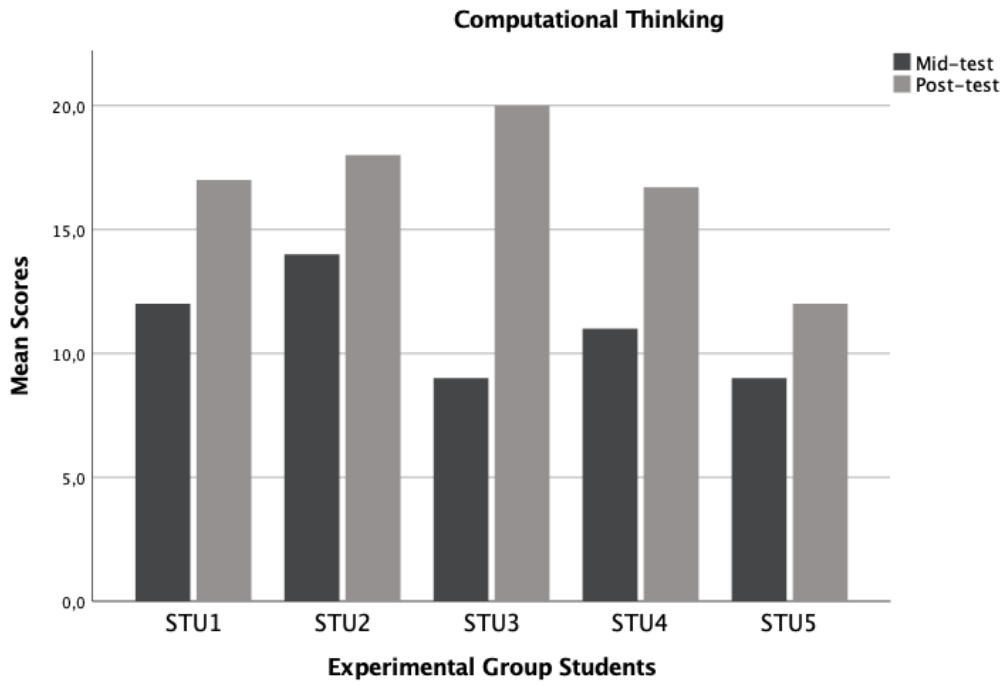

Figure 21: Mean Scores for the Computational Thinking

3.3.1.8 Interim Discussion

In this study, we integrated Scratch activities into teaching English for children and examined how this influenced their coursebook achievement, language skills, and cognitive abilities. The study was designed as an intervention study which lasted 13 weeks and ten participants took part. The results of the study will be presented in this chapter by referring to the relevant literature. Given the fact that the findings are based on a limited number of participants, the results should be taken with the utmost caution. The findings are intended to reflect the performances of this particular group. Thus, they are not meant to be generalizable, yet can be transferable.

The Effect of Integrating Scratch on Students' Coursebook Achievements

We examined the children's coursebook achievement via the exit test of the coursebook before and after Scratch integration. The results indicated that both of the groups significantly increased their coursebook achievements from the pre-test to the post-test. This finding might be attributed to the participants' general success in the coursebook. The overall performance of the class was always above average in the

previous years. Therefore, integrating Scratch may not have affected the students' coursebook achievement. This finding was in line with Moreno-León and Robles (2015) who also found no significant effect of Scratch on the students' academic achievements.

The Effect of Integrating Scratch on Students' Language Use Skills

The effect of Scratch integration on children's language use skills which were vocabulary, functional language, and grammar was measured using the Oxford Young Learners Placement Test. The results showed that both the students who were taught by using Scratch and who were not significantly improved their overall language use skills from the pre-test to the post-test. In the literature, Ihmaid (2017) was the first to investigate the effect of Scratch on participants' vocabulary skills and reported the positive effect of Scratch on the enhancement of vocabulary and its retention. Since the system did not provide the participants' scores for vocabulary, functional language, and grammar skills separately in our study, we are unable to compare our results with Ihmaid's (2017).

The Effect of Integrating Scratch on Students' Listening Skills

We explored the effect of Scratch integration on children's listening skills through the Oxford Young Learners Placement Test. According to the results, the students who participated in Scratch activities significantly improved their listening skills from the pre-test to the post-test. Our findings did not support what Costa et al. (2018) reported in their study. Based on their results, Scratch activities did not have any influence on the experimental group students' performance. The significant finding of our study might be explained by the nature of Scratch activities. There was a specific emphasis on the "speak…" block which spoke the written text. The students included that block in each Scratch project that they created. Each time after writing a word or a sentence in English into the block, the students were encouraged to click and listen to it several times. This may have provided our participants with an opportunity to practice listening skills.

The Effect of Integrating Scratch on Students' Speaking Skills and Narrative Skills

As for the children's speaking and narrative skills before and after Scratch integration, we found a significant increase in the use of story structure components and structural complexity of both groups. To the best of the researcher's knowledge, no one has studied the effect of Scratch integration on narrative skills of children. Therefore, it is not possible to compare our results with the findings in the existing literature. Yet, similarly, Costa et al.'s (2018) study examining children's speaking skills via oral production tests found that Scratch integration did not result in improvement of children's speaking skills. In our study, even though the descriptive analysis showed a clear trend for the experimental group as they outperformed the control group in five out of six components in their narratives, no significance was found. This may be due to the fact that the power of the present study was rather low because of the limited number of participants. Therefore, further work with more participants is necessary to investigate the trend we observed here would be statistically significant with a greater number of participants.

The Effect of Integrating Scratch on Students' Executive Function Skills

We explored the effect of Scratch integration on children's executive function skills through the Wisconsin Card Sorting Test. According to the results, both of the groups performed better in terms of their correct responses and non-perseverative errors. To the researcher's knowledge, no one has studied the effect of Scratch integration on children's executive function skills. Therefore, we are unable to compare our results.

The Effect of Integrating Scratch on Students' Computational Thinking Skills

Regarding the effect of Scratch on children's computational thinking skills, we found that children's computational thinking skills improved significantly from mid-test to the post-test. While this result was in line with what Oluk and Korkmaz (2016) reported, it conflicted with some findings in the literature (Ceylan, 2020; Seo & Kim, 2016). Seo and Kim (2016) reported that Scratch did not affect the participants'

performances significantly when compared. They only found a significance for the performance of experimental group as a result of a within-group analysis. On the other hand, Ceylan's (2020) findings indicated no significant difference in the average scores of the two groups. They only revealed that the control and the experimental group significantly differed from each other in the abstraction subskill, which indicated the ability of filtering out the unnecessary details while solving a problem.

3.3.2 Study B: Qualitative Study

3.3.2.1 Aim

Study B explored the benefits and challenges of integrating Scratch into language instruction to highlight the process from both the teachers' and students' perspective. The rationale was to provide an understanding of the phenomenon and present implications for language teachers who might use Scratch as a tool in their classes. In addition, the analysis revealed some suggestions to overcome the problems that might occur.

3.3.2.2 Participants

The study took place in two phases. In phase one, the participants were five students who took part in the experimental group in Study A. In phase two, a total of 51 students took part in the study. We chose the participants via a stratified sampling method based on their school level and the program in which they were enrolled at the language center. Considering their school level, the students both from the elementary and middle school were included. Considering the program, the students from different programs were involved such as five days a week, three days a week and two days a week. Their native language was Turkish, and they were learning English as a foreign language. Thirty of the participants were female, and 21 of them were male. The age range of the group was from 8 to 13 (M= 9.7, SD= 1.48). Forty-nine of these participants were state school students. There were 35 elementary school and 16 middle school students. They were enrolled in different programs in the language learning center, such as two days a week, three days a week, and five days a week.

Almost all participants had computers and internet access at home. 66.7% of them stated they had no previous coding experience. Table 16 summarizes the demographic information about the participants.

Table 16: Overview of the Participants' Demographic Information

Variables		N	%
Age			
	8	12	23.5
	9	15	29.4
	10	7	13.7
	11	11	21.6
	12	3	5.9
	13	3	5.9
Gender			
	Female	30	58.8
	Male	21	41.2
School			
	State	49	96.1
	Private	2	3.9
Grade			
	2nd	12	23.5
	3rd	15	29.4
	4th	8	15.7
	5th	11	21.6
	6th	3	5.9
	7th	2	3.9
Have a computer			
	Yes	49	96.1
	No	2	3.9
Have internet connection			
	Yes	49	96.1
	No	2	3.9
Coding experience			
	Yes	17	33.3
	No	34	66.7

One parent did not state the amount of time that the participant spent using the computer. The mean was 2.12 for the others. Only 27 of the parents stated they spent time studying English with their children at home, but one parent did not state the amount.

Table 17: Hours Spent Using Computer and Studying English

Variable	N	M (h)	SD	Min	Max
Time spent using PC	50	2.12	1.56	0.00	6.00
Time spent studying English	26	1.40	.73	.5	3.00

To investigate the benefits and challenges of integrating Scratch into language instruction from the teachers' perspective, the researcher took part in phase one, and four teachers took part in phase two. One of these teachers was working in the language center for almost five years, another one was for four, and two of them were newly recruited in the 2019-2020 academic year. None of these teachers had prior experience of using Scratch.

3.3.2.3 Data Collection Tools

Teacher journals and student evaluation forms were used as tools to address the second research question, which was questioning the benefits and challenges of integrating Scratch into language instruction. The tools were designed by the researcher.

Teacher Journals

The journal consisted of six questions which investigated the strong and weak aspects of the lesson, the difficulties that the teacher had, the difficulties that the students had, each students' progress with respect to their language and cognitive skills, and if the lesson went according to the plan. The researcher completed a journal (see Appendix E) after each Scratch session, while the other teachers completed a weekly journal (see Appendix F).

Student Evaluation Forms

There were three questions in the student evaluation forms (see Appendix G). The first one was a 5-point Likert scale about the students' feelings after the Scratch activity. In this question, emojis were used to be able to address the young learners. The other questions were about the things that they liked, and they did not like about the lesson. There were three list bullets in each question to encourage students to write an answer. Since some students were not capable of writing in English, they were allowed to fill the form in Turkish as well.

3.3.2.4 Data Collection Procedure

The first step of the data collection was to receive the parents' consent. After the parents filled out the consent form (see Appendix B), the data collection process started. In phase one, the participants took part in 20 Scratch activities for almost three and a half months. After each Scratch activity, the researcher completed the teacher journal (see Appendix E) and the participants filled out the evaluation form (see Appendix G) at the end of the lesson. The journals and student evaluation forms were collected at the beginning, in the middle, and at the end of the Scratch implementation for four sessions each. Totally, there were 12 journals from the researcher, and 55 student evaluation forms to be analyzed. Figure 22 summarizes the data collection procedure.

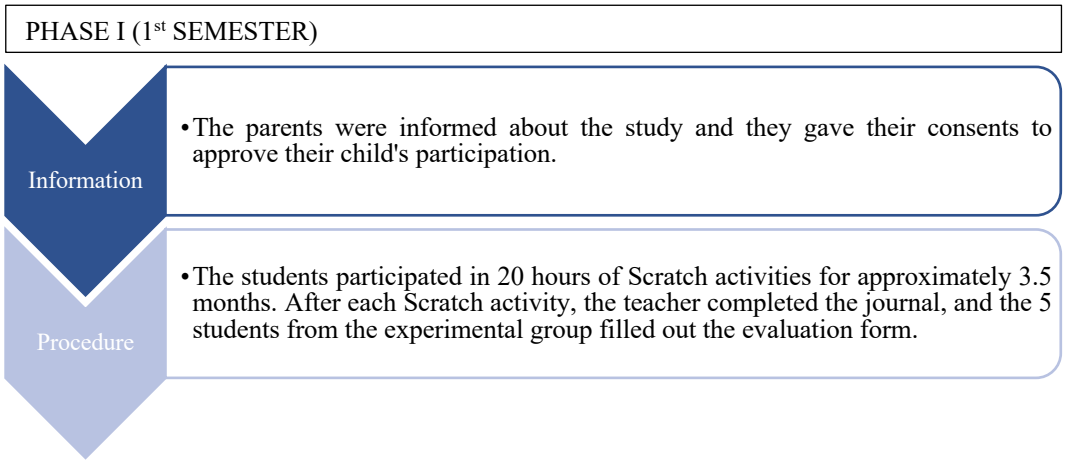

Figure 22: Data Collection Procedure in Phase I

In phase two, the process began after the parents and the teachers filled the consent forms (see Appendix B). The parents also completed the questionnaire (see Appendix C) to provide information about their children. The teachers wrote a weekly journal (see Appendix F), while the students filled out the evaluation form (see Appendix G) after the Scratch activities. The second phase was aimed to last for the whole semester. However, the process had to be stopped after a month due to the COVID-19 epidemic. As a result, only eight journals written by four teachers, and 84 student evaluation forms were included in the analysis. Figure 23 summarizes the procedure.

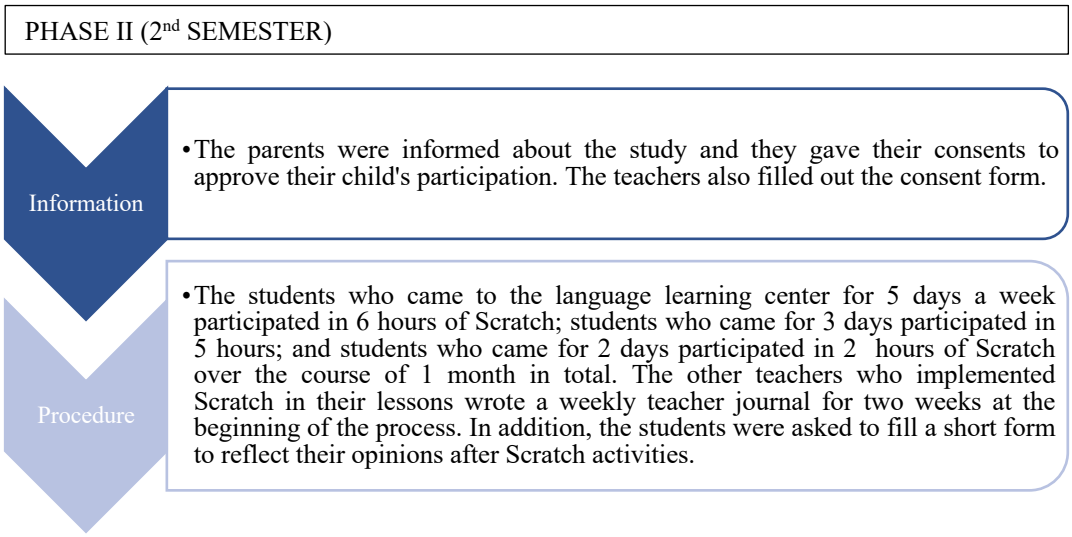

Figure 23: Data Collection Procedure in Phase II

3.3.2.5 Data Analysis

To collect data, teacher journals and student evaluation forms were used. As the first step, all data obtained from these tools were computerized. The data about the participants' feelings after each Scratch activity were transferred to the IBM SPSS to conduct descriptive analysis. The organization and analysis of the qualitative data was performed through the use of MAXQDA 2020. The researcher analyzed the data through the structural coding method. Saldaña (2009) defines structural coding as, "a question-based code that acts as a labeling and indexing device, allowing researchers to quickly access data likely to be relevant to a particular analysis from a larger data set (Namey et al., 2008)" (p.84). Based on this, the researcher coded the data considering the second research question which was addressed to investigate the benefits and challenges of integrating Scratch into language instruction from the students' and teachers' perspective. To explain it step by step, first, the data was organized in the software. Then, initial coding was done considering the two categories emerging from the research question as "benefits" and "challenges". Then, the researcher reviewed the codes again and classified under the relevant category. Lastly, the similarly coded segments were analyzed in detail in terms of their similarities, differences, relationships. The frequency analysis of these codes was also conducted to be presented in the findings.

3.3.2.6 Results

This study explored the benefits and challenges of integrating Scratch into language instruction from the perspective of students and teachers. The qualitative data was gathered in two phases. In the first phase, five participants from the experimental group and the researcher were the sources of data. The data collection tools were student evaluation forms and teacher journals. Both the students and the teacher filled out the forms after each Scratch activity. Totally 12 teacher journals and 55 student evaluation forms were included in the analyses. The data was collected for four sessions at the beginning, four sessions in the middle, and four sessions at the end of the process.

Fifty-one students and four teachers took part in the second phase. The data was gathered using the same tools for one to three weeks, depending on the class schedule. Eight teacher journals written by four teachers and 84 student evaluation forms were included analyses. Table 18 below presents the number of student evaluation forms and teacher journals to be analyzed in this study.

Table 18: Overview of the Data

	Phase I (1st Semester)	
5 Students		55 Student Evaluation Forms
Researcher		12 Journals
	Phase II (2nd Semester)	
51 Students		84 Student Evaluation Forms
Teacher A		3 Weekly Journals
Teacher B		2 Weekly Journals
Teacher C		2 Weekly Journals
Teacher D		1 Weekly Journal

3.3.2.6.1 Phase I: Students' Perspective

Firstly, the participants' responses on the 5-point Likert scale were examined to reveal their feelings after Scratch activities. The results of the descriptive analysis indicated that the students enjoyed the lessons with Scratch greatly. Table 19 presents the results.

Table 19: Affective Experiences of the Participants in Phase I

		N	Very Sad	Sad	Neutral	Happy	Very Happy
Beginning	Activity 1	5	-	-	-	1	4
	Activity 2	5	-	-	-	-	5
	Activity 3	4	-	-	-	-	4
	Activity 4	4	-	-	-	-	4
Middle	Activity 1	5	-	-	1	-	4
	Activity 2	4	-	-	-	-	4
	Activity 3	5	-	-	-	-	5
	Activity 4	4	-	-	-	1	3
Final	Activity 1	5	-	-	-	-	5
	Activity 2	4	-	-	1	3	-
	Activity 3	5	-	-	-	-	5
	Activity 4	5	-	-	-	-	5
Total			-	-	2	5	48

As can be seen, no participant chose very sad or sad to describe their feelings. Only one participant chose the neutral option. As for the rest of the participants, almost all of them stated they were very happy with the lesson, while five described themselves as just happy.

Next, data revealing the participants' opinions about the benefits and challenges of Scratch activities will be presented. Table 20 the benefits of integrating Scratch.

Table 20: The Benefits of Integrating Scratch from the Students' Perspective

Codes	**Frequency**
Enjoyable lessons	23
Enjoying Scratch features and the projects	23
Working in pairs	17
Everything was good	9
Learning new things about Scratch	8
Working individually	7
Using Scratch as a tool	7
Being a driver	6
Learning English	6
Being able to create as wanted	6
Being a navigator	5
Using a computer as a tool	4
Feeling like playing a game	4
Learning about Scratch	3
Gaining a reward from the teacher for good work	2
Being good at using Scratch	2
Switching roles as a driver and navigator	1
Total	129

As illustrated in the table, the participants' opinions of the benefits of integrating Scratch into language instruction revealed codes such as enjoyable lessons, enjoying Scratch features and the projects, working in pairs, and learning English. Totally, the analysis reported 17 codes emerging 129 times. However, some of these codes occurred more frequently than others. The majority of the codes pointed out that the participants thought their lessons with Scratch were enjoyable thanks to the Scratch features and the projects they created. Some of the examples which were translated from Turkish to English are presented below.

> I liked this lesson because it was really exciting to move the fish (Participant 1, Beginning, Activity 3).
>
> I liked this lesson because it was funny that the shark was at school (Participant 5, Beginning, Activity 1).
>
> I liked this lesson because it was always changing the color (Participant 2, Final, Activity 1).
>
> I liked this lesson because the food was coming after 5 seconds (Participant 1, Middle, Activity 4).
>
> I liked this lesson because we chose very nice sprites (Participant 4, Middle, Activity 3).

The students stated they liked everything about the lesson nine times. In addition, they stated that working in pairs was one of their favorite aspects. However, as the number of participants in the experimental group was not even (N=5), there was one student in each Scratch activity working individually. As a result of this, working individually code occurred seven times, although the aim was the opposite. Yet, it is clear that working in pairs overall outweighed working individually.

The majority of the rest of the codes were regarding the use of Scratch as a tool. The participants mentioned some benefits such as using the computer and Scratch as a tool,

being a driver, being a navigator, switching roles as driver and navigator, being able to create something as they wanted, and learning new things about Scratch in each lesson. In addition, they stated that they felt like playing a game during the lesson. Also, as they improved themselves, they felt confident and stated they became better at using the program as one of the benefits of Scratch integration.

Lastly, the students thought they improved themselves in the target language with the integration of Scratch, and some students mentioned gaining a reward from the teacher for their good work in the lab as a benefit.

Next, the participants' opinions about the challenges of integrating Scratch into language instruction will be presented. Table 21 reports the codes and their frequencies obtained from the data analysis.

Table 21: The Challenges of Integrating Scratch from the Students' Perspective

Codes	**Frequency**
No challenge	21
Complaints about their pair	7
Not enjoying the role of a driver	4
Boring	1
Not working with a headphone	1
Being disrupted by other students	1
Wishing they had more Scratch sessions	1
Making a coding error	1
Working in pairs	1
Not being good	1
Total	39

As a result of the analysis, ten codes emerged 39 times. Twenty-one of these implied that the participants did not face any difficulty as a result of the Scratch integration. When they did, it was mostly because of the problems that occurred between the participants and their pairs. The second most frequent code was regarding the driver role. Some participants did not enjoy being a driver during Scratch activities.

The rest of the codes were the least frequent ones occurring only once throughout the analysis. One participant thought the lesson with Scratch was boring. Another participant stated not working with a headphone as a challenge. The other challenges

of the integration of Scratch were as follows: being disrupted by other students, making a coding error, and not being good at using the program. One participant stated s/he wished they had more Scratch sessions, which is actually reflecting the participant's positive attitude towards the lesson. Finally, working in pairs was implied to be a challenge by Participant 4, although the same student mentioned working in pairs as an advantage several times.

3.3.2.6.2 Phase I: Teacher's Perspective

The researcher's perspective about the benefits of integrating Scratch into language instruction was obtained through the journals. After the examination of 12 journals, the following codes emerged:

Table 22: The Benefits of Integrating Scratch from the Researcher's Perspective

Codes	**Frequency**
Improving speaking skills	10
Improving writing skills	8
Enjoyable lessons	7
Fostering motivation	7
Improving listening skills	4
Improving vocabulary	3
Fostering collaboration	1
Total	40

As illustrated in the table above, the analysis resulted in the emergence of seven codes with a total frequency of 40. All of these codes were found to be student-related. The codes revealed that the researcher believed the integration of Scratch into language instruction fostered students' development in the target language.

With regard to the target language, the most frequently mentioned code was the improvement in the students' speaking skills. Some excerpts from the journals are presented below to provide an example.

> …She speaks English all the time and this way encourages her pair to speak English, too (Researcher T., Beginning, Activity 4).

> …Also, they are improving the way that they talk to each other. Before, they were just saying "No, no" or speaking in Turkish like "bunu seç, onu seçme." Now, they are saying, "Let's choose this./Can we choose this sprite?/Yes, or let's choose another sprite." They mostly use phrases like "Click here, click this, choose this, ... block, … code" (Researcher T., Middle, Activity 1).

> Participant 3 is speaking English more nowadays during the Scratch sessions and in the classroom as well. Normally it is difficult to make him speak English, but as being in the computer lab is something that he wants, it motivates him to speak English (Researcher T., Middle, Activity 2).

> …They tried to speak English with each other during the lesson. Participant 3 was repeating English sentences after their sprite spoke (Researcher T., Beginning, Activity 1).

Next, the development of writing skills, listening skills, and vocabulary were listed, respectively.

> All of the students are improving in terms of their writing skills because in order to make their sprites talk they need to use the "speak…" block. With the help of that, they learned the spelling of a lot of words (Researcher T., Middle, Activity 1).

> Also, while they are using the text to speech block, I think he gained awareness of the spellings of the words. Otherwise, he wouldn't pay attention much in the classroom (Researcher T., Middle, Activity 4).

> …This time students made some typos while writing a text into text to speech block. I made them listen to the text and said, "listen and fix if there is something wrong here." They listened and came to me having realized their typos like "dady, Iam". Then, they wrote the sentences again (Researcher T., Beginning, Activity 3).

> … I can say that so far, they have learned new vocabulary about the Scratch or computer use like "click, drag, drop, double-click, sprite, backdrop, stage, coding area, codes, blocks, etc." (Researcher T., Beginning, Activity 2).

The rest of the codes indicated that the researcher believed the Scratch integration made the lessons enjoyable for the students, fostered their motivation and collaboration skills.

> …They enjoyed the lesson and learning new codes every lesson makes them really happy (Researcher T., Beginning, Activity 3)

> As the students were creating their games for the first time, they got really excited when they heard we will have scores (Researcher T., Middle, Activity 2).

> All of the students are improving in terms of their writing skills because in order to make their sprites talk they need to use "speak…" block. With the help of that, they learned the spelling of a lot of words (Researcher T., Middle, Activity 1).

> Also while they are using the text to speech block, I think he gained awareness of the spellings of the words. Otherwise, he wouldn't pay attention much in the classroom (Researcher T., Middle, Activity 4).

The rest of the codes indicated that the researcher believed the Scratch integration made the lessons enjoyable for the students, fostered their motivation, and collaboration skills.

> …They enjoyed the lesson and learning new codes every lesson makes them really happy (Researcher T., Beginning, Activity 3).

> As the students were creating their games for the first time, they got really excited when they heard we will have scores (Researcher T., Middle, Activity 2).

Next, the researcher's journals were examined in terms of the challenges of Scratch integration. Table 23 below shows the findings.

Table 23: The Challenges of Integrating Scratch from the Researcher's Perspective

Codes	**Frequency**
Student-Related	
Not enjoying the role of navigator	3
Not speaking the target language	3
Difficulty in understanding the roles of driver and navigator	3
Difficulty in writing/using keyboard	3
Not paying attention to the instructions	2
Being pair with a disruptive student	2
Teacher-Related	
Insufficient time/time management	3
Loss of time due to technical problems	2
Demanding preparation prior to the lesson	1
Difficulty in organizing pairs	1
Total	23

As depicted in the table, the analysis of the researcher's journals revealed ten codes. Six of these were student-related, while four of them were teacher-related. Firstly, the student-related challenges will be presented. Three types of students were identified as a challenge: the students who did not enjoy the role of navigator, the students who did not speak English, and the students who did not pay attention to the instructions.

> …Some students were impatient, and they didn't give enough time for their friends to do things (Researcher T., Beginning, Activity 1).

> …Navigators were sometimes trying to interfere with their pairs' work (Researcher T., Beginning, Activity 1).

> Participant 3 speaks Turkish too much and it is difficult to encourage him to speak in English (Researcher T., Beginning, Activity 4).

> Participant 5 is the most difficult student in the class. He really has difficulty paying attention to one task. And he constantly tries to do something irrelevant or really has hard time focusing. Besides, he doesn't really speak English although he can. This is why I should be around him to monitor all the time (Researcher T., Middle, Activity 4).

The other challenge reported in the journals was the difficulty in understanding the roles of driver and navigator.

> When they are the navigator, they think that they will be the only one to decide on the sprites or characters. I made it clear today that it's a pairwork (Researcher T., Beginning, Activity 3).

Moreover, it was mentioned that some students had difficulty in writing and using the keyboard.

> One pair was struggling with the writing part into text to speech block. They had to write the same sentences again and again because they accidentally deleted what they had typed (Researcher T., Beginning, Activity 2).

Lastly, being pair with a disruptive student was a challenge for the other students.

The rest of the challenges were teacher-related. These were time management, loss of time due to technical problems, demanding preparation prior to the lesson, and difficulty in organizing pairs.

> …Participant 5 accidentally clicked the "record…" block, so their program did not answer the request, and it stopped working. We had to open it again, so we lost like 5 minutes. (Researcher T., Final, Activity 2)

> …The only difficulty before each lesson is the preparation stage. I need to design projects myself and decide on the target. Only that phase is little bit demanding (Researcher T., Middle, Activity 1).

> Participant 2 is fine but Participant 5 and Participant 3 speaks Turkish a lot. So, it is a little problematic if they are working together. That's why it's difficult to organize pairs (Researcher T., Beginning, Activity 4).

During the analysis of the data obtained from teacher journals, some suggestions were also made for integrating Scratch into language instruction. Although the researcher did not have an intention to point out suggestions for this study initially, it was thought that these codes might be beneficial. Table 24 presents the suggestions generated from the researcher's journals.

Table 24: Suggestions for Integrating Scratch

Codes	Frequency
Gradually, provide less guidance	2
Encourage students to use certain phrases	1
Make sure everyone is at the same place	1
Encourage students to share their projects in class	1
Switch driver and navigators after some time	1
Provide assistance when necessary	1
Prepare the computers before the lesson	1
Total	8

During the analysis of the researcher's journals, seven codes about the suggestions for integrating Scratch into language instruction were indicated. At the initial stages, the teachers suggested making sure every student is at the same place before moving on too fast while creating projects and showing them the next step.

> All students worked at different paces, so I had to run from computer to computer. Next time, I will make sure everyone is at the same place then show them what to do (Researcher T., Beginning, Activity 2).

After students got used to using the program and gained some competency, she suggested providing less guidance.

> Also, I showed what I wanted from the example, went over the blocks and turned off the projection so that they could do what they wanted instead of doing the same as I did (Researcher T., Final, Activity 3).

> … I turned off the projection after showing the blocks and the target (uploading backdrop from the computer). It definitely worked better. The students pay more

> attention to the blocks this way and it is more engaging (Researcher T., Final, Activity 4).

Next, it was suggested to encourage students to make use of certain phrases while working in pairs to improve the students' speaking skills.

> I also asked them to use some phrases while talking like "Can we choose this sprite? Can we choose this backdrop?" (Researcher T., Beginning, Activity 4)

Another code that emerged in the analysis emphasized sharing in class. The researcher suggested creating a classroom environment that will encourage students to share their projects with each other.

> We had extra time and everyone tried each other's game and it was actually better (Researcher T., Middle, Activity 2).

The researcher also benefited from the student feedback during the process and stated that it might be better to switch the roles of driver and navigator after some time to prevent boredom.

> Based on previous Scratch lab's feedback, I switched navigators and drivers after 20 minutes. I think it worked better (Researcher T., Final, Activity 2).

Even though the researcher aimed to encourage students to solve the problems themselves instead of showing them what to do immediately, she suggested that students should be provided with assistance when necessary. Her experience was as follows:

> It wasn't really a difficulty, but they were putting blocks and they put two "go to …" blocks in a row and so they gave command the sprite to do it when the green flag clicked. But the sprite was doing it so quickly so they couldn't do what they wanted. In that moment, I assisted students and told the problem. I

said that the sprite should wait a little in between, and they added a wait block (Researcher T., Middle, Activity 1).

Lastly, it was suggested to prepare all the computers before the lesson to avoid loss of time.

> I should turn on the computers before students arrive in the class. Today, we waited for like 10 minutes until one computer was ready because of the updates. If that hadn't happened, we could have done everything just as I planned (Researcher T., Beginning, Activity 2).

3.3.2.6.3 Phase II: Students' Perspective

Firstly, the 51 participants' affective experiences in their lessons with Scratch were examined through frequency analysis. The findings revealed that the students enjoyed the lessons with Scratch to a great extent. Table 25 illustrates the results.

Table 25: Affective Experiences of the Participants in Phase II

	N	Very Sad	Sad	Neutral	Happy	Very Happy
Activity 1	49	-	1	1	10	37
Activity 2	37	1	-	4	9	23
Activity 3	5	-	1	-	1	3
Total		1	2	5	20	63

The results showed that the participants in their first session had positive feelings towards the integration of Scratch. Among 49 participants, only one of them marked his/her feeling as sad, and one of them as neutral. The rest of the participants stated they were happy or very happy. The students who participated in the second scratch activity provided similar results. Only one of the 37 participants stated s/he was very sad, and four of them stated their feelings were neutral. Nine of these participants stated they were happy with the lessons, whereas 23 of them stated they were very happy. Lastly, only five students from Teacher A's class were able to participate in the third Scratch activity. In the findings, it was seen that only one student marked sad. On the other hand, the rest of the students' experiences were either happy or very happy.

Next, we examined the participants' opinions about the benefits of integrating Scratch into language instruction. Table 26 shows the findings.

Table 26: The Benefits of Integrating Scratch from the Students' Perspective

Codes	Frequency
Enjoyable lessons	30
Everything was good	21
Enjoying Scratch features and the projects	19
Enjoying coding	11
Using Scratch as a tool	9
Using a computer as a tool	7
Working in pairs	7
Being able to create as wanted	5
Being a driver	3
Switching roles as a driver and navigator	2
Learning English	2
Learning new things	2
Different	1
Less speaking practice in the lesson	1
Easy to use	1
Being good at using Scratch	1
Gaining a reward from the teacher for good work	1
Total	123

A total of 18 codes occurred 123 times. Among these, four codes occurred far more frequently than the others. These were enjoyable lessons, enjoying Scratch features and the projects, enjoying coding. In addition, students stated they liked everything about the lesson 11 times. Some excerpts are presented below as an example.

> I like the way of making videos (Teacher A's student, Session 2).

> I liked this lesson because the animal and people sprites are very nice (Teacher E's student, Activity 2).

> The lesson is so goood because I like codeing (Teacher D's student, Activity 1).

Next, the results indicated that the participants enjoyed using Scratch and using a computer as a tool in the lessons. They also stated working in pairs as one of the benefits.

> We learn pair work (Teacher A's student, Activity 3).

> We are groups and we make suggestion to ourselves (Teacher A's student, Activity 2).

The students also stated creating something as they wanted, being a driver, and switching roles as the driver and the navigator were the strong aspects of the lesson. Two students found Scratch beneficial because it helped them to learn English and new skills. The rest of the codes were the least frequent ones, which were mentioned only once by different students. Two of these were about Scratch: the fact that it is a different environment, and it is easy to use. One middle school student stated they did comparatively less speaking in the lesson as a benefit of the Scratch integration. Lastly, gaining confidence and being good at using Scratch and gaining a reward from the teacher for good work were regarded as benefits.

Next, Table 27 reports the challenges of integrating Scratch.

Table 27: The Challenges of Integrating Scratch from the Students' Perspective

Codes	**Frequency**
No challenge	51
Boring	5
Wishing they had more Scratch sessions	4
Being disrupted by other students	3
Not being a driver	3
Not finding the desired features	2
Not gaining a reward from the teacher for their work	2
Being anxious about falling behind the curriculum	1
Disagreement with their pair	1
Time management	1
Difficult to use	1
Disturbed by the occasional use of the mother tongue	1
Technical problems	1
Not being able to do projects freely	1
Not being a navigator	1
Not being good	1
Total	79

A total of 16 codes emerged in the analysis of 84 student evaluation forms. The far most frequently mentioned code indicated that the participants did not have any challenge at all. The rest of the codes did not occur many times in the forms. The codes

which occurred more than once were boring, being disrupted by other students, not being a driver, not finding the desired features in the program, and not gaining a reward from the teacher for their work. Some students mentioned not having more Scratch sessions as a challenge, which was actually a positive comment about the integration. The other codes emerged only once in the journals, and they were reported as follows: being anxious about falling behind the curriculum, disagreement with their pair, time management, being disturbed by the occasional use of mother tongue in the lesson, technical problems, not being able to do projects freely, not being a navigator, and not being good at using Scratch. Lastly, one student thought Scratch was difficult to use.

3.3.2.6.4 Phase II: Teachers' Perspective

Lastly, this study examined four teachers' perspective about the benefits of integrating Scratch through weekly journals. As mentioned earlier, some teachers conducted three Scratch sessions with their students, while the others were able to participate in only one or two sessions due to the schedule of the class. Table 28 presents the codes and the frequencies.

Table 28: The Benefits of Integrating Scratch from the Teachers' Perspective

Codes	**Frequency**
Fostering collaboration	4
Fostering students' motivation	2
Improving students' vocabulary	2
Improving students' speaking skills	1
Total	9

Totally four codes occurred and the most frequent among them was fostering student collaboration. To exemplify, one teacher answered the question investigating whether the students had any difficulties in their first Scratch activity as follows:

> No, they did not. Actually, most of them have learnt this programme before, they helped the others (Teacher B, Activity 1).

Another teacher highlighted the improvement in the collaboration skills of her students.

> I changed the old pairs and I observed that they were getting used to being pairs with different students (Teacher A, Activity 3).

As for the rest of the codes, two of them were related to the improvement of students' skills in the target language, namely vocabulary, and speaking skills.

> In all levels, the students learned all the vocabulary I presented about computers and Scratch, such as code, block, click, drag, sprite, background, driver, navigator etc. (Teacher C, Activity 2).

One teacher reported the students' improvement in terms of their speaking skills in the target language in the second Scratch activity.

> They tried to speak English each other more than the first week. (Teacher B, Activity 2)

Lastly, the teachers thought that integrating Scratch into language teaching fostered student motivation.

> They were so excited about using computers and they were curious to learn more about Scratch (Teacher D, Activity 1).

Table 29 shows the teachers' opinions about the challenges of integrating Scratch.

Table 29: The Challenges of Integrating Scratch from the Teachers' Perspective

Codes	**Frequency**
Student-Related	
Difficulty in writing/using the keyboard	8
Not pay attention to the instructions	4
Not speaking the target language	3
Difficulty in understanding the roles as driver and navigator	2
Asking everything to the teacher	2
Unwilling students	1
Challenge for students with learning difficulties	1
Teacher-Related	
Insufficient time/time management	7
Difficulty in finding new ideas for middle school students	2
Difficulty in organizing pairs	1
Total	31

Table 29 illustrates that seven codes related to the students and three codes related to the teachers occurred after the analysis of the journals. The most frequent code was regarding students who had difficulty in writing and using the keyboard.

> They have difficulties using the keyboard. Especially, adding question marks, apostrophe, capital letters and differentiating i and I letters (Teacher A, Activity 2).

> The elementary school students who are 1st grade don't exactly know how to write in their native language, let alone in English. This was the first time they started using a keyboard, and thus, they had a hard time using capital letters and punctuation marks (Teacher 3, Activity 2).

According to the four teachers, four types of students were identified as a challenge during the integration of Scratch. These were the students who did not pay attention to the instructions, the students who did not speak the target language, the students who asked everything to the teacher, and unwilling students.

> While I was introducing or explaining the things we were up to do, some of them did not listen, tried to do on his own (Teacher B, Activity 1).

> …Also, some of them did not follow my instructions at the beginning and wasted their time with exploring other parts of Scratch such as using "kitten voice", and looking at "costumes" tab. I had to warn them constantly, which was a bit tiring for me (Teacher D, Activity 1).

> They tend to speak in Turkish with each other while working on the project (Teacher D, Activity 1).

> Since they were new to Scratch, they usually asked for my help instead of discussing the problems with each other (Teacher D, Activity 1).

> The students were not really willing to do a project about the topic I presented, but they tried to have fun discovering and using other features in Scratch (Teacher C, Weeks 1-2, Activity 2).

In addition, Teacher A had a student with learning difficulty in her class. She mentioned that this was sometimes a challenge for both the student and her pair.

> One of my students (12 years old) has dyslexia and she had difficulties spelling the words correctly and the pronunciation of the words were all wrong and she really felt disappointed and her pair also felt upset about the last version of their project (Teacher A, Activity 3).

Lastly, the students sometimes had difficulty in understanding the roles of driver and navigator, and this was reported to be one of the challenges.

> In my 5 days class, some of the drivers did not agree with the things that the navigator said, and the same situation with the navigators. They could not make their decisions together (Teacher B, Activity 2).

The findings of the analysis also indicated some challenges related to the teachers. The most frequently mentioned challenge was time management. In addition, the analysis

of the two teachers' journals revealed the code of difficulty in finding new ideas for middle school students.

> …However, as a teacher I have difficulties finding good project ideas for secondary school students (Teacher A, Activity 3).

> They proceed quickly, I should come up with more ideas (Teacher B, Activity 2).

Lastly, one teacher stated that organizing the pairs was a challenge for her.

> They were unhappy because I chose their partners, and they were reluctant to sit with their pairs. That is why we lost some time at the beginning of the lesson (Teacher D, Activity 1)

In addition to the findings above, Table 30 presents the two codes as a suggestion emerged from the analysis of the other teachers' journals.

Table 30: Suggestions for Integrating Scratch

Codes	**Frequency**
Carefully plan the lesson	4
Clarify the rules at the beginning	1
Total	5

One of these suggestions was planning the lesson in a well-organized way.

> Teachers should plan the lesson in a detailed way to have borders because the other way students may get lost. For that reason, I am planning to show project examples to my students in order to let them understand what they are expected to do (Teacher A, Activity 1).

> The students need more assistance in choosing the topic of the project. I aim to give more detailed instructions on what they are expected to do in lab. (Teacher C, Activity 2)

The last one was about clarifying the rules at the beginning in order to prevent undesired student behaviors.

> They tend to speak in Turkish with each other while working on the project, I think I need to clarify that they should follow the same rules in the lab (Teacher D, Activity 1).

3.3.2.7 Interim Discussion

Study B investigated the benefits and challenges of integrating Scratch into language instruction from the viewpoint of teachers and students. The study took place in two phases. While five students and the researcher participated in the study in phase one, there were 51 students and four teachers in phase two. In this chapter, a brief summary of the results and comparison with the previous work from the literature will be presented.

Phase I

According to the results, the students in phase one had a very positive attitude towards Scratch activities. As noted earlier, the data was collected at the beginning, in the middle, and at the end of the semester for four times each. Almost all of the students described their feelings as very happy or happy in those twelve lessons with Scratch. This finding confirmed the previous work in the literature (Lai & Yang, 2011; Wilson & Moffat, 2010). As for the benefits of the Scratch integration, the students thought the lessons were enjoyable, and they liked its features (sprites, backdrops, codes) and the projects they created. These were consistent with the previous work (Burke & Kafai, 2012; Ihmaid, 2017; Moreno-Leon & Robles, 2015; Sáez-López et al., 2016; Wilson & Moffat, 2010). Similar to Ceylan's (2020) finding, they enjoyed working in pairs and stated this quite frequently in the forms. The findings also indicated that the students greatly enjoyed using the computer and Scratch as a tool and their roles as driver and navigator. They liked being able to create something on their own and learning new things about Scratch in each lesson, which was in line with what

Kalelioğlu and Gülbahar (2014) found. The students stated they felt like playing a game during the lessons. They also felt more confident as they improved their coding skills. Finally, the students believed their English language skills improved thanks to Scratch, and they felt motivated when they received a reward from the teacher for their good work. Some of these results concurred with the previous studies. Moreno-León and Robles (2015) also noted that all the students enjoyed the lessons with Scratch, and they believed that Scratch taught them how to work collaboratively. Besides, the students believed that their English skills improved. Lastly, Ceylan (2020) reported that working with a computer was an exciting and motivating factor.

Regarding the challenges, the students stated they did not face any difficulty 21 times in the forms. When they had, it was mostly because of the disagreements they had with their pairs. Another most frequent challenge was being the driver for the students. The role of a navigator was more appealing to them since the navigator was the one guiding the driver. The other challenges emerged only once during the analysis. One student stated not having more Scratch activities as a challenge, which actually reflected a positive attitude. Another student stated that working in pairs was challenging, even though s/he mentioned the opposite several times. One student found the lesson boring, and that was from the time when s/he was working with a comparatively slow student. The other codes were regarding the students' dissatisfaction with their own performance such as were making a coding error, and not being good at using Scratch. Lastly, the students stated being disrupted by the others and not working with a headphone as challenges. Based on these findings, it is possible to make the following suggestions: the teachers should change the students' roles after some time, they should organize the pairs carefully considering the students' strengths and weaknesses (e.g., being impatient, slow, good at using the computer), and they should create a classroom environment in which working in pairs does not become disruptive for the others.

Next, we explored the benefits of Scratch integration from the researcher's viewpoint. The analysis showed that all of the codes were student-related. The researcher believed that Scratch improved the students' skills in the target language. Improvement in speaking skill occurred the most frequently, which was then followed by writing,

listening, and vocabulary, respectively. The teacher also believed that Scratch made the lessons more enjoyable and fostered the students' motivation, which was in line with the previous findings (Burke & Kafai, 2012; Ihmaid, 2017; Moreno-Leon & Robles, 2015; Sáez-López et al., 2016; Wilson & Moffat, 2010). Lastly, she thought that Scratch improved students' collaboration skills through pair-work, which also supported what Ihmaid (2017) reported.

The analysis revealed ten codes regarding the challenges of Scratch integration from the researcher's perspective. Six of these codes were found to be student-related. The teacher stated that some students did not enjoy being a navigator, some did not speak the target language while working on the projects, and some did not listen to the instructions. Another challenge was the fact that the students had difficulty in understanding the roles in pair-work. Also, the researcher observed that the students who worked with a disruptive pair had difficulties. Lastly, she observed that some students had difficulty in writing and using the keyboard.

The rest of the challenges were teacher-related. The most frequently mentioned code among those was time management. The teacher stated that sometimes she lost some time due to technical problems, and organizing pairs was challenging. Finally, she stated that she had to spend a considerable amount of time for preparation before each lesson. These findings supported what Ceylan (2020) reported.

To overcome some of these problems, she made suggestions. Firstly, the researcher suggested making sure that every student was at the same place during the initial stages of Scratch instruction. As the students became competent, she stated that it would be better to provide less guidance. In addition, she highlighted the importance of using certain phrases to improve students' speaking skills, encouraging students to share their projects in class, and switching roles in pair-work to avoid boring the students. Although one of the aims of Scratch integration was to promote the students' problem-solving skills, she stated that students should be provided with help when necessary. Lastly, it was recommended to prepare all the computers before the lesson to avoid losing time.

Phase II

As noted earlier, the students in phase two took part in one to three Scratch activities over the course of four weeks, depending on their schedule. Therefore, the following findings were obtained based on the participants' very limited experiences. According to the results, the participants had a positive attitude towards Scratch activities, which confirmed the previous findings (Lai & Yang, 2011; Wilson & Moffat, 2010). Regarding the benefits of integrating Scratch, the analysis revealed similar results as in phase one. Most frequently, the students thought coding and the lessons with Scratch were enjoyable, and this was mostly because of Scratch features and the projects that they created. This finding was in agreement with the previous studies in the literature (Burke & Kafai, 2012; Moreno-Leon & Robles, 2015; Sáez-López et al., 2016). Similar to Ceylan's (2020) findings, the students mentioned using a computer, using Scratch, and working in pairs as a benefit. They also enjoyed being a driver and switching roles. In addition, students liked creating something (game, story, music) on their own and learning new things. These findings concurred with what Kalelioğlu and Gülbahar (2014) revealed. The students also thought that Scratch helped them to develop their English skills. The rest of the codes occurred only once throughout the analysis and these were Scratch's being different environment and easy to use, which confirmed what Kalelioğlu and Gülbahar (2014) reported. The students felt more confident in using Scratch and receiving a reward from the teacher for their good work was mentioned as a benefit. Lastly, one middle school student stated doing less speaking activities in the lesson as a benefit of the Scratch integration, which might be interpreted as a benefit of pair-work considering he felt more comfortable in Scratch activities rather than speaking in front of the whole class.

Regarding the challenges, the most frequently occurring code (51 times) indicated that the students did not face any difficulty. The rest of the codes emerged far less frequently. Similar to phase one, not having more Scratch activities occurred as a challenge, although it actually reflected the positive attitudes of the students. Some middle school students stated that the lessons were boring, which confirmed the teachers' opinions about the constant need for finding new ideas. In accordance with Kalelioğlu and Gülbahar's (2014) study, the students stated not finding the desired

features as a challenge. However, this problem could have been solved later on when the students learnt how to insert sprites or backgrounds from the web or the computer. Being disrupted by other students in the class, not being a driver and not receiving a reward from the teacher for their work were stated as other challenges. The other codes occurred only once throughout the analysis. Two of these were the anxiety about falling behind the curriculum and being disturbed by the occasional use of Turkish in the lesson, which were written by the same student with academic ambitions. The others were disagreement with the pair, time management issues, technical problems, not creating projects freely, not being a navigator, and not being good at using Scratch. Finally, one student found Scratch difficult to use. Some of these might be overcomed by changing the students' roles after some time in the lesson, allowing students to work freely if they finish their projects early, setting a clear time limit and reminding the students time for them so that they can keep the track, and organizing the pairs considering the students' characteristics.

Next, the study examined the four teachers' opinions about the benefits of Scratch integration. The most frequent code was fostering student collaboration in class, and this was in line with the previous findings (Ihmaid, 2017). The teachers believed that Scratch improved students' vocabulary and speaking skills in the target language. Lastly, the teachers thought that Scratch fostered student motivation, which also supported the previous findings (Ihmaid, 2017; Moreno-Leon & Robles, 2015; Sáez-López et al., 2016; Wilson & Moffat, 2010).

As for the challenges, the majority of the codes were student-related. The most frequent code among them was about students having difficulty in writing and using the keyboard. In addition, the students who did not listen to the instructions, spoke in the mother tongue, asked everything to the teacher, and did not want to participate in the lesson caused some challenges. The teachers also stated that sometimes the students had difficulty in understanding their roles as driver and navigator. Lastly, there was one student with a learning difficulty, and it was stated that sometimes this was a challenge both for the student and her pair. The results also highlighted some challenges related to the teachers. The most frequently occurring challenge was time management. Next, organizing the pairs occurred as a challenge. Finally, the teachers

had difficulty in generating new ideas, especially for middle school students. This confirmed what Ceylan (2020) reported in his study with middle school students. In his study, he mentioned that even though the students enjoyed working with computers, the activities became boring for them after some time. Therefore, the teachers were constantly in search of new and different programs that would appeal to the students. Similar to the findings of this study, Ceylan (2020) also reported that the teachers complained about the students who always put pressure on them for help.

During the analysis, two codes occurred as suggestions. Based on their experience, the teachers suggested clarifying the rules at the beginning of the process to avoid problems. Lastly, they highlighted the importance of the careful planning of the lessons.

CHAPTER 4

GENERAL DISCUSSION AND CONCLUSION

This study integrated Scratch into language instruction for children, investigated how this influenced the students' coursebook achievement, language use, listening, executive function, narrative, computational skills and explored the students' and teachers' opinions about the benefits and challenges of the process. To our knowledge, this study is the first that has explored this issue from as many aspects as we did. While ten students took part in Study A, a total of 56 students and five teachers took part in Study B. In this chapter, the findings of the study will be discussed by referring to the relevant literature.

Firstly, we investigated how integrating Scratch influenced the children's language and cognitive abilities. The intervention with Scratch activities lasted 13 weeks. The data was gathered through the exit test of the coursebook, Oxford Young Learners Placement Test, Multilingual Assessment Instrument for Narratives, Wisconsin Card Sorting Test, and Scratch Design Scenarios before and after the implementation.

4.1 Quantitative Findings of the Study

Regarding the impact of Scratch on children's coursebook achievement, we found out that both the students who were taught by using Scratch and who were taught in traditional way performed in a parallel manner and improved their scores significantly from the pre-test to the post-test. This result confirmed the findings of Moreno-León and Robles (2015). As noted earlier, our finding might be attributed to the participants' overall good performance in the coursebook assessments and integrating Scratch may not have affected the students' achievement.

As for the language use skills (functional language, vocabulary, grammar), the results indicated no significant effect of the Scratch integration on the children's performances since both groups significantly improved their overall performance from the pre-test to the post-test. There was one study which explored the effect of Scratch on vocabulary skill in the literature. Ihmaid (2017) reported that Scratch positively affected the improvement of vocabulary and its retention.

On the other hand, the findings showed that the children who took part in Scratch activities showed a significant improvement in their listening skills, which did not support what Costa et al. (2018) reported. The significant finding of our study could be attributed to the nature of Scratch activities in which the use of "speak…" block was specifically emphasized in each project. Every time after adding a new block, the students were encouraged to click and listen to the blocks a couple of times. This implementation might have resulted in the improvement of the children's listening skills.

In terms of the children's speaking and narrative skills, our findings showed that Scratch activities did not result in a significant improvement. Both of the groups improved their narrative abilities in a parallel manner from the pre-test to the post-test in terms of story structure and structural complexity. This finding supported Costa et al.'s (2018) study who reported no significant effect of Scratch on the students' speaking skills. Despite our non-significant finding, the experimental group's performance indicated a clear trend in the post-tests, which could be statistically significant with a larger sample size.

Regarding the children's executive function skills, the results showed that both of the groups showed a significant increase in their correct responses and non-perseverative errors. However, no one has studied the effect of Scratch integration on children's executive function skills as far as we know, and we are unable to discuss our results by referring to the literature.

Finally, an analysis was run to see how Scratch influenced the students' computational thinking skills. According to the results, Scratch activities resulted in a significant

improvement in the students' computational thinking skills. This showed that Scratch contributed to the children's development of computational concepts such as sequence, loops, parallelism, and events along with computational practices like critiquing, extending, debugging and remixing. While this finding confirmed the findings of Oluk and Korkmaz (2016), it did not support the previous work in the literature by Ceylan (2020) and Seo and Kim (2016).

To sum up, our findings showed that integrating Scratch activities into language teaching for children might be beneficial in terms of developing their listening and computational thinking skills. Regarding the coursebook achievement, language use, narrative and executive function skills, our results did not suggest any significant improvement. However, the children who participated in the Scratch activities showed a better performance in nine out of 13 test components. Therefore, we call on future work with more participants to see if this trend that we observed for the experimental group would turn out to be significant with a larger sample size.

4.2 Qualitative Findings of the Study

Benefits and Challenges of Integrating Scratch from the Students' Perspective

The results showed that the students overall had positive attitudes towards Scratch. Almost all students enjoyed the lessons and described their feelings mostly as very happy or happy, which confirmed the previous studies (Lai & Yang, 2011; Wilson & Moffat, 2010). In line with the previous findings, the students thought that the lessons with Scratch were different and enjoyable, and they liked its features and creating projects (Burke & Kafai, 2012; Ihmaid, 2017; Moreno-Leon & Robles, 2015; Sáez-López et al., 2016; Wilson & Moffat, 2010). Working in pairs emerged many times throughout the forms, and the students thought Scratch taught them how to work collaboratively, as Ceylan (2020) and Moreno-León and Robles (2015) also reported. In addition, they mentioned that they liked their roles as driver and navigator. Concurring with the findings of Kalelioğlu and Gülbahar (2014), the students enjoyed working with computers and using Scratch to create new things on their own. They also said that they felt like they were playing a game while Scratch helped them to

learn new things in each lesson, both about coding and English. The students found Scratch easy to use, and they became confident as they got better at using the program and gained rewards from the teacher for good work. Lastly, one student stated s/he liked Scratch because they did comparatively less speaking practice in the class, which might imply an advantage for the students who would feel more comfortable with pair work activities than whole class speaking practice.

As for the challenges, the students stated they did not have any difficulty 72 times. They sometimes had a disagreement with their pairs arising from their roles in pair work, such as not enjoying being the driver or the navigator or the navigators' being too impatient. The boring code emerged six times, and five of these were in the middle school students' forms, which was what the teachers realized. The students stated not having more Scratch activities as a challenge, which reflected their positive attitudes and enthusiasm. The rest of the codes occurred less than three times. Some of these challenges were being disturbed by other students, not finding the desired features in the tool (similar to Kalelioğlu & Gülbahar, 2014), not working with a headphone, not creating projects freely, facing with technical problems and losing what they did, and not being able to finish the project on time. Some challenges seemed to occur because of the students' sense of failure, such as not being good at using Scratch and believing it was difficult to use although that was the first session, not gaining a reward from the teacher for their work and making an error. Finally, one middle school student was anxious about falling behind the curriculum and s/he was disturbed by the occasional use of Turkish in class. The rationale behind using Scratch and how it is integrated into the curriculum like any other activities could be explained to the students at the beginning to overcome such perceptions that might occur in the students' minds. Also, the students' disagreements with their pairs occurred as the most frequent challenge even though they enjoyed working in pairs. This might result from the fact that the children were not used to working in pairs, and consequently discussing, making decisions, and creating something together. It clearly takes some time for them to get used to this and it is predicted to be less problematic over time as they understand the nature of working together.

Benefits and Challenges of Integrating Scratch from the Teachers' Perspective

Firstly, it is important to note that the researcher and the implementer of Scratch activities were the same person in this study. This had some advantages such as spending a lot of time in the research setting and observing the advantages and disadvantages of the process through experience at first-hand.

The data gained from the teachers' journals revealed more consistent results. All of the codes about the benefits of Scratch integration were related to the students. The teachers believed that Scratch fostered students' motivation and improved their speaking, vocabulary, and collaboration skills. In addition to these, the researcher mentioned that Scratch made the lessons more enjoyable for the students and helped them to develop their writing and listening skills.

On the other hand, the teachers thought Scratch was challenging because the students had difficulty in writing and using the keyboard, they did not speak in English while working in pairs and had difficulty in understanding the roles. Also, the unwilling and disruptive students who did not listen to the instructions caused difficulties both for their pairs and the teacher. The teachers also found the times challenging when the students asked everything to them without trying to work on the problems themselves. Lastly, there was one student with a learning difficulty, and sometimes this was a challenge both for the student and her pair. The rest of the codes were related to the teachers, and they were as follows: insufficient time/time management, loss of time due to technical problems, difficulty in organizing pairs. The researcher mentioned demanding preparation before the lesson. Lastly, two teachers had difficulty in finding new ideas for middle school students, which was consistent with the boring code emerged that five times in the middle school students' forms.

The results of the analysis also revealed recommendations to overcome some of these challenges. These were making sure that every student was at the same place during the initial stages, gradually providing less guidance, using certain phrases to improve students' speaking skills, encouraging students to share their projects in class, switching roles in pair-work to avoid boring the students, providing help when

necessary, and preparing the computers before the lesson. The other teachers highlighted the importance of clarifying the rules at the beginning of the process and careful planning of the lessons.

According to the results, the students had a very positive attitude towards Scratch. In addition, the benefits of integrating Scratch into language teaching for children have outnumbered the challenges both for the students and the teachers. The students and the teachers from different phases seemed to have similar opinions regarding the benefits and challenges of the process, although phase one lasted 13 weeks while phase two lasted only four weeks. The suggestions made by the teachers could be taken into consideration to overcome possible problems that might occur.

4.3 Conclusion

Although this study may not reach firm conclusions due to the limited number of participants, we gained some insights. The results showed that using Scratch as a tool to teach English to children might be useful in developing listening and computational thinking skills. Our findings did not indicate any significant change with regards to the coursebook achievement, language use, narrative, and executive function skills. However, the children who participated in the Scratch activities showed a better performance than the control group in nine out of the 13 components. In addition, the data obtained from the teachers in both phases indicated the opposite as well. The teachers believed that Scratch contributed to the improvement of the students' vocabulary, speaking, listening, and writing skills.

It is possible to argue that Scratch might be useful for developing children's English language skills when they are using the tool in the target language. In order to create projects, the students need to read the blocks, understand what they do, write texts in the blocks to make the sprites speak, then listen to check if they have typed the text correctly. In addition, they create these projects by using what they previously covered in the classroom. This way, they both practice the language target, and learn new things every time they use Scratch such as a new vocabulary item, spelling of a word,

pronunciation of a word, or even how to write a good story because they learn the importance of sequence, structure and clarity of expression (Burke & Kafai, 2010).

In terms of the development of the 21st century skills, this study reached some conclusions as well. These skills were listed as creativity, critical thinking, problem-solving, communication, collaboration and computational thinking. The qualitative findings indicated that the teachers believed that Scratch improved the students' creativity, communication, and collaboration skills. The effect of Scratch on the students' communication and collaboration skills could be explained by the pair-work activities in this study. As the students make decisions, discuss, and solve problems together, they learn how to work in harmony. They also learn to listen effectively and express themselves appropriately to create something together. Our analysis also revealed that the students who were taught by Scratch improved their computational thinking skills significantly, which also involved the problem-solving skills through debugging activities. While using Scratch, the students learn to identify a series of steps for a task (sequence), make things happen at the same time (parallelism), make one thing causing another thing to happen (events), and run the same sequence multiple times (loop). They learn all these by trying out, making mistakes, finding and fixing problems when they occur, which eventually results in the development of their computational thinking abilities.

Finally, Scratch seems to achieve all these while successfully applying the four key design features proposed by Brennan (2013) which were designing, personalizing, sharing, and reflecting. These design features were based on the constructionist theory of Papert (1980). Through the creation of their own games, stories, and music, the students become actively engaged building their own knowledge in a meaningful and motivating way. Moreover, the use of pair-work strengthens this process because interaction with others is another important aspect of learning based on the constructionist theory. Considering all these, the findings of our study favor the use of Scratch as a tool in teaching English for children for their language and cognitive development.

4.4 Limitations and Suggestions for Further Studies

This study has some limitations that might be improved in future studies. To start with, this research was conducted with the participation of very limited participants for some reasons. First of all, finding an institution that would allow us to make changes in its curriculum, overcoming the administrators' curricular concerns, integrating Scratch activities into the program of one group and not of the other and obtaining the parents' consent for this was quite difficult. Therefore, we believe that this study will serve as a base for future works with larger sample size to reach statistically significant results.

In addition, we selected the participants via convenience sampling method which may not represent the target population in an unbiased way. Thus, further studies could be conducted by using random sampling method to reach generalizable results.

Next, to the best of researcher's knowledge, the literature lacks the studies on how integrating Scratch into language teaching effects the children's narrative and executive function abilities. That's why were unable to compare our findings with the previous research. However, we believe that our study sets the ground for future work on these topics. Therefore, conducting studies on these areas is recommended.

As a result of this study, we reached some conclusions for the effect of Scratch on language and cognitive development of Turkish learners of English. We call on future research with participants from different cultures to explore if (and how) the native culture affects these outcomes.

Finally, the researcher and the implementer of Scratch activities were the same person in this study. We observed that this did not affect the qualitative findings about the benefits and challenges of Scratch integration since the researcher's and other teachers' views were similar to each other. We recommend future studies with a different implementer to see if this would affect the quantitative findings.

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APPENDICES

A. APPROVAL OF THE METU HUMAN SUBJECTS ETHICS COMMITTEE

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Sayı: 28620816/

04 EKİM 2019

Konu: Değerlendirme Sonucu

Gönderen: ODTÜ İnsan Araştırmaları Etik Kurulu (İAEK)

İlgi: İnsan Araştırmaları Etik Kurulu Başvurusu

Sayın Dr.Öğretim Üyesi Duygu ÖZGE

Danışmanlığını yaptığınız **Nilay BAHAR'ın "Çocuklara Dil Öğretiminde Scratch Kullanımı"** başlıklı araştırması İnsan Araştırmaları Etik Kurulu tarafından uygun görülmüş ve **355 ODTÜ 2019** protokol numarası ile onaylanmıştır.

Saygılarımızla bilgilerinize sunarız.

Prof. Dr. Tülin GENÇÖZ
Başkan

Prof. Dr. Tolga CAN
Üye

Doç.Dr. Pınar KAYGAN
Üye

Dr. Öğr. Üyesi Ali Emre TURGUT
Üye

Dr. Öğr. Üyesi Şerife ŞEVİNÇ
Üye

Dr. Öğr. Üyesi Müge GÜNDÜZ
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Dr. Öğr. Üyesi Süreyya Özcan KABASAKAL
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İlgi: İnsan Araştırmaları Etik Kurulu Başvurusu

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İlgi: İnsan Araştırmaları Etik Kurulu Başvurusu

Sayın Dr.Öğretim Üyesi Duygu ÖZGE

Danışmanlığını yaptığınız **Nilay BAHAR'ın "Çocuklara Dil Öğretiminde Scratch Kullanımı"** başlıklı araştırması İnsan Araştırmaları Etik Kurulu tarafından uygun görülmüş ve **355 ODTU 2019** protokol numarası ile onaylanmıştır.

Saygılarımızla bilgilerinize sunarız.

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Dr. Öğr. Üyesi Süreyya Özcan KABASAKAL
Üye

B. INFORMED CONSENT FORMS

VELİ ONAY FORMU (Phase I)

Sevgili Anne/Baba,

Bu çalışma Orta Doğu Teknik Üniversitesi yüksek lisans öğrencisi Nilay Bahar tarafından yürütülmektedir.

Bu çalışmanın amacı nedir? Çalışmanın amacı, çocukların dil öğrenimlerine entegre ettiğimiz Scratch isimli programla oluşturulan kodlama aktivitelerinin çocukların konuşma ve bazı bilişsel becerilerine etkisini ortaya çıkarmaktır.

Çocuğunuzun katılımcı olarak ne yapmasını istiyoruz? Bu amaç doğrultusunda, çocuğunuzdan araştırmanın başında ve sonunda birer kez olmak üzere hikaye anlatımı yapmasını ve bir kart sınıflandırma aktivitesini tamamlamasını isteyeceğiz. Hikaye anlatımı, sonrasında incelenmek üzere ses kaydına alınacaktır. Çalışmanın sonunda ise çocuğunuzun Scratch aktiviteleri ile ilgili görüşlerini almak adına kısa süreli görüşme yapılacak ve değerlendirilmek üzere kayda alınacaktır. Çocuğunuzun katılımcı olmasıyla ilgili izin istediğimiz gibi, çalışmaya başlamadan çocuğunuzdan da sözlü olarak katılımıyla ilgili rızası mutlaka alınacak.

Çocuğunuzdan alınan bilgiler ne amaçla ve nasıl kullanılacak? Çocuğunuzdan alacağımız cevaplar tamamen gizli tutulacak ve sadece araştırmacılar tarafından değerlendirilecektir. Elde edilecek bilgiler sadece bilimsel amaçla (yayın, konferans sunumu, vb.) kullanılacak, çocuğunuzun ya da sizin ismi ve kimlik bilgileriniz, hiçbir şekilde kimseyle paylaşılmayacaktır.

Çocuğunuz ya da siz çalışmayı yarıda kesmek isterseniz ne yapmalısınız? Katılım sırasında sorulan sorulardan ya da herhangi bir uygulama ile ilgili başka bir nedenden ötürü çocuğunuz kendisini rahatsız hissettiğini belirtirse, ya da kendi belirtmese de araştırmacı çocuğun rahatsız olduğunu öngörürse, çalışmaya sorular tamamlanmadan ve derhal son verilecektir.

Bu çalışmayla ilgili daha fazla bilgi almak isterseniz Çalışma hakkında daha fazla bilgi almak için araştırma yürütücüsü Nilay Bahar (e-posta: nlybahar@gmail.com) ile iletişim kurabilirsiniz. Bu çalışmaya katılımınız için şimdiden teşekkür ederiz.

Yukarıdaki bilgileri okudum ve çocuğumun bu çalışmada yer almasını onaylıyorum (Lütfen alttaki iki seçenekten birini işaretleyiniz.

Evet onaylıyorum___ ***Hayır, onaylamıyorum___***

Ebeveynin adı-soyadı: _____ Bugünün Tarihi:_____

Çocuğun adı soyadı ve doğum tarihi:_____

ARAŞTIRMAYA GÖNÜLLÜ KATILIM FORMU (For Parents in Phase I)

Bu çalışma Orta Doğu Teknik Üniversitesi yüksek lisans öğrencisi Nilay Bahar tarafından yürütülmektedir. Bu form sizi araştırma koşulları hakkında bilgilendirmek için hazırlanmıştır.

Çalışmanın Amacı Nedir?

Çalışmanın amacı, öğrencilerin dil öğrenimlerine entegre ettiğimiz Scratch isimli programla oluşturulan kodlama aktivitelerinin çocukların dil becerilerine ve bazı yürütücü işlem becerilerine etkisini ortaya çıkarmaktır.

Bize Nasıl Yardımcı Olmanızı İsteyeceğiz?

Araştırmaya katılmayı kabul ederseniz, çocuğunuz hakkında bilgi toplayabilmek için hazırladığımız kısa anketi tamamlamanızı rica edeceğiz.

Sizden Topladığımız Bilgileri Nasıl Kullanacağız?

Araştırmaya katılımınız tamamen gönüllülük temelinde olmalıdır. Çalışmada sizden kimlik veya kurum belirleyici hiçbir bilgi istenmemektedir. Cevaplarınız tamamıyla gizli tutulacak ve sadece araştırmacı tarafından değerlendirilecektir. Katılımcılardan elde edilecek bilgiler toplu halde değerlendirilecek ve bilimsel amaçla kullanılacaktır.

Katılımınızla ilgili bilmeniz gerekenler:

Anketler, genel olarak kişisel rahatsızlık verecek sorular veya uygulamalar içermemektedir. Ancak, katılım sırasında sorulardan ya da herhangi başka bir nedenden ötürü kendinizi rahatsız hissederseniz çalıştayı yarıda bırakıp çıkmakta serbestsiniz. Böyle bir durumda çalışmayı uygulayan kişiye çalışmadan çıkmak istediğinizi söylemek yeterli olacaktır.

Araştırmayla ilgili daha fazla bilgi almak isterseniz:

Çalışma hakkında daha fazla bilgi almak için araştırma yürütücüsü Nilay Bahar (e-posta: nlybahar@gmail.com) ile iletişim kurabilirsiniz. Bu çalışmaya katılımınız için şimdiden teşekkür ederiz.

Yukarıdaki bilgileri okudum ve bu çalışmaya tamamen gönüllü olarak katılıyorum.

(Formu doldurup imzaladıktan sonra uygulayıcıya geri veriniz).

İsim Soyad Tarih İmza

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VELİ ONAY FORMU (Phase II)

Sevgili Anne/Baba,

Bu çalışma Tekdil İngilizce Öğrenim Merkezi İngilizce öğretmeni, Orta Doğu Teknik Üniversitesi yüksek lisans öğrencisi Nilay BAHAR tarafından yürütülmektedir.

Bu çalışmanın amacı nedir?

Çalışmanın amacı, çocukların dil öğrenimlerine entegre ettiğimiz Scratch isimli programla oluşturulan kodlama aktivitelerinin çocuklar açısından faydalarını ve zorluklarını ortaya çıkartmaktır.

Çocuğunuzun katılımcı olarak ne yapmasını istiyoruz?

Bu amaç doğrultusunda, çocuğunuzdan Scratch kodlama aktiviteleri sonrasında düşüncelerini belirteceği 3 soruluk bir form doldurmasını isteyeceğiz. Çocuğunuzun katılımcı olmasıyla ilgili izin istediğimiz gibi, çalışmaya başlamadan çocuğunuzdan da sözlü olarak katılımıyla ilgili rızası mutlaka alınacaktır.

Çocuğunuzdan alınan bilgiler ne amaçla ve nasıl kullanılacak?

Çocuğunuzdan alacağımız cevaplar tamamen gizli tutulacak ve sadece araştırmacı tarafından değerlendirilecektir. Elde edilecek bilgiler sadece bilimsel amaçla (yayın, konferans sunumu, vb.) kullanılacak, çocuğunuzun ismi ya da sizin isminiz ile kimlik bilgileriniz, hiçbir şekilde kimseyle paylaşılmayacaktır.

Çocuğunuz ya da siz çalışmayı yarıda kesmek isterseniz ne yapmalısınız?

Katılım sırasında sorulan sorulardan ya da herhangi bir uygulama ile ilgili başka bir nedenden ötürü çocuğunuz kendisini rahatsız hissettiğini belirtirse, ya da kendi belirtmese de araştırmacı çocuğun rahatsız olduğunu öngörürse, çalışmaya sorular tamamlanmadan ve derhal son verilecektir.

Bu çalışmayla ilgili daha fazla bilgi almak isterseniz; Çalışma hakkında daha fazla bilgi almak için araştırma yürütücüsü Nilay Bahar ile nlybahar@gmail.com ya da 0 312 242 18 38 numaralı telefondan iletişim kurabilirsiniz. Bu çalışmaya katılımınız için şimdiden teşekkür ederiz.

Yukarıdaki bilgileri okudum ve çocuğumun bu çalışmada yer almasını onaylıyorum.

(Lütfen alttaki iki seçenekten birini işaretleyiniz.)

Evet, onaylıyorum ……..

Ebeveynin Adı-Soyadı: …….

Çocuğun Adı Soyadı: ……..

Hayır, onaylamıyorum ……..

Bugünün Tarihi: …. / …. / ….

Doğum Tarihi: …. / …. / ….

ARAŞTIRMAYA GÖNÜLLÜ KATILIM FORMU (For Parents in Phase II)

Bu çalışma Tekdil İngilizce Öğrenim Merkezi İngilizce öğretmeni, Orta Doğu Teknik Üniversitesi yüksek lisans öğrencisi Nilay BAHAR tarafından yürütülmektedir.

Çalışmanın Amacı Nedir?

Çalışmanın amacı, öğrencilerin dil öğrenimlerine entegre ettiğimiz Scratch isimli programla oluşturulan kodlama aktivitelerinin çocukların açısından faydalarını ve zorluklarını ortaya çıkarmaktır.

Bize Nasıl Yardımcı Olmanızı İsteyeceğiz?

Araştırmaya katılmayı kabul ederseniz, çocuğunuz hakkında bilgi toplayabilmek için hazırladığımız kısa anketi tamamlamanızı rica edeceğiz.

Sizden Topladığımız Bilgileri Nasıl Kullanacağız?

Araştırmaya katılımınız tamamen gönüllülük temelinde olmalıdır. Çalışmada sizden kimlik veya kurum belirleyici hiçbir bilgi istenmemektedir. Cevaplarınız tamamıyla gizli tutulacak ve sadece araştırmacı tarafından değerlendirilecektir. Katılımcılardan elde edilecek bilgiler toplu halde değerlendirilecek ve bilimsel amaçla kullanılacaktır.

Katılımınızla ilgili bilmeniz gerekenler:

Anketler, genel olarak kişisel rahatsızlık verecek sorular veya uygulamalar içermemektedir. Ancak, katılım sırasında sorulardan ya da herhangi başka bir nedenden ötürü kendinizi rahatsız hissederseniz çalıştayı yarıda bırakıp çıkmakta serbestsiniz. Böyle bir durumda çalışmayı uygulayan kişiye çalışmadan çıkmak istediğinizi söylemek yeterli olacaktır.

Araştırmayla ilgili daha fazla bilgi almak isterseniz:

Çalışma hakkında daha fazla bilgi almak için araştırma yürütücüsü Nilay Bahar ile nlybahar@gmail.com ya da 0 312 242 18 38 numaralı telefondan iletişim kurabilirsiniz. Bu çalışmaya katılımınız için şimdiden teşekkür ederiz.

Yukarıdaki bilgileri okudum ve bu çalışmaya tamamen gönüllü olarak katılıyorum.

(Formu doldurup imzaladıktan sonra uygulayıcıya geri veriniz).

İsim Soyad Tarih İmza

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ARAŞTIRMAYA GÖNÜLLÜ KATILIM FORMU (Teachers)

Bu çalışma Orta Doğu Teknik Üniversitesi yüksek lisans öğrencisi Nilay Bahar tarafından yürütülmektedir. Bu form sizi araştırma koşulları hakkında bilgilendirmek için hazırlanmıştır.

Çalışmanın Amacı Nedir?

Çalışmanın amacı, öğrencilerin dil öğrenimlerine entegre edilen Scratch isimli programla oluşturulan kodlama aktivitelerinin öğretmenler açısından faydalarını ve zorluklarını ortaya çıkarmaktır.

Bize Nasıl Yardımcı Olmanızı İsteyeceğiz?

Araştırmaya katılmayı kabul ederseniz, Scratch kodlama aktivitelerinden sonra haftalık doldurulmak üzere hazırlanmış açık uçlu 6 sorudan oluşan formu doldurmanızı rica edeceğiz.

Sizden Topladığımız Bilgileri Nasıl Kullanacağız?

Araştırmaya katılımınız tamamen gönüllülük temelinde olmalıdır. Çalışmada sizden kimlik veya kurum belirleyici hiçbir bilgi istenmemektedir. Cevaplarınız tamamıyla gizli tutulacak ve sadece araştırmacı tarafından değerlendirilecektir. Katılımcılardan elde edilecek bilgiler toplu halde değerlendirilecek ve bilimsel amaçla kullanılacaktır.

Katılımınızla ilgili bilmeniz gerekenler:

Anketler, genel olarak kişisel rahatsızlık verecek sorular veya uygulamalar içermemektedir. Ancak, katılım sırasında sorulardan ya da herhangi başka bir nedenden ötürü kendinizi rahatsız hissederseniz çalıştayı yarıda bırakıp çıkmakta serbestsiniz. Böyle bir durumda çalışmayı uygulayan kişiye çalışmadan çıkmak istediğinizi söylemek yeterli olacaktır.

Araştırmayla ilgili daha fazla bilgi almak isterseniz:

Çalışma hakkında daha fazla bilgi almak için araştırma yürütücüsü Nilay Bahar (e-posta: nlybahar@gmail.com) ile iletişim kurabilirsiniz. Bu çalışmaya katılımınız için şimdiden teşekkür ederiz.

Yukarıdaki bilgileri okudum ve bu çalışmaya tamamen gönüllü olarak katılıyorum.

(Formu doldurup imzaladıktan sonra uygulayıcıya geri veriniz).

İsim Soyad Tarih İmza

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C. DEMOGRAPHIC QUESTIONNAIRE

VELİ ANKETİ

Öğrencinin,
Adı Soyadı: _____ Doğum tarihi ___/ ___/ __
Okulu:_____
Sınıfı: _____

1. **Evde hangi dil(ler)hangi sıklıkta kullanılıyor? (Lütfen Türkçe dahil yazınız.)**

(1)_____ ☐ Her zaman☐Çok sık ☐ Sıkça☐Bazen ☐Nadiren
(2) _____☐ Her zaman☐Çok sık ☐ Sıkça ☐Bazen ☐Nadiren
(3) _____☐ Her zaman☐Çok sık ☐ Sıkça ☐Bazen ☐Nadiren

2. **Evde bilgisayar var mı?**

☐Evet.(Cevabınız evet ise 3. soruyu *yanıtlayınız*.)
☐ Hayır.(Cevabınız hayır ise 3.soruyu *geçiniz*.)

3. **Evde bilgisayar var ise, internet bağlantısı var mı?**

☐ Evet.
☐ Hayır.

4. **Bilgisayarı evde kimler kullanabiliyor/kullanıyor?**

_____

5. **Öğrenci haftada kaç saatini bilgisayara ayırıyor?**

☐ 0-2 saat ☐ 2-4 saat ☐ 4-6 saat ☐ 6-8 saat ☐ 8-10 saat ☐ 10 saat+

6. **Öğrenci televizyon izliyor mu?**

☐ Evet. (Cevabınız evet ise 7. soruyu *yanıtlayınız*.)
☐ Hayır. (Cevabınız hayır ise 7.soruyu *geçiniz*.)

7. **Öğrenci televizyon izliyor ise, buna günde kaç dakika/saat ayırıyor?**

_____

8. **Öğrenci bilgisayarı hangi amaçla kullanıyor? (Birden fazla işaretleyebilirsiniz.)**

☐ Eğitim ise;
Hangi site(ler)/uygulama(lar): _____
☐ Sosyal ağlar (Facebook, Twitter vb.)
☐ Video paylaşım siteleri (Youtube vb.)
☐ Oyun
☐ Diğer: _____

9. **Öğrencinin programlama/kodlama ile ilgili bir eğitim geçmişi var mı?**

☐ Evet, var. (Varsa programlama dilinin ismini ve alınan eğitim süresini yazınız.)
_____
☐ Hayır, yok.

10. **Evde öğrenci ile İngilizce çalışıyor musunuz?**

☐ Evet ise;
Bunun için haftada ortalama kaç saat vakit ayırıyorsunuz? _____
☐Hayır.

11. **Öğrenci İngilizce için extra bir ders/eğitim alıyor mu?(TEKDİL dışında)**

☐ Evet ise; (Kaç saatlik bir eğitim alıyor?)
_____
☐Hayır.

D. SCRATCH DESIGN SCENARIO QUESTIONS

1. **Name project:** Dean has designed an animated project that features his name.
a. Can you explain what does this project do?
b. How could we extend this project? What do you want to change?
c. Dean wants the N to appear after the A, not at the same time. What is the bug? How do we fix the bug?
d. Dean wants the N to do something interesting (like the other letters), but only when the N is clicked. How do we add this feature?
2. **Performance project:** Keely has designed an animated performance project.
a. Can you explain what does this project do?
b. How could we extend this project? What do you want to change?
c. What else can we add? Keely wants the singer to sing while she is moving, not after. What is the bug? How do we fix the bug?
d. Keely wants each drum to start only if it is clicked. How do we add this feature?
3. **Underwater project:** Miguel has designed a project that features a conversation between a whale and an octopus.
a. Can you explain what does this project do?
b. How could we extend this project? What do you want to change?
c. Miguel wants the whale to say, "Not much!" after the octopus says, "Hey whale! What's up?" What is the bug? How do we fix the bug?
d. Miguel wants the crab to appear after the whale says, "Not much!" How do we add this feature?
4. **Sports scene:** Gracie has designed a project that helps people learn about sports.
a. Can you explain what does this project do?
b. How could we extend this project? What do you want to change?
c. Gracie wants to show the Tennis background when the Tennis button is clicked. What is the bug? How do we fix the bug?
d. Gracie wants the baseball to appear and say, "Do you know who invented baseball?" when the Baseball button is clicked. How do we add this feature?
5. **Jump**: Amaya has designed a three-level obstacle jumping game.
a. Can you explain what does this project do?
b. How could we extend this project? What do you want to change?
c. Amaya wants the game to stop after the three levels are completed. What is the bug? How do we fix the bug?
d. Amaya wants to add another level to her jumping game. How do we add this feature?
6. **Fruit quiz:** Mylo designed a fruit quiz with an apple, a banana, and an orange.
a. Can you explain what does this project do?
b. How could we extend this project? What do you want to change?
c. Mylo wants to display "Perfect!" at the end of the project if all three fruit were correctly identified, and "Almost!" otherwise. But the project always displays "Perfect!" What is the bug? How do we fix the bug?
d. Mylo wants to add another fruit to his quiz. How do we add this feature?

E. JOURNAL TEMPLATE FOR RESEARCHER

Teacher Journal for Unit _ Scratch Activity _ (__.__.2020)

1. Did the lesson go according to the plan?

2. What were the strong aspects of the lesson?

3. What were the aspects that could be improved?

4. Did the students have any particular difficulties? If yes, in what domains?

5. Did the teacher have any particular difficulties? If yes, in what domains?

6. How do you think each student has been progressing with respect to their language (e.g., grammar, vocabulary, functional use, speaking/listening skills) and cognitive abilities (e.g., attention, memory, dealing with multiple alternatives, flexibility, inhibiting irrelevant alternatives)?

F. WEEKLY JOURNAL TEMPLATE FOR TEACHERS IN PHASE II

Teacher: **Dates: __/__/2020-__/__/2020**
The number of Scratch hour(s) this week=
Student group(s): _____(E.g.: Elementary School/3 days)

*NOTE: Please answer the questions specifying the groups if you had different classes (E.g.: Elementary vs. secondary school students and/or 5 days students vs. 3 days students).

Teacher Journal for Week ___

1. Did your lesson(s) go according to the plan?

2. What were the strong aspects of your lesson(s)?

3. What were the aspects that could be improved?

4. Did the students have any particular difficulties? If yes, in what domains?

5. Did you have any particular difficulties? If yes, in what domains?

6. Do you have any additional comment?

G. STUDENT EVALUATION FORM

1.How do you feel about this lesson?

2. I liked this lesson because ...

-
-
-

3. I didn't like this lesson because…

-
-
-

H. TURKISH SUMMARY / TÜRKÇE ÖZET

SCRATCH'İN ÇOCUKLARIN İNGİLİZCE VE BİLİŞSEL BECERİLERİ ÜZERİNE ETKİSİ

Giriş

İletişimin ve uluslarası ticaretin baskın dili olan İngilizce, 60'tan fazla ülkenin resmi dili ve dünyadaki en yaygın üçüncü ana dildir (Crystal, 2003). Son birkaç yüzyıldaki önemi oldukça artan bu dili öğrenme ihtiyacı da zamanla artmış ve İngiliz dili öğretimi alanında sürekli gelişim gerekli hale gelmiştir. Dünya'daki gelişim ve değişimlerden her daim etkilenen dil öğretimini en çok etkileyen alanlardan biri de teknoloji olmuştur. Yabancı dil öğretmenleri her zaman gelişimlere ve değişimlere ayak uydurarak öğretim tekniklerini öğrencilerin performanslarını daha iyi hale getirecek şekilde geliştirmeye çalışmışlardır. Bu çabanın en önemli örneklerinden birisi de Bilgisayar Destekli Dil Eğitimi'nin (BDDE) ortaya çıkmasıdır (Martin, 2015). Bilgisayar Destekli Dil Eğitimi, dil öğretiminde ve öğreniminde bilgisayar ve bilgisayar tabanlı kaynakların kullanılması olarak tanımlanabilir. Warschauer ve Healey (1998) bu kavramın gelişim sürecini Davranışçı, İletişimsel, ve Bütünleştirici BDDE olarak üç tarihsel aşamaya bölmüştür. Davranışçı BDDE aşamasında, dil öğretmenleri pedagojik yaklaşım olarak dilbilgisi-çeviri ve görsel-işitsel yaklaşımları benimsemişlerdi. Bilgisayarlar, öğrencilerin kendi hızlarında çalışmalarına izin veren ve aynı şeyi defalarca tekrar etmekten asla yorulmayan mekanik öğretmenler olarak görülüyordu. İletişimsel BDDE aşamasında, öğretmenler iletişimsel yaklaşımı benimseyip dilin etkili kullanımına önem verdiler. Öğrencilerin derslere katılımı artmasına rağmen bilgisayarlar temel bilgi kaynağı olmaya devam etti (Hidayati, 2016). Bütünleştirici BDDE aşamasında ise içerik temelli öğrenme yaklaşımı benimsenmiş ve dört beceriyi (dinleme, okuma, yazma, konuşma) geliştirmek için multimedya ve web tabanlı uygulamalar kullanılmıştı. Bu aşamada, öğrencilere dil öğrenme süreçlerinde çeşitli teknolojik araçları nasıl kullanacaklarını öğretmeye de

vurgu yapılmıştı. Warschauer ve Healey (1998), bir sonraki aşamanın öğrencileri yeni küresel ve ağ topluma faydalı olmaları için hazırlamayı amaçlayacak olan Entegre BDDE olacağını tahmin etmişlerdir.

Bugünlerde bu tahminin doğru olduğu görülmektedir. Bellanca ve Brandt'e (2010) göre, günümüz dünyasında yalnızca sürekli değişime uyum sağlayabilen ve yeni durumlar için kendilerini yeniden keşfedebilen öğrenciler başarılı olabilecektir. Bu konu eğitim alanı için düşünüldüğünde, okulların öğrencileri öngörülemeyen geleceklerine hazırlamaları gerekmektedir. Stevens ve Verschoor (2017) bu öngörülemezliği şu şekilde tanımlamaktadır: "Okulların öğrencileri henüz var olmayan işlerde başarılı olmaları için eğittiklerini fark ettikleri bir çağda, işverenler işi iş üzerindeyken öğrenebilen ve üç İ'yi içeren beceri setine sahip olan çalışanlar aramaktadır: inovasyon, iletişim ve işbirliği "(s.4).

Gelecek nesiller için gerekli olacak bu becerileri daha kapsamlı inceleyebilmek ve eğitim kurumlarına yol gösterebilmek için 21.Yüzyıl Becerileri kavramı öne sürülmüştür. Yeni ekonominin talepleri olarak tanımlanan bu beceriler, yenilikçilik, yaratıcılık, eleştirel düşünme gibi birçok önemli yeteneği kapsamaktadır (Casner-Lotto & Barrington, 2006; Lichtenberg, Woock & Wright, 2008). Detaylandırmak gerekirse, öğrencilerde geliştirilmesi önemli olan beceriler üç temel kategoriye ayrılmıştır. Bunlar yaşam ve kariyer becerileri (esneklik, uyumluluk, girişkenlik, özyönetim, sosyal ve kültürler arası beceriler, üretkenlik, hesap verebilirlik, liderlik, sorumluluk), öğrenme ve yenilikçilik becerileri (yaratıcılık, eleştirel düşünme, problem çözme, iletişim, işbirliği, bilgi işlemsel düşünme), ve bilgi, medya ve teknoloji becerileri (bilgi okuryazarlığı, medya okuryazarlığı, iletişim okuryazarlığı) olarak sıralanmıştır. Bir eğitim sisteminin bu temel üzerine inşa edilmesinin, öğrencilerin öğrenme süreçlerine daha fazla dahil olmalarını ve hem normal hayat hem de iş hayatlarında başarılı olmalarını sağlayacağı belirtilmiştir (The Partnership for 21st Century Skills, 2009).

Son yıllarda, eğitimciler öğrencilerde 21. yüzyıl becerilerini geliştirmek için çeşitli yollar aramışlardır. Bunu gerçekleştirmenin bir yolu kodlamadır (Şimşek, 2018). Altıok ve Yükseltürk (2018), kodlamanın bilgi işlemsel düşünmede gerçekleştirilen

bilişsel görevleri desteklemenin ve algoritmik problem çözme becerilerini desteklemenin yanı sıra üst düzey düşünme becerilerini geliştirmenin en işlevsel yolu olduğunu belirtmiştir (Grover & Pea, 2013; Özden & Tezer, 2018; Weintrop ve ark., 2016). Kodlama, öğrencilerin 21. yüzyıl becerilerini geliştirmeye ek olarak teknolojiye yeni bir bakış açısı da getirmektedir. Stevens ve Verschoor (2017), kodlamayı öğrenmenin öğrencileri kullandıkları teknolojinin sadece tüketicisi değil, yaratıcısı da olmaya teşvik ettiğini belirtmiştir.

Son yıllarda, İngilizce öğretimi ile çocuklarda 21. yüzyıl becerilerini geliştirmek için kodlamayı entegre etmenin bir yolu olabileceği düşünülmüştür. Ancak bunun, öğretmenlerin "öğrettiği" ve öğrencilerin sadece dinleyerek "öğrendiği" bir sınıfta başarmak mümkün değildir. Bu entegrasyonun gerçekleşebileceği ideal ortamı yaratmak için, çalışmamız Papert'in (1980) yapılandırmacı öğrenme kuramını temel olarak almıştır. Bu yaklaşımın özellikleri, 21. yüzyıl becerilerini otomatik olarak geliştireceğinden, bu çalışmanın amaçlarına uygun olduğu düşünülmüştür. Papert'e (1980) göre, en başarılı öğrenme, öğrencilerin kendilerine kişisel ve sosyal olarak anlamlı olan bilgileri aktif olarak yapılandırılmasıyla gerçekleşir. Dahası, bilginin sosyal etkileşim yoluyla oluşması ve kişinin kendi düşünceleri hakkında düşünmeye yardımcı olması da önem taşımaktadır. Papert'in yapılandırmacı teorisini temel alan Brennan (2013), öğrenme ortamlarını planlarken dikkate alınması gereken dört temel tasarım özelliği önermiştir: (i) tasarlama, (ii) kişiselleştirme, (iii) paylaşma ve (iv) yansıtma. İlk olarak, etkinliklerin tasarlanması öğrencilerin iteratif düşünme, problem çözme ve eleştirel yaratıcılık becerilerini teşvik ederek öğrenmenin temeli olarak işlev görür. Bu şekilde öğrenciler sadece anlatılanları dinlemek yerine, öğrenme süreçlerinde aktif bir rol alma fırsatına sahip olurlar. İkinci olarak, kişiselleştirme, öğrencilerin öğrendikleriyle kişisel bağlantılar kurabilmeleri ve bu bilgileri anlamlandırabilmeleri için önemlidir. Öte yandan paylaşım, öğrencinin başkalarıyla etkileşimini destekler ve öğrenmenin sosyal doğasına katkıda bulunur. Son olarak, Brennan (2013), öğrencilerin tasarlama, kişiselleştirme ve paylaşma aktivitelerine katıldıklarında, geçmiş eylemleri ve düşünceleri üzerinde düşünmeye başladıklarını belirtmektedir. Bu süreç yansıtma olarak adlandırılır ve öğrencilerin üst bilişsel becerilerinin gelişmesini sağlar.

İngilizce öğretimi ile kodlamayı entegre etmek, günümüzde 21. yüzyıl becerilerini geliştirmek için önemli bir adım olabilir. Bunu uygulamak isteyen öğretmenler için umut vaad eden bir araç Scratch'tir (Stevens ve Verschoor, 2017). Scratch, Massachusetts Teknoloji Enstitüsü Medya Laboratuvarı tarafından 8-16 yaş arası çocuklar için geliştirilmiş görsel bir programlama aracıdır. Bu kodlama dili, yapılandırmacı öğrenme ve Logo projesini temel olarak almıştır (Papert, 1980). Scratch ile birlikte, öğrenciler çeşitli medya türlerini yönetmeyi, proje oluştururken karakterler arasındaki zamanlamayı ve etkişimleri düzenlemeyi ve yaptıkları projeleri paylaşırlar. Böylelikle daha önce bahsettiğimiz problem çözme, bilgi ve iletişim becerileri, kişiler arası ve özyönetim becerileri gelişmiş olur (Pinto ve Escudeiro, 2014).

Scratch'in 21. yüzyıl becerilerini geliştirmesine ek olarak, öğrenciler sınıfta öğrenilen konular ile ilgili ikili olarak projeler oluştururken onların dil becerilerini geliştirmelerine de faydalı olabileceğine inanıyoruz. Örnek vermek gerekirse, "söyle ..." veya "konuş ..." bloğunun kullanımı, imla ve yazma becerilerini geliştirebilir. Ayrıca, ses kayıt aracının kullanımı öğrencilerin telaffuz ve konuşma becerilerini geliştirebilir. En önemlisi Scratch, tüm bu becerilerin çocuklar için kişisel ve sosyal olarak anlamlı, motive edici bir ortamda geliştirilmesi için bir fırsat yaratmaktadır. Bunlara dayanarak, çalışmamız Scratch'i çocukların İngilizce öğretimine entegre etmeyi ve Scratch'in çocukların dil ve bilişsel gelişimleri açısından etkisini incelemeyi amaçlamaktadır.

Scratch, literatür boyunca birçok çalışmaya konu olmuştur. Moreno-León ve Robles (2016) sistematik literatür taramalarında, Bilişim Teknolojileri dışında Scratch ile programlamanın entegre edildiği dersleri listelemiştir. Bunların Matematik (Ke, 2014; Levis & Shah, 2012; Zavala ve ark., 2013), Fen Bilgisi (Baytak & Land, 2011; Lai & Lai, 2012), Sanat (Levis & Shah, 2012), Yazma (Burke & Kafai, 2010; Burke, 2012), İkinci dil olarak İngilizce (Moreno-León & Robles, 2015) olduğu görülmüştür. Genel olarak bu çalışmalar, Scratch'in bu derslerdeki öğrenme çıktılarını geliştirdiğini ve öğrencilerin kodlama becerilerinin ötesinde başka beceriler ve yetenekler geliştirmelerini sağladığını göstermiştir (Moreno-León & Robles, 2016).

Literatürde Scratch ile ilgili bulunan çalışmaların çoğu yaratıcılık, problem çözme, mantıksal, eleştirel ve bilgi işlemsel düşünme becerilerinin gelişimini incelemiştir. Bu çalışmaların bazıları, Scratch'in olumlu etkisini kanıtlarken (Kobsiripat, 2015; Korkmaz, 2016; Lee, 2011; Oluk & Korkmaz, 2016; Siegle, 2009; Stevens & Verschoor, 2017), bazıları istatistiksel olarak önemli sonuçlara ulaşamamıştır (Kalelioğlu & Gülbahar, 2014; Lai & Yang, 2011; Seo & Kim, 2016).

Scratch ve dil öğretimini entegre eden çalışmalara bakıldığında, bu çalışmaların sayıca az olduğu dikkat çekmektedir. Bu çalışmalardan biri Papatga ve Ersoy (2016) tarafından Scratch'in dördüncü sınıf öğrencilerinin anadilleri olan Türkçe'de okuduğunu anlama becerileri üzerindeki etkisini incelemek için yapılmıştır. Nitel ve nicel bulgular Scratch'in öğrencilerin okuduğunu anlama becerilerini geliştirmede etkili olduğunu göstermiştir.

Bir başka çalışmada Ihmaid (2017), Scratch'in ikinci dil olarak İngilizce öğrenen öğrencilerin kelime öğrenme becerileri ve bu kelimelerin kalıcılığı üzerinde önemli etkisini ortaya çıkarmıştır. Aynı zamanda, Scratch'in öğrencilerin öz yeterlik düzeylerine de katkısı olduğu gözlemlenmiştir.

Burke ve Kafai (2010), çalışmalarında Scratch ile programlamanın öğrencilerin hikâye anlatma ve yaratıcı yazma becerileri üzerindeki etkisini incelemiştir. Çalışmanın sonunda, Scratch aktivitelerinin öğrencilerin hikâye yazma becerileri ve dijital okuryazarlık becerilerini geliştirmede yardımcı olduğu bulunmuştur. Buna ek olarak, öğrencilerin yüzde sekseni Scratch ile hikâye anlatma yeteneklerinin geliştiğine inandıklarını ve neredeyse hepsi bu aktiviteler sırasında keyif aldığını belirtmişlerdir.

Kodlamayı Scratch ve dil öğretimiyle birleştiren bir diğer çalışma Moreno-León ve Robles'e (2015) aittir. Çalışmanın sonunda, öğrencilerin akademik başarıları üzerinde Scratch'in önemli bir etkisi bulunamamıştır. Ancak bulgular, Scratch ile tüm öğrencilerin motivasyonlarının arttıkları ve derslerden keyif aldıklarını ortaya koymuştur. Buna ek olarak neredeyse tüm öğrenciler, kodlamanın İngilizce becerilerinin yanı sıra arkadaşlarıyla iş birliği içinde çalışma ve İnternette bilgi aramayı öğrenme gibi becerileri üzerinde olumlu bir etkisi olduğunu belirtmişlerdir.

Son olarak, Costa ve ark. (2018) Scratch ile kodlamayı ikinci dil olarak İngilizce öğretimine entegre eden çalışmalarının ilk sonuçlarını bildirmiştir. Bulgular, deney grubunun ön testte kontrol grubuna göre İngilizce öğrenme motivasyonunun daha düşük olduğunu ortaya koymuştur. Ancak tüm öğrenciler oyun oynamaktan keyif aldıklarını ve derslerde bilgisayarı kullanmak istediklerini belirtmişlerdir. Scratch'in dört beceri üzerindeki etkisine bakıldığında, öğrencilerin okuma ve yazma becerilerinin gelişiminde olumlu bir etkisi olduğu gözlemlenirken, dinleme ve konuşma becerileri üzerinde herhangi bir etki belirtilmemiştir.

Amaç ve Araştırma Soruları

Scratch, öğrencilerin bilgi ve iletişim teknolojisi, problem çözme, yaratıcı düşünme ve işbirliği gibi 21. yüzyıl becerilerini geliştirmek için yararlı bir araç gibi gözükmektedir. İngilizcenin ve bahsi geçen bu becerilerin öğrencileri geleceklerine hazırlamak için önemi göz önüne alındığında, bu çalışma Scratch kodlamayı çocukların İngilizce öğretimine entegre etmeyi, Scratch'i entegre etmenin çocukların dilini ve bilişsel yeteneklerini nasıl etkilediğini ve sürecin faydalarını ve zorluklarını öğretmenlerin ve öğrencilerin bakış açısından araştırmayı amaçlamaktadır.

Bu çalışmada aşağıdaki araştırma soruları formüle edilmiştir:

1. Scratch'i dil öğretimine entegre etmek, öğrencilerin başarısını:

    a. Ders kitabının bitirme sınavındaki puanları,
    b. Dil kullanım becerileri,
    c. Dinleme becerileri,
    d. Konuşma ve anlatım becerileri,
    e. Yürütme işlevi becerileri,
    f. Bilgi işlemsel düşünme becerileri açısından arttırır mı?

2. Öğrenciler ve öğretmenler açısından Scratch'i dil öğretimine entegre etmenin faydaları ve zorlukları nelerdir?

Yöntem

Yarı deneysel, karma yöntemli olarak tasarlanan bu araştırma nicel ve nitel olmak üzere iki çalışmadan oluşmuştur. Nicel çalışma, çocukların dil öğretiminde Scratch kullanımının ders kitabı başarısı, dil kullanımı, dinleme, yürütücü işlev, anlatı ve bilgi işlemsel düşünme becerileri üzerindeki etkilerini incelemiştir. 2019-2020 akademik yılında Ankara'da bir dil öğrenme merkezinde gerçekleşen bu çalışmaya devlet okuluna giden on ilkokul öğrencisi katılmıştır. Katılımcılar kolayda örneklem yöntemiyle belirlenmiş ve çevrimiçi bir rastgele grup oluşturma aracı kullanılarak iki gruba ayrılmıştır. Dördü kız, altısı erkek öğrenci olan bu katılımcıların ana dili Türkçeydi ve İngilizceyi yabancı dil olarak öğreniyorlardı. Bu katılımcıların ikisi üçüncü sınıf, geri kalanı ise ikinci sınıf öğrencisiydi. Katılımcılar dil öğrenme merkezine haftada 5 gün 2'şer saat olarak geliyorlardı. Tüm katılımcıların evde bilgisayar ve internet erişimi vardı. Sadece iki katılımcı çok az kodlama tecrübesi olduğunu belirtti. Bu öğrencilerden biri deneysel gruba, diğeri ise kontrol grubuna yerleştirilmiştir. Ön ve son test tasarımı uygulanan bu müdahale çalışmasında ders kitabının bitirme sınavı, Oxford Yerleştirme Testi, Çokdilli Anlatı için Değerlendirme Aracı, Wisconsin Kart Sıralama Testi, ve Scratch Dizayn Senaryoları aracılığıyla nicel veri toplanmıştır. Scratch aktiviteleri ile uygulanan müdahale toplam 13 hafta sürmüş ve deney grubu öğrencileri toplam 20 Scratch aktivitesine katılmıştır. Veri analizi kısmına geçildiğinde, ilk olarak katılımcıların ön ve son testlerdeki genel performanslarını görmek için betimleyici analiz yapılmıştır. Ardından, iki grubun performanslarında grup etkisini görmek için tekrarlı ölçümlerle iki yönlü varyans analizi gerçekleştirilmiştir.

Nitel çalışma ise çocukların dil öğretiminde Scratch kullanımının hem öğretmenlerin hem de öğrencilerin bakış açısından faydalarını ve zorluklarını araştırmayı amaçlamıştır. Çalışma iki aşamada gerçekleşmiştir. Çalışmanın birinci aşamasına, nicel veri topladığımız beş öğrenci katılmıştır. İkinci aşamada ise toplam 51 öğrenci yer almıştır. Bu katılımcıların da ana dili Türkçeydi ve İngilizceyi yabancı dil olarak öğreniyorlardı. Katılımcıların 30'u kız, 21'i erkek öğrenciydi. Grubun yaş aralığı 8 ile 13 idi. Bu katılımcıların neredeyse tamamı devlet okulu öğrencisiydi ve 35'i ilkokula, 16'sı ise ortaokula gidiyordu. Katılımcılar, dil öğrenme merkezinde haftada iki, üç

veya beş gün gibi farklı programlara kayıtlıydılar. Hemen hemen tüm katılımcıların evde bilgisayar ve internet erişimi vardı. Son olarak, katılımcıların %66,7'si önceden kodlama deneyimi olmadığını belirtti. İkinci aşamada Scratch kullanımının öğretmenlerin bakış açısından incelemek için birinci aşamada araştırmacıdan, ikinci aşamada ise dört öğretmenden veri toplanmıştır. Bu öğretmenlerden biri yaklaşık beş yıl, diğeri dört yıldır dil öğrenim merkezinde çalışıyordu. Diğer iki öğretmen 2019-2020 akademik yılında öğretmenliğe başlamıştı. Öğretmenlerin hiçbirisinin Scratch kullanma konusunda önceden deneyimi yoktu. Veri toplama aracı olarak araştırmacı tarafından hazırlanan öğretmen günlükleri ve öğrenci değerlendirme formları kullanılmıştır. Birinci aşamada, her Scratch aktivitesinden sonra, araştırmacı öğretmen günlüğünü ve katılımcılar değerlendirme formlarını doldurmuştur. Birinci aşamada, günlükler ve öğrenci değerlendirme formları Scratch uygulama sürecinin başında, ortasında ve sonunda olmak üzere dörder kez toplanmıştır. Bu süreçte toplamda 12 günlük ve 55 öğrenci değerlendirme formu elde edilmiştir. İkinci aşamada ise, öğretmenler günlükleri haftalık doldururken, öğrenciler Scratch etkinliklerinden sonra değerlendirme formunu doldurmuşlardır. İkinci aşamanın tüm dönem boyunca sürmesi hedefleniyordu. Ancak COVID-19 salgını nedeniyle veri toplama sürecinin bir ay sonra durdurulması gerekmiştir. Sonuç olarak, dört öğretmen tarafından yazılan sekiz günlük ve 84 öğrenci değerlendirme formu elde edilmiştir.

Genel Sonuçlar ve Tartışma

Betimleyici analiz sonuçlarına göre, deney grubu öğrencileri ders kitabı başarısı, dil kullanma, dinleme ve anlatı becerilerine ait olan on üç test ögesinin dokuzunda kontrol grubu öğrencilerine kıyasla daha iyi skorlar elde etmiştir. Deney grubu için gözlemlediğimiz bu eğilimin istatistiksel olarak önemli olup olmadığını görmek için iki yönlü varyans analizi gerçekleştirilmiştir.

Scratch'in çocukların ders kitabı başarısı üzerindeki etkisi incelendiğinde hem Scratch kullanılarak hem de geleneksel yolla İngilizce öğretilen öğrencilerin benzer şekilde performans sergiledikleri ve ön testten son teste kadar skorlarını önemli ölçüde arttırdıkları görülmüştür. Bu sonuç Moreno-León ve Robles'in (2015) bulgularını doğrulamıştır. Bu bulgu katılımcıların ders kitabı değerlendirmelerindeki önceki

dönemlerde de gösterdikleri yüksek performanslarına bağlanabilir ve Scratch'i entegre etmek öğrencilerin ders kitabı başarılarını etkilememiş olabilir.

Dil kullanma becerilerine gelindiğinde (işlevsel dil, kelime, gramer), sonuçlar Scratch'in çocukların performansları üzerinde önemli bir etkisini olmadığını göstermiştir. Analiz sonuçlarına göre her iki grup da dil kullanma becerilerini ön testten son teste önemli ölçüde geliştirmiştir. Literatürde, Scratch'in öğrencilerin kelime becerileri üzerindeki etkisini araştıran ilk kişi Ihmaid (2017) olmuş ve Scratch'in kelime dağarcığının geliştirilmesi ve kalıcılığı üzerindeki olumlu etkisini bildirmiştir. Test sonuçları katılımcıların işlevsel dil, kelime bilgisi ve gramer becerileri puanlarına belirtmediğinden, sonuçlarımızı Ihmaid'in (2017) bulguları ile tam olarak karşılaştırmamız mümkün olmamıştır.

Öte yandan çalışmamız Scratch aktivitelerine katılan çocukların dinleme becerilerinde önemli bir gelişme gösterdiklerini göstermiştir. Bu bulgu Costa ve ark. (2018) bildirdiği sonuç ile çelişmiştir. Çalışmamızın bu bulgusu, her bir projede "konuş…" bloğunun özel olarak vurgulandığı Scratch aktiviteleri ile açıklanabilir. Her eklenen yeni bloktan sonra, öğrenciler blokları birkaç kez tıklayıp dinlemeye teşvik edilmiştir. Bu uygulama, çocukların dinleme becerilerinin gelişmesiyle sonuçlanmış olabilir.

Scratch'in çocukların konuşma ve anlatı becerileri üzerindeki etkisine bakıldığında, sonuçlar önemli bir etki göstermemiştir. Her iki grup da öykü yapısı ve yapısal karmaşıklık açısından benzer şekilde anlatım becerilerini geliştirmiştir. Bu bulgu, Scratch'in öğrencilerin konuşma becerileri üzerinde önemli bir etkisi olmadığını bildiren Costa ve ark.'nın (2018) çalışmasını desteklemiştir. Buna rağmen, deney grubunun performansı son testlerde skorlarında net bir eğilim göstermiş ve bunun daha büyük bir örneklem ile istatistiksel olarak önemli olabilecek bir sonuç olabileceği düşünülmüştür.

Çocukların yürütme işlevi becerileri ile ilgili olarak, sonuçlar her iki grubun da toplam doğru cevap sayılarında ve perseveratif olmayan hatalarında önemli bir artış olduğunu göstermiştir. Ancak, Scratch entegrasyonunun çocukların yürütme işlevi becerileri

üzerindeki etkisini bildiğimiz kadarıyla hiç kimse incelemediği için sonuçlarımızı literatüre atıfta bulunarak tartışmamız mümkün olmamıştır.

Son olarak, Scratch'in öğrencilerin bilgi işlemsel düşünme becerilerini nasıl etkilediğini görmek için analiz yapılmıştır. Sonuçlara göre, Scratch aktiviteleri öğrencilerin bilgi işlemsel düşünme becerilerinde önemli bir gelişme sağlamıştır. Bulgular, Scratch'in çocuklarda sıralama, yineleme, paralellik ve olay gibi bilgi işlemsel kavramların yanı sıra eleştirme, geliştirme, hata ayıklama ve yeniden tasarlama gibi uygulamaların da geliştirilmesine katkıda bulunduğunu göstermiştir. Bu bulgu, Oluk ve Korkmaz'ın (2016) bulgularını doğrularken, literatürdeki istatiksel olarak önemli bir etki bulamayan çalışmalar ile çelişmiştir (Ceylan, 2020; Seo & Kim, 2016).

Özetlemek gerekirse, bulgularımız Scratch'i çocuklar için dil öğretimine entegre etmenin, çocukların dinleme ve bilgi işlemsel düşünme becerilerini geliştirmek açısından yararlı olabileceğini göstermiştir. Ders kitabı başarısı, dil kullanımı, anlatı ve yürütme işlevi becerileri ile ilgili olarak, sonuçlarımız önemli bir etkiye işaret etmemiştir. Ancak Scratch aktivitelerine katılan çocuklar, 13 test ögesinden dokuzunda kontrol gruptan daha iyi performans göstermiştir. Bu nedenle, deney grubu için gözlemlediğimiz bu eğilimin daha büyük bir örneklem ile gerçekleştiğinde önemli olup olmayacağını görmek için gelecek çalışmaların daha fazla katılımcıyla gerçekleşmesini öneriyoruz.

Nitel verilere baktığımızda ise, sonuçlar, öğrencilerin genel olarak Scratch'e karşı olumlu tutumları olduğunu göstermiştir. Hemen hemen tüm öğrenciler derslerden keyif almış, duygularını çok mutlu ya da mutlu olarak tanımlamıştır ve bu önceki çalışmaları doğrulamıştır (Lai & Yang, 2011; Wilson & Moffat, 2010). Önceki bulgulara paralel olarak öğrenciler Scratch ile derslerin daha farklı ve keyifli olduğunu düşünerek, Scratch'in özelliklerinden ve proje oluşturmaktan zevk aldıklarını söylemişlerdir (Burke & Kafai, 2012; Ihmaid, 2017; Moreno-Leon & Robles, 2015; Sáez-López vd., 2016; Wilson & Moffat, 2010). Analizlerde ikili çalışma kodu pek çok kez ortaya çıkmış ve öğrenciler Scratch'in onlara iş birliği içinde çalışmayı öğrettiğini düşünmüşlerdir (Ceylan, 2020; Moreno-León & Robles, 2015). Ayrıca

öğrenciler ikili çalışmalarda sürücü ve navigasyon olarak adlandırılan rollerini beğendiklerinden bahsetmişlerdir. Kalelioğlu ve Gülbahar'ın (2014) bulgularıyla uyumlu olarak öğrenciler bilgisayar kullanmaktan ve yeni projeler yaratmak için Scratch kullanmaktan keyif almışlardır. Ayrıca dersler sırasında oyun oynuyormuş gibi hissettiklerini ve Scratch'in hem kodlama hem de İngilizce hakkında her derste yeni şeyler öğrenmelerine yardımcı olduğunu söylemişlerdir.

Zorluklara gelince, öğrenciler 72 kez herhangi bir zorluk yaşamadıklarını belirtmişlerdir. Yaşadıklarında ise, bu çoğu zaman ikili çalışmadaki rollerinden kaynaklanan anlaşmazlıklarından dolayı olmuştur. Öğrenciler zaman zaman sürücü ve navigasyon olmaktan hoşlanmamış veya navigasyonlar çok sabırsız davranıp bilgisayarı kontrol etmek için arkadaşlarına müdahale etmişlerdir. Sıkıcı kodu analizlerde altı kez ortaya çıkmış ve bunlardan beşi ortaokul öğrencilerinin formunda bulunmuştu. Öğrenciler daha fazla Scratch aktivitesi yapmamayı formlarında bir zorluk olarak belirtmişlerdi, ancak bu onların olumlu tutum ve isteklerini yansıtmıştır. Geri kalan kodlar üç kereden daha az ortaya çıkmıştır. Bu zorlukların bir kısmı diğer öğrenciler tarafından rahatsız edilmek, Scratch’te istenen özellikleri bulamamak (Kalelioğlu & Gülbahar, 2014), kulaklıkla çalışmamak, özgürce proje oluşturmamak, teknik problemlerle karşılaşmak, yaptıklarını kaybetmek ve projelerini zamanında bitirememek idi.

Öğretmenlere Scratch aktiviteleri ile ilgili bakış açıları sorulduğunda, cevaplar birbirleriyle daha tutarlıydı. Derslerde Scratch kullanımının faydaları ile ilgili kodların tamamı öğrencilerle ilgiliydi. Öğretmenler, Scratch'in öğrencilerin motivasyonunu arttırdığına, konuşma, kelime bilgisi ve iş birliği becerilerini geliştirdiğine inanmışlardır. Araştırmacı, bunlara ek olarak Scratch'in dersleri öğrenciler için daha eğlenceli hale getirdiğini, onların yazma ve dinleme becerilerini geliştirmelerine yardımcı olduğunu belirtmiştir.

Öte yandan öğretmenler özellikle ilkokul öğrencilerin klavyeyi kullanmada zorluk yaşadıkları, ikili çalışırken İngilizce konuşamadıkları ve rolleri anlamakta güçlük çektiklerini belirtmişlerdir. Ayrıca yönergeleri dinlemeyen isteksiz ve arkadaşlarını rahatsız eden öğrenciler hem eşleri hem de öğretmenleri için zorluklara neden

olmuştur. Öğretmenler, öğrencilerin problemleri kendi çözmeye çalışmadan onlara her şeyi sordukları zamanları da zorlayıcı bulmuşlardır.

Kodların geri kalanı öğretmenlerle ilgili olup şu şekildedir: yetersiz zaman / zaman yönetimi, teknik sorunlar nedeniyle olan zaman kaybı, eşleri organize etmede zorluk. Araştırmacı dersten önceki yoğun hazırlık aşamasının zorluğundan bahsetmiştir. Son olarak, iki öğretmen ortaokul öğrencileri için yeni fikirler bulmakta zorlanmış, bu da ortaokul öğrencilerinin formlarında beş kez ortaya çıkan sıkıcı koduyla tutarlı bulunmuştur.

Analizin sonuçları, bu zorlukların bazılarının üstesinden gelmek için öneriler de ortaya çıkartmıştır. Bunlar, her öğrencinin ilk aşamalarda aynı hızda ilerlemesini sağlamak, kademeli olarak öğrencileri daha az yönlendirmek, öğrencilerin konuşma becerilerini geliştirmek için belirli kalıplar kullanmalarını teşvik etmek, projelerini arkadaşlarıyla paylaşmaya teşvik etmek, öğrencilerin sıkılmalarını engellemek için ikili çalışmadaki rolleri belirli aralıklarla değiştirmek, öğrencilere gerektiğinde yardım sağlamak ve ders öncesi bilgisayarları hazırlamaktır. Diğer öğretmenler, sürecin başında kuralları netleştirmenin ve derslerin dikkatlice planlanmasının önemini vurgulamışlardır.

Bu çalışmanın sonuçları Scratch'i çocuklara İngilizce öğretmek için bir araç olarak kullanmanın dinleme ve sayısal düşünme becerilerini geliştirmede yararlı olabileceğini göstermiştir. Bulgular, ders kitabı başarısı, dil kullanımı, anlatı ve yürütme işlevi becerileri açısından önemli bir değişikliğe işaret etmemiştir. Ancak Scratch ile projeler oluşturan çocuklar, 13 test ögesinin dokuzunda kontrol grubuna göre daha iyi performans göstermiştir. Ayrıca her iki aşamada öğretmenlerden elde edilen veriler de bunu desteklemiştir. Öğretmenler, Scratch'in öğrencilerin kelime dağarcığı, konuşma, dinleme ve yazma becerilerinin gelişmesine katkıda bulunduğunu düşünmüşlerdir.

Scratch’in İngilizce olarak kullanıldığında çocukların dil becerilerini geliştirmede yararlı olabileceğini iddia etmek mümkündür. Öğrencilerin projeler oluşturmak için blokların adlarını okuması, işlevlerini anlamaları, karakterleri konuşturmak için bloklara metin yazmaları ve ardından metni doğru yazıp yazmadıklarını kontrol etmek

için bu metinleri dinlemeleri gerekmektedir. Ayrıca öğrenciler bu projeleri daha önce sınıfta işlenen konular ile ilgili olarak oluştururlar. Bu şekilde öğrenciler Scratch'i kullandıklarında hem sınıfta öğrendikleri konuları tekrar etmiş hem de yeni bir kelime, bir kelimenin yazılışı, telaffuzu veya hatta iyi bir hikâyenin nasıl yazılacağı gibi yeni şeyler öğrenmiş olurlar (Burke ve Kafai, 2010).

Çalışmamız 21. yüzyıl becerilerinin gelişimi açısından da bazı sonuçlara ulaşmıştır. Bu beceriler yaratıcılık, eleştirel düşünme, problem çözme, iletişim, iş birliği ve sayısal düşünme olarak sıralanmıştır. Nitel bulgular, öğretmenlerin Scratch'in öğrencilerin yaratıcılık, iletişim ve iş birliği becerilerini geliştirdiğine inandıklarını göstermiştir. Scratch'in öğrencilerin iletişim ve iş birliği becerileri üzerindeki etkisi, bu çalışmadaki ikili çalışma yöntemi ile açıklanabilir. Öğrenciler birlikte kararlar alırken, tartışırken ve sorunları çözerken, uyum içinde nasıl çalışacaklarını öğrenirler. Aynı zamanda etkili bir şekilde dinlemeyi ve birlikte bir şeyler yaratmak için kendilerini uygun şekilde ifade etmeyi öğrenirler. Ayrıca sonuçlar, Scratch aktivitelerine katılan öğrencilerin sayısal düşünme becerilerini önemli ölçüde geliştirdiğini ortaya çıkarmıştır. Scratch'i kullanırken öğrenciler bir görev (dizi) için bir dizi adım tanımlamayı, aynı anda bir şeyler yapmayı (paralellik), başka bir şeyin olmasına neden olan bir şeyi yapmayı (olaylar) ve aynı diziyi birden çok kez çalıştırmayı öğrenirler (döngü). Öğrenciler tüm bunları deneyerek, hatalar yaparak, sorunları ortaya çıktığında tanımlayarak ve onları çözerek öğrenirler. Bu da onların sayısal düşünme becerilerinin gelişmesiyle sonuçlanır.

Son olarak Scratch'in tüm bunları, Brennan (2013) tarafından önerilen, tasarlama, kişiselleştirme, paylaşma ve yansıtma aşamalarından oluşan ders tasarımını uygularken gerçekleştirdiği düşünülmektedir. Daha önce bahsedildiği üzere, bu tasarımın özellikleri, Papert'in (1980) yapılandırmacı teorisine dayanmaktadır. Öğrenciler kendi oyunlarını, hikayelerini ve müziklerini yaratırken, kendi bilgilerini oluşturma sürecinde aktif rol alırlar. Dahası bunu onlar için anlamlı ve motive edici bir oşekilde gerçekleştirirler. Bunlara ek olarak, ikili çalışma yöntemi bu süreci güçlendirir çünkü başkalarıyla etkileşim, yapılandırmacı teoriye dayanan öğrenmenin bir başka önemli özelliğidir. Tüm bunları göz önünde bulundurduğumuzda,

çalışmamızın bulguları Scratch'in çocukların dil ve bilişsel gelişimleri için İngilizce öğretmede bir araç olarak kullanılmasını desteklemektedir.

Kısıtlar ve Gelecek Çalışmalar

Bu çalışmanın gelecekteki çalışmalarda geliştirilebilecek bazı kısıtları vardır. İlk olarak, bu araştırma sınırlı sayıda öğrencinin katılımıyla gerçekleştirilmiştir. Ancak betimleyici analiz sonuçlarına göre deney grubu son testlerde on üç test ögesinin dokuzunda kontrol gruptan daha iyi skorlar elde etmiştir. Bu nedenle, bu çalışmanın istatistiksel olarak önemli sonuçlara ulaşmak için daha büyük örneklem büyüklüğüne sahip gelecekteki çalışmalar için bir temel oluşturacağına inanıyoruz.

Ayrıca katılımcılar kolay örnekleme yöntemi ile seçilmiştir. Bu yöntem, hedef kitlenin tarafsız bir şekilde temsil edilmesini gerçekleştirmek için uygun olmayabilir. Dolayısıyla, ileriki çalışmalar daha genellenebilir sonuçlara ulaşmak için, katılımcılarını rasgele örnekleme yöntemi kullanarak seçebilir.

Son olarak, araştırmacının bildiği kadarıyla, literatür Scratch'i dil öğretimine entegre etmenin çocukların anlatı ve yürütme işlevlerini nasıl etkilediğine dair çalışmalardan yoksundur. Bu nedenle bulgularımızı önceki araştırmalarla karşılaştırmamız mümkün olmamıştır. Ancak, çalışmamızın bu konularla ilgili gelecekteki çalışmalar için zemin oluşturduğuna inanıyoruz. Bu nedenle bu alanlarda çalışma yapılması tavsiye edilmektedir.

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