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Second Life in Education in Turkey: A Methodological Review Research

Türkiye'de Eğitim Alanında İkincil Yaşam: Metodolojik Bir İnceleme Araştırması

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ABSTRACT

This study aimed to examine the educational studies methodologically using the Second Life application in Turkey. In the study conducted with the qualitative research paradigm, the document review method was used. The studies were analyzed with descriptive analysis technique. According to the findings, it was revealed that qualitative studies as research philosophy and case studies as research design were mostly adopted in the studies. In those studies, undergraduate students as the study group and questionnaire and interview techniques as data collection methods were mostly preferred, and the content analysis technique was used mostly for data analysis. Moreover, in those studies, the purposive sampling technique was mostly used. Most of the studies examined reached their aims and most of their results were positive.

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ÖZ

Bu çalışma, Türkiye'de İkincil Yaşam uygulamasının kullanıldığı eğitim çalışmalarını metodolojik olarak incelenmeyi amaçlamıştır. Nitel araştırma paradigması ile yapılan çalışmada doküman inceleme yöntemi kullanılmıştır. Çalışmalar betimsel analiz tekniği ile çözümlenmiştir. Elde edilen bulgulara göre; çalışmalarda araştırma felsefesi olarak en çok nitel çalışmaların, araştırma deseni olarak da durum çalışmalarının benimsendiği görülmüştür. Çalışmalarda en fazla çalışma grubu olarak lisans öğrencileri, veri toplama yöntemi olarak anket ve görüşme teknikleri tercih edilmiş ve verilerin analizi için en çok içerik analizi tekniği kullanılmıştır. Ayrıca çalışmalarda en çok amaçsal örneklem tekniği kullanılmıştır. İncelenen çalışmaların amaçlarına ulaştığı ve sonuçlarının çoğunun olumlu olduğu ortaya çıkmıştır.

1. Introduction

Virtual worlds are environments that allow people to experience difficult, dangerous, or impossible experiences in real life by offering virtual identities and bodies. A virtual world provides a variety of experiences in a technological environment, giving the user strong feelings about being there (Sanchez, 2009). Therefore, virtual worlds cannot be ignored for experiential learning, they have recently been used in the field of education, and various virtual learning environments have been created. Thus, virtual educational environments have provided significant improvements, especially in terms of encouraging many students who spend their time online to learn more (Erturk & Sahin, 2019; Gao, Noh & Koehler, 2009).

Virtual learning environments are three-dimensional (3D) digital environments in which many users interact with each other synchronously or asynchronously with the help of various avatars (Erturk & Sahin, 2019; Sural, 2008; Tepe, 2012). Second Life (SL), Active World, Opensim, Quest Atlantis, Fuvle, Cubix Editor, Celestia, Stellarium, and Solar Model are the learning environments used in education (Demirer & Erbas, 2016). However, in educational studies, SL is mostly preferred (Demirer & Erbas, 2016; Kim, Lee, & Thomas, 2012; Reisoglu, Topu, Yilmaz, Yilmaz, & Goktas, 2017; Tokel & Cevizci-Karatas, 2014).

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SL, a 3D virtual world created by Philip Rosedale in 1999, was presented to the public by Linden Lab in 2003 (Dadakoglu, 2018). SL was designed as a utopian alternative to the real world (Harrison, 2009). SL is frequently used as a platform for revenue generation, information and knowledge sharing, and learning. For this reason, SL has been used in many areas such as tourism, architecture, and health and has recently become the focus of interest for educators as it can be used for collaboration, peer interaction, and resource sharing. Many universities, colleges, and other educational institutions created virtual educational environments using SL (Tunc, 2018).

Because of the affordances offered by the SL learning environment, it enables the use of learning approaches such as role-playing, experimental learning, experiential learning, collaborative learning, game-based learning, and problem-based learning (Warburton, 2009). These affordances are mentioned by Warburton and Perez-García (2009) as immersion, extended and rich social interaction, community presence, authentic content and cultures, role-playing and identity, content production tools, visualization and context formation, and simulations.

Immersion is the creation of a virtual sense of existence by creating a real sense of existence through an avatar (Emre, Selçuk, Budak, Butun, & Simsek, 2019; Warburton & Perez-García, 2009). This feeling can surround the person with sound and vision (Roussou, 2001) and enable people to perform virtual browsing, seeing, hearing, and speaking activities (Gokoglu, 2019). This provides 3D participation in the learning environment of students (Deutschmann, Panichi, & Molka-Danielsson, 2009).

SL is an online 3-D virtual environment in which users can socialize and role-play through realistic avatars (Kawulich & D'Alba, 2019). Therefore, SL is a multi-user virtual environment. In the SL environment, people communicate and interact with each other through avatars and collaborate when necessary (Zhou, Jin, Vogel, Fang, & Chen, 2011). This is a convenience that Warburton and Perez-García (2009) noted for SL. That is, there is an extended or rich social interaction between individuals and communities (between individuals and communities, humans and objects, and also intelligent interaction between artifacts) in the SL environment (Warburton & Perez-García, 2009). In this context, SL enables students to engage in life-like and simultaneous interaction by providing a bi-directional and body language interaction, similar to the real world, rather than just one-way communication, as in traditional distance education applications (Salmon, 2009). SL provides students with an environment in which they can work together and learn in collaboration (Can, 2012).

In the SL environment, people can join and interact with groups, subcultures, or geography of their choice. Participants in these communities have harmonious goals. They feel that they belong to that community and their sense of trust develops. This is expressed as community presence or socialization, which is another affordance that SL offers to students in the field of education, and students have a new identity through avatars in the process of their interaction (Warburton & Perez-García, 2009). Students can format avatars that they use with their own free will. In other words, students can select and use the eye and hair color, body image, clothing, and appearance they want, integrate themselves into virtual communities in the form of these icons (Can, 2012), and play the role of their identity. Also, a digital community such as SL can promote students' academic continuity as it also strengthens social cohesion. (Layne, Lee, O'Connor, Horn, & McFarlin, 2010).

SL facilitates access to cultures reflecting linguistic and cultural diversity at local and national levels. This means that, as in learning a foreign language, students experience a real cultural dimension virtually and interact with these cultural elements (Can, 2012). In this way, students can gain information and intercultural experiences that they cannot reach in real life more easily (Levy, 2009).

SL also facilitates education by individualizing learning and ensuring the active participation of students (Sierra, Gutiérrez, & Garzón-Castro, 2012). SL enables the student to be more effective and reduces the stress and negative excitement of the learning process, increases self-confidence, motivation (Arslantas & Tokel, 2018; Wehner, Gump, & Downey, 2011), risk-taking (Gokoglu, 2019) and class participation in learning activities (Pellas & Kazanidis, 2015).

SL allows the creation and ownership of objects in a virtual environment and the use of content production tools that respect an individual's intellectual property rights. Therefore, people can produce, modify, develop, and reproduce historically lost, imaginative, futuristic, or impossible to see by the human eye and normally inaccessible content (Warburton & Perez-García, 2009). This special characteristic engages students in actively creating their learning activities and experiences, rather than just being passive consumers of learning (Wagner & Ip, 2019), and with this characteristic, SL offers various opportunities for students to create and organize their learning environments. Students can create own scenarios, make designs, have what they produce, and use their knowledge as they wish. Thus, students can improve themselves by making self-assessments (Can, 2012).

One of the most important advantages and affordances provided by SL to education is simulations which can be created to overcome some physical constraints in the virtual environment and to simulate real-world content that can be costly and dangerous to produce in real life (Warburton & Perez-García, 2009). Simulation-based activities develop problem-solving and critical thinking skills by using problem-based learning that guides constructivist learning theory, supports independent decision-making, and takes risks through avatars (Russell, 2009). Simulations enable students to benefit from architectural, marketing, military, tourism, health, and safety training effectively, make practical experiences, and gain behavioral skills (Gokoglu, 2019).

Although the use of the SL environment in education has many benefits, it also has some limitations. These limitations specified by the researchers are as follows:

1. It requires high technical skills for students and educators (Warburton & Perez-García, 2009). Trainers and students can develop a prejudice against the SL environment because of these technical skills and lack of knowledge of the practice (Layne et al., 2010),

2. Although membership can be done free of charge, creation of training area, adding objects to the environment, uploading images and textures, purchasing useful in -world tools, employing building, and scripting expertise and updates may require fees (Warburton, 2009),
3. Some technical problems (failure to connect to the server computer, insufficient capacity of the user computer, the problem of access to the internet, the density of avatars, video, and audio problems, and lack of mobile device support such as a tablet, mobile phone, etc) may occur when connecting to SL environment (Dincer, 2008; Esgin, Pamukçu, Ergul, & Ansay, 2011; Ozonur, 2013; Warburton, 2009),
4. The SL environment requires simple and useful activities for students to create and manipulate basic objects. Sometimes even simple things can take a long time. Especially serious, high quality and good designs and projects that will develop students' design skills require time and patience. However, any design or product made in an SL environment can be easily damaged and destroyed (Warburton & Perez-García, 2009),
5. The design, implementation, and practice overheads in SL often require educators to develop multiple skills to cope with them. Therefore, designing, validating, and running teaching activities require time to address issues such as intellectual property rights, object permissions, and accessibility (Warburton, 2009),
6. To realize some interactions and high-level cognitive skills in the SL environment, programming knowledge may be needed (Reisoglu, 2014),
7. Because of the irradiation feature and the malicious use of individuals or institutions in the SL environment, students may encounter distracting or inappropriate content or participate in those environments. The fluidity and playfulness inherent in SL identity construction can be disconcerting and confusing (Warburton, 2009). This can lead to occur false identities or join wrong communities (Inman, Wright, & Hartman, 2010).

A sample screenshot of the SL in education is as Figure 1.

Figure 1. Sample Screenshot of the SL Environments

Although many studies examined the studies on virtual reality in the literature in general, only Inman et al. (2010) examined 27 empirical studies on the SL environment methodologically and analyzed the findings and recommendations. Hew and Cheung (2010) reviewed the past 15 empirical research studies on the use of 3D virtual worlds in K-12 and higher education settings. The goal of Reisoglu et al.'s (2017) meta-review study was to investigate 167 empirical studies on 3D virtual environments in terms of their platforms, design goals, research topics, learning strategies, and findings. Saka's (2019) study was conducted to review the literature related to educational virtual reality games in the international field. In this study, the findings of 124 studies that were examined in the study revealed different and similar aspects of the studies. Tokel and Cevizci-Karatas (2014) analyzed 55 studies from 2008 to 2013 using the constant-comparative method across five categories: use cases of virtual worlds, research topics, disciplines, platforms, and participants. Demirer and Erbas (2016) analyzed and discussed studies on virtual learning environments in Turkey in terms of the research model, data collection tools, sample sizes, sampling status, sampling methods, data analysis methods, variables, and outcomes. Kapucu and Yildirim (2019) methodologically reviewed 32 studies in terms of general characteristics (subject area, application area, year, research approach, working group, data collection tools, data analysis technique, results, and recommendations. Kim et al. (2012) aimed to provide a detailed analysis of the research methods and research trends related to the research of 3D virtual worlds for educational environments. Wang and Burton (2013) explored how SL was discussed, investigated, and applied it in the educational context from 2006 to 2011.

It was hoped that to investigate how the SL environment was implemented and analyzed in educational activities in Turkey would give important ideas to educators and researchers who want to do applications, studies, and projects related to virtual learning environments. Therefore, this study aimed to methodologically review the SL-related studies in the field of education in Turkey from its launch to the present. In this context, the answer to the questions "How are the methodological structures of the studies using the SL environment in education in Turkey, and what are the effects of these studies?" was sought. The research questions of the study are as follows:

1) What are the aims of the studies?
2) What is the distribution of the studies according to the publication year?
3) What is the distribution of the publication types of the studies according to the research philosophies?
4) What are the research designs of the studies?
5) What are the implementation periods of the studies?
6) What are the study groups, observation unit\sample sizes, and sampling methods of the studies?
7) What are the types of data collection tools and data analysis methods of the studies?
8) What are the results\effects of the studies?

2. Method

The research model, data sources, data analysis procedures, and data analysis process of the study are presented in this section.

2.1. Research Model

In this study, it was aimed to examine the educational studies methodologically using the SL environment between 2003 and 2019. For this reason, the document review method, one of the qualitative research methods, was used and the documents were evaluated methodologically. Document review is the process of obtaining data by analyzing written documents on the subject examined within the scope of the research (Yildirim & Simsek, 2006). Methodological evaluation is a kind of evaluation that shows how different methodologies (research method, data collection tool, and sampling) explain different results by comparing and evaluating the methodological power of various studies through document review (Neuman, 2003).

2.2. Data Sources

The universe of this research consisted of studies in the Council of Higher Education (CoHE) National Thesis Center, Turkish Academic Network and Information Center, and Google Scholar databases and the sample of the study consisted of studies related to the SL environment in the field of education. The sample of the study consisted of papers, book chapters, articles, and theses containing "second life" or "ikincil yaşam" and "education" keywords in the title or keyword sections of the studies in these databases. Also, the following criteria are taken into consideration for the determination of the studies:

- The SL environment was first introduced in 2003 by Linden Lab. For this reason, the studies were performed between 2003 and 2019,
- Only studies in the field of education,
- SL environment is used in virtual reality applications,
- The language of publication is Turkish,
- Not generated from thesis included in the study,
- If the study is a paper, the full-text is published.

2.3. Data analysis procedures

Before the data analysis process, the documents were coded between "1" and "33". After the studies were coded as in Table 1, these studies were analyzed descriptively.

Table 1. Codes of Publications

Code	Publication Type	Code	Publication Type
1	Master Thesis	18	Article
2	Master Thesis	19	Article
3	Full-text paper	20	Master Thesis
4	Full-text paper	21	Master Thesis
5	Full-text paper	22	Ph.D. Thesis
6	Full-text paper	23	Full-text paper
7	Book chapter	24	Master Thesis
8	Full-text paper	25	Master Thesis
9	Master Thesis	26	Book chapter
10	Master Thesis	27	Full-text paper
11	Ph.D. Thesis	28	Article
12	Article	29	Article
13	Ph.D. Thesis	30	Ph.D. Thesis
14	Master Thesis	31	Master Thesis
15	Master Thesis	32	Ph.D. Thesis
16	Ph.D. Thesis	33	Article
17	Article		

In the descriptive analysis, the data was classified, summarized, and interpreted according to the predetermined framework and themes. Descriptive analysis is mostly used in studies where the conceptual structure of the research is clearly defined in advance. The descriptive analysis aimed to present the findings in an edited and interpreted manner. The steps of descriptive analysis are to form a framework for descriptive analysis, to process the data according to the thematic framework, to define the findings, and to interpret the findings (Sozbilir, 2009; Yildirim & Simsek, 2006).

Firstly 15 themes (code, author, publication year, purpose, publication type, research philosophy, research design\model, implementation period, study group, observation unit\sample sizes, sampling method, sample size, data analysis method, data collection tool, and effect) related to the methodologies of the studies were created. These themes were converted to an analysis form using the MS Excel program. The studies were examined within the framework of these themes and the necessary data were processed on the form. MS Excel and SPSS 21 programs were used for the analysis of the processed data and also the frequency and cross table calculations were performed.

2.4. Validity and Reliability Process of Data Analysis

In qualitative research, it is an important criterion that the data, the analysis of the data, and the results are credible and reliable. This depends on the validity and reliability of the study. One of the important methods to increase the reliability of qualitative data is to explain in detail the path of data analysis. Also, the inclusion of other researchers to the recording and observation process in the research and examining the consistency between analyzes and observations increases the reliability of the results (Buyukozturk, Kilic Cakmak, Akgun, Karadeniz, & Demirel, 2008). For this reason, two more researchers were included in the process of determining the studies to be analyzed, eliminating the studies, and creating the study analysis form.

Firstly, the studies that would constitute the data source of the study were determined with one of the researchers. For this purpose, firstly, the literature review was made. In the

literature, 112 studies were reached, 40 of them were theses and 13 of them were papers and 59 of them were articles related to virtual reality. Among these studies, those with the English language (n=38), not related to education (n=15), inaccessible to full-text (n=11), with a virtual environment expression but out of scope (n=9), generated from the thesis (n=5), published as both papers and articles (n=1) were excluded from the scope of the review by researchers.

The researchers then developed a study analysis form to record the methodologies of the studies. To increase the validity of the study, the theme names (units of analysis) to be entered into the analysis form should be formed correctly. Therefore, research methodologies related to educational sciences were investigated from various sources and it was decided to use the research methodologies mentioned by Buyukozturk et al. (2008) as their theme names. Then, the study analysis form was checked by another researcher except for the researchers who carried out the analysis, and unnecessary themes were removed or changed. For example, the sample number of observation units\subjects theme was changed to sample size, the research method theme was divided into two themes as the research philosophy and the research design\model, and the data collection technique theme was changed to the data collection tool theme. The final version of the study analysis form is as in Appendix-1.

To ensure consistency in the data to be recorded in the analysis form shown in Appendix-1, the researchers also identified several categories before the analysis. According to these categories; in terms of the type of publication, the studies were handled as thesis, articles, full-text papers, and book chapters. The categories to be used in the analysis of the research philosophies, research designs, and the number of observation units\subjects of the studies was determined according to Buyukozturk et al. (2008). Accordingly, the studies were examined in three groups as qualitative, quantitative, and mixed according to the research philosophies. Quantitative studies were categorized as screening research, correlational research, causal comparison research, experimental research, single-subject research, design and development research, and meta-analysis; qualitative studies were categorized as ethnographic research, historical research, action research, phenomenology studies, theory-building studies, case studies, and narrative research; and mixed studies were categorized as quantitative and qualitative studies.

In terms of the sampling method, studies were examined as random or nonrandom sampling. While random sampling methods are divided into simple random sampling and stratified sampling, non-random sampling methods are divided into three as systematic sampling, purposive sampling, and convenience\accidental sampling. The studies were examined in two groups as single-subject and multi-subject studies according to the number of observation units or subjects. Observation, interview, document analysis, achievement tests, diary, evaluation form, rubrics, portfolio, aptitude test were determined as data collection tools. The questionnaires and scales used in the studies were considered as surveys. Besides, semi-structured interviews and focus group interviews were used as interviews.

Descriptive (frequency, percentage, average, standard deviation, median, cross table, chi-square, etc.) and inferential statistics [t-test, ANOVA, MANOVA, correlation analysis (Kendall's tau, Pearson multiple correlation analysis, Pearson product-moment correlation), Kruskal-Wallis test (KWH), Mann Whitney U test (MWU), Box's M, and Wilcoxon signed-rank test] were used for the techniques used in the analysis of quantitative data and descriptive and content analysis techniques were used for the analysis of qualitative data. During the analysis of the data, the missing themes were marked with a "-" sign in the study analysis form. In the effect category, the "+" sign was used for positive results, the "-" sign was used for negative results. If the study was conducted in the form of a literature review or if the SL environment application did not cause any significant change in the study group, it was planned to use the "±" sign for the result of the study.

After this planning, the necessary data were recorded in the study analysis form. For this reason, the researchers analyzed the studies individually. To increase the credibility of the study, the studies examined during the data analysis period were repeatedly checked by the researchers in the context of the identified categories. Then, the consensus percentage was calculated to check whether the data analysis was reliable. For this, "(Consensus / (Consensus + Disagreement)) x 100" formula proposed by Miles and Huberman (1994) was used and the consensus percentage was calculated as 93. Saban (2004) stated that 90% or more similarity between the analyzes of the researchers was sufficient for the reliability of the research. The analysis form in which the researchers reached a joint decision as a result of the data analysis is shown in Appendix-1. The Data analysis process is summarized in Table 2.

Table 2. Data analysis process

Activities	Month
Literature review	January
Determining the purpose of the study and getting the opinions of another researcher	February
Starting the data collection process	February
Determining the criteria for the studies that will constitute the data source	March
Collecting studies with document review	March
Identifying, eliminating, and encoding the studies	March
Establishing a framework for the descriptive analysis	April
Creating analysis units and finalizing the analysis form in line with other the researchers' opinions	May
Determining the categories related to the themes by the researchers' opinion	May-June
According to the thematic framework, the researchers analyze the studies independently and fill the necessary data in the analysis form	June-July
One-week break in analysis and re-checking of analyzes by the researchers	July- August
Comparison of the analyzes and calculating the percentage of compromise	August-September
Defining the findings according to the research questions and forming the necessary frequency tables and getting the opinions of the researchers	September
Interpretation of the findings according to the research questions and getting the opinions of the researchers	October

3. Findings

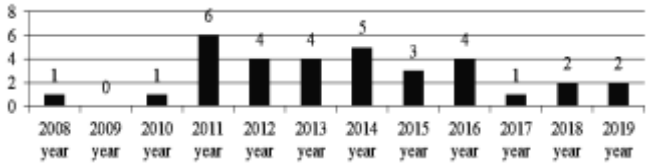
Findings of the analysis of data in light of the research questions are presented in this section.

3.1. Findings related to the first research question

According to the research question of "*What are the aims of the studies?*", the studies focused on the development of students' knowledge and skills. In the studies examined, SL environment was used for consultancy services (n=1), educational design (n=7), design analysis (n=1) as well as foreign language (n=7), art and design (n=2), mathematics (n=2), science (n=1), social studies teaching (n=1). Among the studies, there are studies aimed at improving psychomotor and behavioral skills (n=2), developing positive attitudes (n=1), and increasing students' achievement, self-efficacy, motivation, and social presence (n=8). Also, in some of the studies (n=3), opinions and experiences about the SL application were revealed.

3.2. Findings related to the second research question

Within the scope of the study, the studies using SL application in the field of education between 2003 and 2019 were examined. The findings of the research question of "*What is the distribution of the studies according to the publication year?*" is as in Graphic 1.



Graphic 1. Distribution of Studies by Publication Year

As can be seen in Graphic 1, the first of the studies examined in chronological order was the study conducted in 2008. It is seen that most studies on the SL environment were performed in 2011 (n=6) and followed by 2014 (n=5), 2012, 2013, and 2016 (n=4), 2015 (n=3), 2018 and 2019 (n=2), 2008, 2010, and 2017 (n=1) respectively.

3.3. Findings related to the third research question

The findings of the research question of "*What is the distribution of the publication types of the studies according to the research philosophies?*" are shown in Table 3.

Table 3. Distribution of the Publication Types of the Studies according to the Research Philosophies

	Research Philosophy			Total
Publication Type	M	Qn	Ql	
Full-text paper	-	1	6	7
Ph.D. thesis	5	-	1	6
Book chapter	-	-	2	2
Article	-	2	5	7
Master thesis	2	5	4	11
Total	**7**	**8**	**18**	**33**

M: Mixed; Qn: Quantitative; Ql: Qualitative

As can be seen in Table 3, most of the studies examined were master's theses (n=11), while others were articles (n=8), papers (n=7), Ph.D. theses (n=6), and book chapters (n=2). Qualitative (n=18), quantitative (n=8), and mixed research (n=7) philosophies were preferred for determining the effectiveness of the SL environment and experiences related to the SL application.

According to research philosophy, the papers were qualitative (n=4) and quantitative (n=1); the Ph.D. theses were mixed (n=5) and qualitative (n=1); the book chapters were qualitative (n=2); the articles were quantitative (n=2) and qualitative (n=5); the master's theses were mixed (n=2), quantitative (n=5), and qualitative (n=4). The research philosophy was not specified in the papers. However, when the studies were examined thoroughly, it was decided that they were qualitative studies.

3.4. Findings related to the fourth research question

Analysis findings on studies using virtual reality applications in the field of education in Turkey are shown in Table 4.

Table 4. Research Designs of the Studies

Theme	Category	Code	N
Research Design	Case study	4, 5, 9, 10, 15, 17, 19, 26, 27, 32	10
	Quantitative & Qualitative	11, 13, 14, 16, 22, 30	6
	Experimental	2, 6, 20, 33	4
	Literature review	7,12, 23	3
	Qualitative	25, 28	2
	Scanning	1, 31	2
	Relational	21, 29	2
	Fenomology	24	1
	Causal-comparative research	18	1
	Unspecified	3, 8	2

As shown in Table 4, most of the studies using SL applications were designed as case studies (n=10). Some of the studies were the studies in which quantitative and qualitative data were collected together (n=6). Apart from these, experimental design (n=4), literature review (n=3), qualitative (n=2), scanning (n=2), relational design (n=2), causal-comparative research (n=1), and phenomenology (n=1) were used in the studies.

3.5. Findings related to the fifth research question

The findings of the research question of "*What are the implementation periods of the studies?*" are shown in Table 5.

Table 5. Implementation Periods of the Studies

Theme	Category	Code	N
Implementation period	1-4 weeks	2, 16, 20, 21, 22, 25, 32, 33	8
	5-8 weeks	9, 11, 19, 24	4
	9-12 weeks	10, 14, 30	3
	13-16 weeks	13	6
	17-20 weeks	15	1
	21-24 weeks	1, 3, 4, 5, 8,17	6
	None	6, 7, 12, 18, 26, 23, 27, 28, 29, 31	10

According to the findings in both Appendix-1 and Table 5, the implementation periods of the studies related to SL application varied between one week and 24 weeks (six months). In most of the studies, implementation periods ranged from one to four weeks (n=8). Implementation periods of other studies were 21 to 24 weeks (n=6), five to eight weeks (n=4), nine to 12 weeks (n=3), 17 to 20 weeks

(n=1), and 13 to 16 weeks (n=1). In some of the studies, the application period was not used or specified (n=10).

3.6. Findings related to the sixth research question

The findings related to the research question of "*What are the study groups, observation unit\sample sizes, sampling methods of the studies?*" are shown in Table 6.

Table 6. Study Groups and Sampling Methods of the Studies

Theme	Category	Code	N
Study Group	All users	31	1
	Undergraduate students	1, 2, 3, 5, 6, 8, 10, 11, 13, 14, 15, 19, 21, 24, 27, 30	16
	Secondary or high school students	4, 17, 9, 16, 18, 20, 22, 23, 25, 32, 33	11
	Museums	28	1
	None	7, 12, 26, 29	4
Sampling Methods	Nonrandom (purposive sampling)	2, 4, 5, 6, 9, 10, 15, 17, 18, 19, 22, 25, 27, 28, 29, 30, 32, 33	18
	Nonrandom (convenience sampling)	1, 3, 8, 13, 14, 16, 20, 21, 24	9
	Random sampling (simple random sampling)	11, 31	2
	None	7, 12, 23, 26	4
Observation Unit \ Subjects	Multiple subject	1, 2, 3,4, 5, 6, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 24, 25, 27, 28, 29, 30, 31, 32, 33	29
	None	7, 12, 23, 26	4

In Table 6, most of the studies were multi-subject studies (n=29), and most of these studies were conducted with undergraduate students (n=16) and secondary or high school students (n=11). There were also studies in which everyone using the SL environment (n=1) and museums created in the SL environment (n=1) constituted the universe of the research. While determining the study group, the studies used purposive sampling (n=18), convenience sampling (n=9), and simple random sampling (n=2). No sample or study group was used in some of the studies (n=4).

3.7. Findings related to the seventh research question

As seen in Appendix-1, more than one data collection tools and data analysis method\techniques were used in some of the studies. The findings regarding what type of data collection tools used in the studies are as in Table 7.

Table 7. Data Collection Tools and Data Analysis Techniques Used in the Studies

Theme	Category	Code	N
Data Collection Tools	Survey	1, 2, 4, 6, 9, 10, 11, 13, 14, 16, 18, 20, 22, 25, 27, 29, 31,32	18
	Interview	3, 4, 5, 9, 10, 11, 14, 15, 16, 17, 19, 22, 24, 25, 30, 32, 33	17
	Observation	2, 4, 5, 9, 10, 16, 17, 19, 21, 22, 24, 26, 28, 30, 32,33	16
	Achievement test	2, 6, 13, 16, 20, 21, 22, 25, 30, 33	10
	Document analysis	7, 23, 24, 26, 28, 30	6
	Diary	8, 9, 10, 15, 17	5
	Evaluation form	15	1
	Portfolio	10	1
	Rubrics	30	1
	Aptitude test	21	1
	Unspecified	12	1

According to the findings in Table 7, survey (n=18), interview (n=17), observation (n=16), academic achievement test (n=10), document review (n=6), diary (n=5) evaluation form (n=1), portfolio (n=1), rubrics (n=1), and aptitude test (n=1) were used as data collection tools in the studies examined.

The findings regarding what type of data analysis methods/techniques used in the studies are shown in Table 8.

Table 8. Data Analysis Methods/Techniques Used in the Studies

Theme	Category	Code	N
Data Analysis Methods/Techniques	Content analysis	4, 5, 9, 10, 11, 13, 15, 16, 17, 19, 22, 25, 24, 27, 30	15
	Inferential statistics	2, 6, 11, 13, 16, 18, 20, 21, 22, 25, 29, 30, 31, 33	14
	Descriptive statistics	1, 11, 14, 16, 21, 22, 29, 30, 31, 32, 33	11
	Descriptive analysis	33	1
	Unspecified	3, 7, 8, 26, 23, 28, 12	6

According to Table 8, content analysis (n=15), inferential statistics (n=14), descriptive statistics (n=11), and descriptive analysis (n=1) were used to analyze the data in the studies examined. In some of the studies, no data analysis methods or techniques were mentioned (n=6).

3.8. Findings related to the eighth research question

The findings of the research question related to the results\effects of the studies examined are shown in Table 9.

Table 9. Findings on the Results\Effects of the Studies

Theme	Category	Code	f
Effect	Pozitive	3, 4, 5, 8, 9, 10, 13, 14, 15, 16, 17, 18, 19, 20, 21, 24, 25, 27, 28, 29, 30, 31, 32, 33	24
	Neutral	1, 2, 6, 7, 11, 12, 22, 23, 26	9

As seen in Table 9, in most of the studies, it was observed that SL application had significant and positive effects on the participants (n=24). In other studies, either experience and problems related to SL application were mentioned or the training did not have any significant effect on the participants (n=9). However, none of the studies showed that the SL application had a negative effect. In addition, various

suggestions were provided to researchers and practitioners at the end of all studies. The results of the studies and the codes related to the studies are presented below.

In the study by Dincer (2008), the use of SL in distance education consultancy services was discussed and the experiences and problems of the learners in the application process and the instruction designer in the creation process were determined (20). In the experimental study of Olpak (2010), it was observed that there were no significant differences between the academic achievement, social presence, and the time spent in the learning environment of the experimental group studying in SL and the control group studying online (2). In the study conducted by Esgin et al. (2011), in SL environment, there were no differences between the academic achievement and motivation of traditional virtual classroom and non-traditional virtual classroom students but the increase in success and motivation between the experimental groups were found to be in favor of the traditional virtual class (6). Similarly, in Yildirim's (2012) study, no significant difference was found between the two e-learning environments according to the learners' achievement, motivation, and social presence. No significant effects of learning styles and personalities were found on student's achievement. Yet, the Second Life environment appealed to more positive perceptions and opinions of the participants than the web-based environment (11).

In Ozonur's (2013) study, in the comparison of the available web-based distance learning and 3D instruction application designed in Second Life as a virtual world, the results indicated that there were significant differences between the groups in terms of students' attitudes, social presence, motivation and the time spent in the learning environment. Although the students in the experimental group had higher scores in the scales related to attitudes, social presence, motivation, and the time spent in the learning environment, no significant difference was found between the groups concerning academic success. In Gokoglu's (2019) study, it was observed that the SL environment developed participants' behavioral skills and the presence of virtual reality environments. It was also found that there was a positive relationship between behavioral skills and the presence of virtual reality environments (32).

Bezir, Cukurbasi, and Baran (2011), Bezir (2012), Can (2012), Iliç (2013), Colak (2013), Kazazoglu (2014), and Bezir and Baran (2014) used SL environment for foreign language education in their studies. Bezir, Cukurbasi, and Baran (2011) revealed that foreign language activities in the SL environment contribute to language development and self-confidence in speaking English of students (4). The results of the studies conducted by Bezir (2012) and İliç (2012) were found to be consistent with each other. In both studies, it was found out that foreign language education, organized in the SL environment, helped students learn from their peers, overcome their shyness, increase their self-confidence and self-efficacy levels and get rid of community pressure. In addition, the immersion feature of the SL environment increased students' interest and motivation towards the course, while the use of avatars enabled communication to be effective between the students. In addition to this, some limitations and problems in the SL learning environment were discussed in detail, and recommendations were provided to the researchers (9, 14). In the study conducted by Kazazoglu (2014), it was revealed that SL can be used as an alternative and effective educational tool for the development of descriptors such as learner autonomy, self-assessment, learning to learn, and gaining intercultural experience (19). In the study of Colak (2013), it was found out that students had positive experiences in the virtual environment and these experiences had positive effects on self-efficacy beliefs and social presence in communication (15). Bezir and Baran (2014) concluded that the SL environment increases students' social learning, motivation, attention, and interest (17). Concerning foreign language education in the SL environment, Can (2012) also discussed what opportunities SL offer to support learner autonomy (12).

Cukurbasi's (2012) study revealed that the participants found the environment effective, easy to use, and a place that enabled them to socialize and to express themselves confidently. Besides, participants stated that they constructed own knowledge, and connected it with real-life and achieved all of the stages of the five-stage model (10). In a study conducted by Reisoglu (2014), it was found that the academic achievement of students in 3D virtual learning environments was significantly weakly correlated with teaching and cognitive presence levels, but not with social presence levels (16).

In the studies by Gunay, Baydas, Karakus, and Goktas (2014) and Yilmaz, Karaman, Karakus, and Goktas (2014), it was found that SL positively affected students' attitudes and perceptions towards the virtual environment, learning winter sports in virtual environments, and winter sports (18, 29). In Gunay's (2015) study, 3D virtual environment interaction and spatial ability were interrelated and had a positive influence on achievement. In Kalkan's (2016) experimental study, a significant difference was observed in terms of the level of achievement of both experimental groups, the levels of flow and their attitudes towards learning winter sports in SL environment while such difference wasn't seen in their attitudes towards SL environments (25). In the studies conducted by Bulbul (2016, 2017), it was shown that the SL environment can be used effectively in the field of visual art education (26, 28). According to the results of Tunc's (2018) study, users generally did not have much interaction anxiety in the SL environment, but the audience anxiety was higher than the interaction anxiety (31).

In other studies conducted in the domestic literature, SL made learning interesting, diverse, effective, efficient, useful, permanent, concrete, and fun (Bulu & Isler, 2011; Erbay, Simsek, & Kirisci, 2019; Kalkan, 2016; Kobak, 2011; Ozonur, Yeken, & Tokmak, 2016; Sahin, 2016) (e.g. 3, 8, 24, 25, 27, 33) and increased motivation (Bulu & Isler, 2011; Cukurbasi, Bezir, & Karamete 2011; Kalkan, 2016; Ozonur et al., 2016; Sahin, 2016) (e.g. 3, 5, 24, 25, 27), creativity (Dadakoglu, 2018) (30), self-efficacy levels (Sahin, 2016) (24), social communication skills (Ozonur et al., 2016) (27), and academic achievement (e.g. 20, 22, 33) of the students. Also, it was revealed that the SL environment brought a different dimension to education with its 3D realistic design, evoked visual sense with its structure appealing to visual and auditory perception, and also was easy, quick to understand, original, informative, and reinforcing. Thanks to these

features, students with different learning types can easily learn (Ozonur et al., 2016; Sahin, 2016) (27, 24).

In most of the studies (e.g. 3, 4, 5, 13, 27), it was revealed that students experienced some technical problems during the educational processes in which they participated in the SL environment (Bezir, Cukurbasi, & Baran, 2011; Bulu & Isler, 2011; Cukurbasi, Bezir, & Karamete, 2011; Ozonur, 2013; Ozonur et al., 2016). At the end of Kobak's (2011) study, it was found that it was difficult to build an educational environment in the SL environment and to transfer the educational software to it (8). Bezir, Cukurbasi, and Baran (2011) stated that the lack of body language was one of the limitations of SL (4).

4. Results and Discussion

Nowadays, the use of technology in the field of education has been increasing and the importance of using virtual reality and virtual learning environments has gained more momentum recently. SL is the most preferred and used virtual learning environment and the use of this virtual learning environment in domestic literature has been increasing. However, in the literature, there is no other study that directly examines the studies using SL except for Inman et al. (2010) and Wang and Burton (2013). Therefore, the results of this study were compared with the results of the studies examining the studies related to virtual reality and comments were made.

According to the results obtained from the first research question, in the studies examined, researchers focused on the development of students' knowledge and skills. The SL environment was also used for consultancy services, educational design, design analysis as well as a foreign language, art, and design, mathematics, science, social studies teaching. Among the studies, there were some studies aimed at improving psychomotor and behavioral skills, developing positive attitudes, and increasing students' achievement, self-efficacy, motivation, and social presence. Hew and Cheung (2010) reported that past virtual world research had been most frequently carried out in the media arts and health and environment disciplines. However, in the education literature, SL was mostly used in foreign language teaching. Wang and Burton (2013), Reisoglu et al. (2017), and Kim et al. (2012) revealed that virtual worlds are mostly used in foreign language education. This can be interpreted as the fact that the SL application facilitates interpersonal interactions in the virtual environment and allows for easy communication with people from different languages. Warburton (2009) also stated that SL provides a wide range of opportunities for individuals to talk to each other and intercultural interaction.

In this study, studies between the years 2003-2019 on the use of SL in the field of education in Turkey aimed to investigate methodologically. For this purpose, various criteria were taken into consideration in the studies examined. Within the scope of these criteria, a total of 33 studies with 17 theses, seven articles, seven papers, and two book chapters published on SL application in domestic literature between 2008 and 2019 were examined and it was seen that SL application was mostly used in 2011. When both domestic and international literature is examined, it is seen that studies on virtual learning environments generally started in 2008 but increased in 2011 (Kim et al., 2012; Tokel & Cevizci-Karatas, 2014). Demirer and Erbas (2016) also reported that most of the studies on virtual learning environments were conducted in 2011 and 2012. The reason why there were not enough studies on SL application in the education field in recent years is that the studies examined are only in the Turkish language.

According to the results obtained from the research question about the research philosophies of the studies examined, most of the studies were conducted with qualitative research philosophy. This was followed by mixed and quantitative studies, respectively. Most of the qualitative studies were conducted as case studies. According to the research philosophies (qualitative, quantitative, and mixed), the studies examined by Inman et al. (2010) were found to be equally distributed. Most of the studies examined by Wang and Burton (2013) and Reisoglu et al. (2017) were found to be case studies and followed by quasi-experimental studies. Kapucu and Yildirim (2019) also stated that qualitative research was mostly adopted as a research approach in the studies. In the study conducted by Saka (2019), it was seen that the qualitative research method was mostly used in the researches, followed by mixed studies. Hew and Cheung (2010) found that most studies were descriptive research and experiment. According to the results of the studies examined and the results of this study, quantitative and mixed studies using virtual reality or SL were less than the qualitative studies.

According to the results of the research question related to the implementation periods of the studies examined, the duration of the studies ranged from one week to twenty-four weeks. However, in some of the studies, the application period was not used or specified and most of the study implementations were performed between one and four weeks. It is concluded that the implementation periods of the studies were not very long. The reason for this can be interpreted as the participation rate or motivation of the participants may decrease as the implementation period increases.

According to the results of the research question related to the study groups of the studies examined, in most of the studies, purposive sampling and convenience sampling techniques were preferred and most of the studies were conducted with undergraduate students. While Kapucu and Yildirim (2019) reported that students were mostly selected as the study group in virtual and augmented reality studies, Reisoglu et al. (2017), Saka (2019), Inman et al. (2010) and Kim et al. (2012) stated that undergraduate students were mostly preferred more for virtual environments. Wang and Burton (2013) also reported that most of the empirical studies were conducted in college settings. The suitability of the environment (computer laboratory and the adequacy of the laboratory, etc) and the sample to be used in the study are important elements to conduct a study on the effectiveness of a technological environment. Because, as mentioned before, to use SL effectively, participants need to have some technical skills. Therefore, this can be interpreted as the researchers mostly prefer to select the participants among the students especially to reveal the effectiveness, advantages, and disadvantages of SL application.

According to the results obtained from the research question about the data collection tools and data analysis methods of the studies examined, in some of the studies, more than one

data collection method\technique and data analysis method\technique were used. In the studies, interviews, and questionnaires\scales were the most used data collection techniques, followed by observation, academic achievement test, document review, and diary, respectively. In the studies examined by Kapucu and Yildirim (2019), it was found that surveys and interview forms were the most preferred data collection tools. Inman et al. (2010) reported that surveys were used most, regardless of research methods. In the study by Saka (2019), it was seen that various interview techniques were used to evaluate the application processes using virtual reality games and surveys\questionnaires, evaluation forms, and open-ended questions were also applied in the studies. This finding can be interpreted as the simultaneous use of different data collection tools and the use of surveys and interviews are important for demonstrating the effectiveness of technology-based applications such as the SL in the field of education, as well as for sharing experiences and practical problems with other researchers and practitioners.

In the studies examined, according to the frequency of use, content analysis, inferential statistics, and descriptive statistics were used, respectively. Kapucu and Yildirim (2019) reported that the inferential statistics were preferred most as the data analysis technique since the scales were mostly utilized in the studies examined. The data analysis methods/techniques used in the studies depend on the data collection process and tools. It is an expected result that in most of the studies examined, content analysis, inferential statistics, and descriptive statistical techniques were used due to the use of surveys, interviews, and observations.

According to the results obtained from the last research question related to the results\effects of the studies examined, in most of the studies, it was observed that SL application had significant and positive effects on the participants. In some of the studies, either experiences and problems related to SL application were mentioned or the training did not have any significant effect on the participant outcomes. None of the studies showed that the SL application had a negative effect. In addition, various suggestions were made to researchers and practitioners at the end of all studies. Moreover, Kapucu and Yildirim (2019) stated that in most of the studies examined, descriptive results were presented and suggestions were made for future researches. Inman et al. (2010) reported that several potential problems with using Second Life were identified by researchers. Problems include issues such as student acceptance of SL as an educational tool, technical problems, the potential for distraction and disruption caused by avatars unrelated to the class, and potential exposure to misinformation and pornography. Despite these problems, educators also recognized potential uses for SL as an instructional tool or forum. The problems experiencing in SL vary depending on the person, situation, computer, or situation. This shows that the problems experienced in SL cannot be solved completely. However, if these problems are reduced, it can be said that SL can be an effective educational application.

As a result, it has been found out that the use of SL as an educational environment can provide important and positive contributions to the educational outcomes, and these contributions are summarized as follows:

- Individualizes learning while promoting participatory learning, peer support, and cooperative learning,
- Decreases the feeling of social disconnection by using avatars,
- Provides users with innovative ways to construct, communicate, and collaborate,
- Provides an effective learning and teaching environment in visual arts education thanks to its rich teaching content,
- Improves students' problem solving and critical thinking skills through simulations,
- Provides students with highly interactive experiences and develops skills to discover new concepts,
- Reduces students' interaction and watching anxiety levels and increases motivation, self-confidence, class participation, and engagement levels,
- Provides information with less effort than traditional teaching process,
- Provides a more realistic environment than distance education,
- Ensures costly, dangerous or impossible experiences in real life and makes the education process safe,
- Provides engaging, effective, enduring, and realistic learning,
- Provides a positive attitude towards various sports,
- Different teaching methods and techniques can be used easily and together,
- Teaches the characteristics of digital culture and develops virtual literacy and communication skills, thus ensures the linguistic and cultural development of students.
- Develops psychomotor and behavioral skills,
- Creates a realistic browsing experience by using representations of various places in the virtual world and simulation effect
- Enables skill training that involves a high level of risk or is difficult to implement.

5. Recommendations

Studies showed that the SL virtual learning environment was effective in foreign language education. One of the reasons behind this result is that SL provides individuals with enhanced and rich interaction with other individuals and communities. So, SL can be used for individuals who have problems with communicating or avoid communicating in real life. Also, SL can be used especially for students with disabilities or those who cannot attend formal education due to any illness. SL can help students socialize, solve problems, and support their education. Based on these, various applications can be realized in the SL environment to improve students' social skills, and the effectiveness of these applications can be tested by mixed, experimental, or case studies.

In the study, only studies with some criteria were examined. One of these criteria was the criterion that the language of publication should be Turkish. This led to the inability to obtain a valid result regarding the distribution of SL over the years. Therefore, researchers can examine the studies

without limiting the publication language to increase the validity and generalizability of the study.

It was observed that most of the studies were carried out qualitatively as case studies, and the views on the implementation process of SL were collected mostly through surveys and interviews. In addition, the lack of long implementation periods of the SL applications is one of the results of the study. Therefore, more longitudinal and experimental studies can be conducted to reveal the effectiveness of SL in the field of education.

The learning activities in SL were mostly carried out with undergraduate students who are the most appropriate study group and the effects of these activities performed on the students' social presence, academic achievement, various skills, attitudes, and behaviors were revealed. However, the type and number of studies in the SL environment that improve students' professional skills should be increased. For example, the SL learning environment can be used as a virtual classroom environment in which prospective teachers can have real experiences before the teaching profession.

To disseminate SL in educational organizations, both educators and students should be encouraged to develop positive attitudes towards this virtual reality environment. For this, it is important to reduce the prejudices of both educators and students against information and communication technologies and to develop their virtual literacy skills, ie technical skills. In this regard, in-service training can be provided to teachers to help educators recognize and use the SL. To enable students to use virtual worlds more effectively, the SL application should be introduced in computer lessons and added as a subject. Besides, a variety of meetings or seminars should be organized for both educators and students to raise awareness about SL practice.

Some technical problems were observed during the implementations in the SL environment. In addition, not all students may have access to the virtual environment. Laboratories can be established in educational organizations to ensure equal opportunities in education and to reduce the problems experienced. Also, a real or virtual technical team can be formed or a consultancy office can be established to consult technical problems experienced in the SL environment.

Because of the irradiation feature and the malicious use of individuals or institutions in the SL environment, students may meet or participate in distracting or inappropriate content. To solve this problem, awareness training can be given to the students, or the web-based learning management system called SLOODLE - The Simulation Linked Object-Oriented Dynamic Learning Environment- can be used as a training environment. SLOODLE is a free and open-source project which integrates the multi-user virtual environments of SL with the Moodle learning-management system (Griol & Callejas, 2019). SLOODLE provides to integrate intuitively into the student's virtual world experiences as simple as possible and bridges text chat between the virtual world and the web-based Moodle chat room allowing real-time (Kemp, Livingstone, & Bloomfield, 2009). Another way to avoid meet or participate in distracting or inappropriate content is to pay attention to the grids of SL. SL has two distinct grids: the main adult grid and the Teen Second Life grid. The main adult grid is for people ages 18 and up and the Teen Second Life grid is for teens ages 13 to 17. Students over the age of 17 are not legally allowed to enter the Teen Second Life grid and educators are considerably restricted in how they can enter and interact with teens in the Teen Second Life grid.

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Appendix -1

Code	Author	Year	Purpose	Publication Type	Research Philosophy	Research Design\Model	Implementation Period	Study Group	Sampling Method	Sample Size	Data Analysis Method	Data Collection Tool	Effect
1	Dincer	2008	The uses of the SL virtual world environment in consulting services in distance education	Master Thesis	Quantitative	Scanning	6 months (24 weeks)	Undergraduate students	Nonrandom (convenience sampling)	122	Descriptive statistics (frequency, chi-square, cross-table)	Survey	±
2	Olpak	2010	To introduce the effects of different interaction tools utilized in online learning environments on academic achievements and social presence perceptions of students	Master Thesis	Quantitative	Experimental design	4 weeks	Undergraduate students	Nonrandom (purposive sampling)	57	Inferential statistics (ANOVA)	Academic achievement test, Survey, Observation	±
3	Bulu & Isler	2011	Design and development of SL METU campus	Full-text paper	Qualitative	-	1 term (24 weeks)	Undergraduate students	Nonrandom (convenience sampling)	4	-	Interview	+
4	Bezir, Cukurbasi, & Baran	2011	To present the design process of foreign language activities which are developed by using online role-playing in SLand to reveal students' views on these activities	Full-text paper	Qualitative	Case study	1 term (24 weeks)	High school students	Nonrandom (purposive sampling)	12	Content analysis	Survey, Observation, Interview	+
5	Cukurbasi, Bezir, & Karamete	2011	To design the Turkish orientation area for the use of SL in SL and reveal students' views on this area.	Full-text paper	Qualitative	Case study	1 term (24 weeks)	Undergraduate students	Nonrandom (purposive sampling)	30	Content analysis	Observation, Interview	+
6	Esgin, Pamukcu, Ergul, & Ansay	2011	To investigate the effects of 3-D online social environments on student success and motivation.	Full-text paper	Quantitative	Experimental design	-	Undergraduate students	Nonrandom (purposive sampling)	61	Inferential statistics (t-testi)	Academic achievement test, Survey	±
7	Canbek	2011	To discuss the SL in the context of existing applications in Turkey and provide recommendations for structuring appropriate educational designs for the future	Book chapter	Qualitative	Literature review	-	-	-	-	-	Document analysis	±
8	Kobak	2011	Designing an educational environment in SLand transfer the developed training software to the virtual world	Full-text paper	Qualitative	-	1 term (24 weeks)	Undergraduate students	Nonrandom (convenience sampling)	15	-	Diary	+
9	Bezir	2012	To determine factors affecting the interaction between student, teacher, and environment which occurs in SL used for foreign language education	Master Thesis	Qualitative	Case study	6 weeks	Secondary school students	Nonrandom (purposive sampling)	12	Content analysis	İnterview, Diary, Observation, Survey	+
10	Cukurbasi	2012	To examine the utility and effectiveness of five-stage models in SL environments	Master Thesis	Qualitative	Case study	11 weeks	Undergraduate students	Nonrandom (purposive sampling)	19	Content analysis	Observation, Diary, Portfolio, Survey, Interview	+
11	Yildirim	2012	To compare virtual world based learning environment and web-based e-learning environments depend on the student variables (achievement, learning style, personality, motivation, and social presence)	Ph.D. Thesis	Mixed	Quantitative & Qualitative	8 weeks	Undergraduate students	Simple random sampling	116	Descriptive and Inferential statistics (percentage, frequency, mean, standard deviation, t-test, correlation) Content analysis	Survey, Interview	±
12	Can	2012	To discuss what opportunities the SL platform offers to support learner autonomy in the process of learning a foreign language	Article	Qualitative	Literature review	-	-	-	-	-	-	±
13	Ozonur	2013	To compare the effects of the available web-based distance learning and 3D instruction application designed in SL on students' learning.	Ph.D. Thesis	Mixed	Quantitative & Qualitative (experimental design)	14 weeks	Undergraduate students	Nonrandom (convenience sampling)	70	Inferential statistics (t-test, Box's M, MWU and Wilcoxon tests) Content analysis	Academic achievement test, Survey	+

Code	Author	Year	Purpose	Publication Type	Research Philosophy	Research Design\Model	Implementation Period	Study Group	Sampling Method	Sample Size	Data Analysis Method	Data Collection Tool	Effect
14	Iliç	2013	To design a learning environment for foreign language education in SL and to evaluate the attitudes of students towards this learning environment and to investigate the problems that were occurred in this environment	Master Thesis	Mixed	Quantitative & Qualitative	10 weeks	Undergraduate students	Nonrandom (convenience sampling)	24	Descriptive statistics (frequency)	Survey, Interview	+
15	Colak	2013	To examine the effects of English communication activities taking place in SL environment on foreign language self-efficacy beliefs and social presence of students	Master Thesis	Qualitative	Case study	18 weeks	Undergraduate students	Nonrandom (purposive sampling)	5	Deductive thematic analysis	Evaluation form, Diary, Interview	+
16	Reisoglu	2014	To determine whether instructional, social, and cognitive presence show change according to a classroom, computer, and 3D game experience; factors that affect these components and their relation with academic success.	Ph.D. Thesis	Mixed	Quantitative & Qualitative	3 weeks	Secondary school students	Nonrandom (convenience sampling)	103	Descriptive Inferential statistics (mean, Standard deviation, MWU, KWH, Kendall's tau) Content analysis	Survey, Observation, Interview, Academic achievement test	+
17	Bezir & Baran	2014	The contribution of six thinking hats techniques to the language teaching process in the SL	Article	Qualitative	Case study	1 term (24 weeks)	High school students	Nonrandom (purposive sampling)	16	Content analysis	Interview, Observation, Diary	+
18	Yilmaz, Karaman, Karakus, & Goktas	2014	To develop an attitude scale and investigate the attitudes of students towards the virtual environment, learning winter sports in virtual environments and winter sports	Article	Qualitative	Causal comparative research	-	Secondary school students	Nonrandom (purposive sampling)	70	Factor analysis Inferential statistics (t-test, ANOVA)	Survey	+
19	Kazazoglu	2014	SL based interaction in foreign language teaching	Article	Qualitative	Case study	6 weeks	Undergraduate students	Nonrandom (purposive sampling)	5	Content analysis	Observation, Interview	+
20	Deniz	2015	Supporting the teaching principles in the full learning model in mathematics teaching with SL	Master Thesis	Quantitative	Experimental design	3 weeks	Secondary school students	Nonrandom (convenience sampling)	28	Inferential statistics (Wilcoxon test)	Academic achievement test, Survey	+
21	Gunay	2015	To investigate the relationships between 3D virtual environment interaction level, spatial abilities, and achievement level for participants in the SL environment	Master Thesis	Quantitative	Relational	2 weeks	Undergraduate students	Nonrandom (convenience Sampling)	45	Descriptive and Inferential statistics (mean, standard deviation, correlation analysis)	Observation, Aptitude test, Academic achievement test	+
22	Topu	2015	To determine whether behavioral, affective and cognitive engagement and academic achievement show change according to guided and unguided students groups	Ph.D. Thesis	Mixed	Quantitative & Qualitative	2 weeks	Secondary school students	Nonrandom (purposive sampling)	104	Descriptive and Inferential statistics (mean, standard deviation, MANOVA, t-test, Pearson multiple correlation tests) Content analysis	Survey, Interview, Observation, Academic achievement test	±
23	Tokel & Cevizci-Karatas	2013	To provide information to the educators who want to use virtual worlds for educational purposes and to provide them a roadmap to by presenting design principles	Full-text paper	Qualitative	Literature review	-	-	-	-	-	Document analysis	±
24	Sahin	2016	To give an orientation training to the teacher candidates of social studies about one of the three-dimensional virtual environment SL	Master Thesis	Qualitative	Fenomology	5 weeks	undergraduate students	Nonrandom (convenience sampling)	10	Content analysis	Observation, Interview Document analysis	+

Code	Author	Year	Purpose	Publication Type	Research Philosophy	Research Design\Model	Implementation Period	Study Group	Sampling Method	Sample Size	Data Analysis Method	Data Collection Tool	Effect
25	Kalkan	2016	To research the effect of gamification virtual learning environment on students' success, flow, and attitudes	Master Thesis	Mixed	Qualitative	2 weeks	Secondary school students	Nonrandom (purposive sampling)	134	Inferential statistics (t-testi) Content analysis	Survey, Academic achievement test, Interview	+
26	Bulbul	2016	The usage of the SL environment in visual arts education in Turkey	Book chapter	Qualitative	Case study	-	-	-	-	-	Observation, Document analysis	±
27	Ozonur, Yelken, & Tokmak	2016	To determine the opinions of secondary school students about SL experiences	Full-text paper	Qualitative	Case study	-	Undergraduate students	Nonrandom (purposive sampling)	35	Content analysis	Survey	+
28	Bulbul	2017	To focus on how to benefit from the museum within the visual arts education program and the SL museum in education	Article	Qualitative	Qualitative	-	Museum	Simple random sampling	4	-	Observation, Document analysis	+
29	Gunay, Baydas, Karakus, & Goktas	2014	Investigation of primary school students' perceptions of learning winter sports in a 3D virtual environment	Article	Quantitative	Relational	-	Secondary School students	Nonrandom (purposive sampling)	166	Descriptive and Inferential statistics (frequency, mean, MANOVA)	Survey	+
30	Dadakoglu	2018	To demonstrate the impact of Second Life on creativity in art and design education.	Ph.D. Thesis	Mixed	Quantitative & Qualitative	12 weeks	Undergraduate students	Nonrandom (purposive sampling)	16	Descriptive and Inferential statistics (frequency, percentage, average, median, t-test) Content analysis	Rubrics, Academic achievement test, Interview, Observation, Document analysis	+
31	Tunc	2018	To investigate the effect of SL application on the peoples' interaction and audience anxieties	Master Thesis	Quantitative	Scanning	-	SL Users	Simple random sampling	564	Descriptive and Inferential statistics (frequency, percentage, mean, t-test, ANOVA)	Survey	+
32	Gokoglu	2019	To develop a virtual reality-based learning environment for teaching basic fire safety skills and to evaluate the impact of this environment on the development of basic behavioral skills of students	Ph.D. Thesis	Qualitative	Case study	1 month (4 weeks)	Secondary school students	Nonrandom (purposive sampling)	16	Descriptive statistics	Survey, Observation, Interview	+
33	Erbay, Simsek, & Kirisci	2019	Examining the effect of Second Life application on teaching fractions	Article	Quantitative	Experimental design	1 month (4 weeks)	Secondary school students	Nonrandom (purposive sampling)	34	Inferential statistics (t-test, correlation analysis) Descriptive analysis	Observation, Interview, Academic achievement test	+