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Second Life Application for Creativity in Art and Design Education

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Abstract: This research aims at revealing the effects of Second Life (SL) application used in virtual environment in art and design education of creativity. This research is a qualitative study conducted evaluating the results of a group of 16 students studying art and design at universities, for a period of 12 weeks. For SL, a 3D, online, multi-user virtual environment was chosen as the study area. The process of the research was evaluated by the researcher with a Structured Observation Form (SOF). Student designs were evaluated by four graduated artists/educators and researchers with a Rubric. The study group discovered SL during the application process. They made numerous trials, took risks and tried different solutions in SL. The design process that started with an avatar creation continued with 3D design, adding texture, colour, and script to objects and creating a notecard. According to the researcher's feedback based on SOF, the group is considered "Good" in the design process. According to the Rubric for creativity, applied by the experts is evaluated as "Accomplished." As for the rubric applied by the researcher, the group is evaluated "Good." Based on these results, it can be considered that the inclusion of SL in the art and design education curriculum will contribute to 21st century skills and develop imagination and creativity of students.

Keywords: Creativity, second life, art and design education.

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Introduction

The 21st century is a period in which digital technologies are rapidly evolving, modifying and spreading. There emerged a completely new generation called "Generation Z" who were mostly born in the 2000s – a purely technological age (Taslibeyaz, 2019) and they are highly different from digital immigrants. These individuals spend more time online, for which reason educators have adapted teaching platforms to cover all educational, technological and cultural needs of the new age (Wang & Braman, 2009).

The 21st century skills are supposed to include effective communication, flexible and harmonious collaboration, good knowledge of technology, creative and critical thinking, problem solving skills, producing, developing social and cultural traits, self-learning and self-regulation (Kotluk & Kocakaya, 2015). According to Loveless (2002), information and communication technologies can be used for developing ideas and connections between users, adding meanings, collaboration and communication in order to support creativity. Therefore, in the information age, technology is expected to be effective in improving creativity and problem solving skills of individuals. Cakıroğlu et al. (2015) says that using technology to support student-centered education improves students' higher-order thinking skills. Erol and Tas (2012) state that technology has an important place in the process of developing high-level thinking skills (critical, logical, reflective, metacognitive and creative thinking).

Virtual Environment and Education

Recently, the rapid development of knowledge and technology has led to an increase in educational needs. Educational environment has been transformed and digitalised in parallel with the physical and social ones. One of these innovations is the three-dimensional (3D) virtual world (Wang et al., 2016), where users can communicate with each other via avatars like they do in reality. Nowadays, this practice is widely and effectively used in many scientific studies. For an instance, environments that cannot be reached under normal conditions (moon surface etc.) are designed in virtual reality. Today, traditional classes are replaced by web and virtual classrooms, based on concept of learning anytime and anywhere (Gunawardena & McIsaac, 2004, as cited in Canbek, 2009).

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Technology and creativity

Nowadays, technology and creativity are used simultaneously. Creative thinking and creative practices are essential to keep up with the changing world. Creativity is a multi-component and very important skill, behaviour, process or phenomenon that makes us feel its effectiveness at every stage of life, which has been researched a lot. To be able to raise a creative and productive generation is the target of many curriculums today.

Cellek (2003) states that the creative process continues within the framework of requirements. Loveless (2002) states that individuals can transform original ideas of imagination into concrete outputs such as image, poetry, artistic 2D or 3D work or video by using ICT.

ICT can also be used to develop higher-order thinking skills such as researching, imagination, experimenting, correcting, making assumptions and problem solving. It is known that simulations, spreadsheet programs, digital measurement tools, control units, programmable and controllable tools, virtual reality and educational games (e.g. SL) are effective in this process. In addition, online and offline virtual laboratory applications, smart systems and games are used in many countries to develop scientific creativity and to increase motivation of learners (Loveless, 2002, as cited in Erol & Tas, 2012).

Creativity in Art and Design Education and Second Life

The concept of art and design is not independent of those innovations brought by time, but on the contrary, it has a close relationship with them. Stokrocki (2011) states that the potential of digital worlds will be infinite in the future, as it allows art educators and students to learn, plan and produce digitally. The innovations brought by digitalization are reshaping human consciousness and life (Tugal, 2018), affecting the creativity of artists and art educators and helping them gain new perspectives.

Art education, which is more diverse in both theory and practice today, should offer students the opportunity to try any media (Han et al., 2017). Curriculum should take the form and content and new technologies into consideration, for the student to criticize, analyse and create using computer technology (Kirisoglu, 2015).

Technological materials in visual arts develop students' creativity (Dolunay, 2016). Fox and Schirmacher (2014) state that thanks to the art activities on the computer some things can be easily deleted, undone or added. There are numerous choices of colours, the chance of adding a text to the artistic work and a variety of possibilities to express creative thinking. Under the light of this information, the effect of SL virtual environment on creativity in art and design education has been studied in this research.

Second Life is defined as 3D internet which has been designed as a lifelike online simulation and a 3D visual interface (Second Life Turkey, 2019). While the impact of virtual environment on creativity is evaluated in art and design education, students are encouraged to use SL, because SL supports synchronous design communication and real-time 3D modelling. In addition to all these benefits, SL is cheap and easy to use. In the context of education, SL provides a very rich environment for constructive learning, socialization, research and discovery. This virtual environment allows learners to demonstrate the skills and strategies of using technological tools, designing visuals and bringing innovations into 3D environment (Burgess et al., 2010).

Considering the mentioned characteristics of today's generation Z, appropriate environments of learning should be discovered, designed and used in education to supply these students with the best possible education system. There are many virtual education applications in the world and in our country. Even some universities set up virtual campuses within the SL including Open University, Harvard, Texas, Stanford, Ohio, METU and Istanbul University. In addition to virtual trainings, the trainers here also use SL with the intention of networking, communication, real-world seminars and conferences. The New Media Consortium (NMC), which is a member of universities, museums and research centers of MIT, Harvard, Yale, Princeton, USC, Rice has been using SL since 2006 to support projects in education, training, research and development. With the NMC Campus Project, it can be seen that educators and students are trained on a variety of subjects and students working in the field of health are offered trainings in this simulation environment to solve the problems they may actually encounter" (Uzun, 2011).

That digital instruments and virtual platforms are used in many studies and the introduction of virtual and augmented reality centers which are also made a part of the education are among the topics about the education system that Turkey has been facing frequently. The aim of this article is to examine the dimensions of the relationship between art and design education and creativity through a virtual world example, 3D, an online life simulation SL.

Purpose of the research

The purpose of this research is to reveal the effects of SL application used in virtual environment in art and design education on creativity. So:

1. How does the SL application affect the learning process in art and design courses?

2. What are the opinions of the experts regarding the artistic creativity that develops in the students through the designs resulting from the use of SL application in art and design courses?

Creativity consists of both process and result. It was wondered by the researcher if the SL method is a learning process and how successful this process is. The first question was aroused for this purpose. Creativity is a multi-component issue. Expert opinions were also needed on whether the outcomes of the applied method were creative or not. It has been wondered what the resulting products mean to those who are experts in the field of design. A second question was aroused to determine this situation.

The Importance of the Research

This research is based on the SL virtual environment;

- To reveal its potential in creativity of art and design education,
- Testing how effective its usage in education,
- The inclusion of art and design education in Turkey and monitoring their results,
- The importance of evaluation of its usage in education by decision-makers and providing the opportunity to be included in education environments.

This research is unique in Turkey in that there is no study examining the relationship between a 3D virtual environment and creativity, which has become one of the most frequently used technologies in the world. The information obtained via this research is also considered to assist researchers and practitioners, who will provide training in a virtual environment in terms of structuring more favourable learning environments.

Method

Research Design

This research is a qualitative study evaluated by the rubric and Structured Observation Form (SOF) which serves as a numerical classification of qualitative information from the designs and the 12-week design process.

Working group

The study group of the research consisted of 16 students studying in the field of art and design faculty. 6 students from the 3rd grade studying design in the Visual Communication Design Department of TOBB University, 6 students from Gazi Faculty of Education, Art Education, Graphic Main Art Workshop Class, and 4 students from Giresun Görele Fine Arts Faculty, Graphic Department. "Typical Case Sampling" method was used for this study group.

Study field

TOBB ETU Visual Communication Design Department 3D Modelling lesson, Gazi University, Art Education Program, Graphic Workshop course, Giresun Görele Faculty of Fine Arts, Graphic Workshop course and SL virtual platform that provides 3D technologies for use in educational framework have been determined as an area of research.

Data Collection Tools

The information's been collected with the rubric and SOF applied to the study group. While the rubric was being prepared, in order to obtain the experts' opinions about the artistic creativity emerging within the students via the designs as a result of SL applications and art classes, and mark and evaluate these designs, the literature was scanned and similar sources were examined.

Creativity is defined in many ways, according to many researchers. For some, creativity is a process; for others, a product; and to others, it is both. Creativity can also be defined as the interaction of the individual in cultural and social relations. Concepts such as originality and innovation can be given as examples. The expression of creativity used in this research has a unifying qualification that appeals to both the process and the product. The creativity definitions of researchers such as Wallas, Guilford, Torrance coincide with the creativity definition in this research. Creativity according to their definitions; it is about problem-finding, problem-solving, divergent and convergent thinking, self-expression, adapting to new situations, critical thinking, producing and being a part of the learning process.

In this context, rubric has been prepared to evaluate the studies of student in terms of "Information and Perception Capacity", "Technical Skills", "Design", "Research and Working Approach" and "Self-Evaluation Capacity". After determining the criteria, definitions and descriptions of each criterion were examined. Then, by defining these features appropriately, the performance criteria and the levels of performance expected from the student were determined. Each criterion was rated with a score between 1 and 5. As a result of SOF and Rubric scores, scores between 0-5 scaled as "Needs improvement", 6-10 "Satisfactory", 11-15 "Good" and 16-20 "Accomplished".

The qualification classification of the total scores in SOF is determined according to the following intervals: 50 and less "Needs Improvement", 51-56 "Satisfactory", 57-64 "Good", 65 and above "Accomplished".

The qualification of the classification of "information and perception capacity", "technical ability" and "design" scores, and their sum are taken by the participants from the researcher's perspective, which is determined according to the following intervals: 0-1.49 range "Needs Improvement", 1.50-2.49 "Satisfactory", 2.50-3.49 "Good", 3.50-4.00 "Accomplished".

The content of the five titles in Rubric and SOF is as the following:

1-With "information and perception capacity", the student's knowledge about three-dimensional, online, multi-user virtual environments, information about techniques and methods to create Avatar and exhibition space in SL environment are determined.

2-The students' "technical skills" have been evaluated by analysing their abilities to use materials and techniques effectively, especially for the students' talent in design.

3- With the "design" students created; it has been evaluated that using visual design elements and principles and affective qualities in an unusual and effective way, creating unique, extraordinary exhibition designs in a virtual environment.

4-With the "research and study approach", it has been evaluated that the students' ability to fulfil all responsibilities regarding the learning process within the given time.

5- With the "Self-evaluation capacity", the students' ability to demonstrate a multi-faceted critical attitude to their own design has been evaluated.

It was discussed in a meeting with a group of three students whether the prepared rubric was sufficiently comprehensible. At the end of this discussion, the rubric was prepared by considering the opinions of the students. Then, the developed Rubric was presented to three field experts, and one assessment and evaluation specialist. In accordance with the opinions of the experts, Rubric's final form was shaped (See Table 1 in Appendix). The scoring scale and rubrics' reliability was ensured relying on the rater-to-fit index, that is, Kendall's W test was applied whose results are indicated in Table 2.

Table 2. Kendall's W Coefficient of Concordance for Criteria

Coefficient of concordance	Criteria		
	Information and perception capacity	Technical skill	Design
Kendall's W	0,637*	0,552*	0,550*

*p<0,01

When Table 2 was examined that it was found that the co-efficiency of concordance between the scores of each criterion of the raters were between 0.550 and 0.637 and all the values were statistically significant. When the values are interpreted in general terms, it can be said that there is a medium and significant level of harmony among the raters according to the criteria of Von Eye and Mun (2005).

How does the SL application affect the learning process in art and design courses? SOF was used to answer this question, in that SOF was developed with the same criteria as Rubric and was used by the researcher throughout the implementation process. SOF was prepared to describe the contribution of the SL virtual environment to the creative process in art and design education. In this process, the researcher acted as a "participant observer".

Practice and Data Collection Process

After determining the problem, forming the working group and creating a working space in the SL virtual environment, the 12-week implementation period has started. In the first week, the researcher gave information about SL to the participant students. After opening the account, creating an avatar and orientation in SL, the working group was teleported to the working area. Then, the working group was given a briefing. The working group was asked to design 3D exhibition spaces using SL's modelling tools. The group conducted the first construction trials under the supervision of the instructor. In the second week, articles, presentations, examples and links related to the exhibition design were sent to the working group via e-mail. Applications started in the third week of studying and continued until the 11th week. In the 12th week, the working group completed the task and the application process was completed. While the researcher observed the design process, made progress with more than 600 screenshots. The data obtained from students' products were evaluated using rubric by four experts in art and design. The design process was observed for 12 weeks using SOF, and 16 exhibition designs created by students during the application process were examined as data sources.

Data Analysis

This research is a qualitative study that examines the designs evaluated with rubric and SOF. This data collection tools enables the qualitative data obtained to be classified numerically. In this study, the scores obtained from the rubric and SOF are described with percentage and frequency values. Interpretation is made on these values.

Findings

The findings and results were gathered under two main headings to answer two questions in order to reach the purpose of the research.

1. The effect of SL application process on creativity.
2. Opinions of experts on the artistic creativity development of the students through the designs obtained with the use of the SL application

1. The effect of the SL method application process on creativity

1.1. Researcher's Rubric assessments

In order to reveal the development of students' creativity according to the designs obtained by applying SL method, the researcher evaluated the designs of each participant.

Table 3. Researcher Creativity Rubric Evaluation Results

Student No	Information and Perception Capacity	Technical Ability	Design	Study Approach	Self-evaluation Capacity	Total Score	Mean	Quality
1	3	3	2	2	2	12	2,4	Good
2	3	3	2	2	2	12	2,4	Good
3	3	3	3	2	2	13	2,6	Good
4	3	3	3	1	1	11	2,2	Good
5	3	3	3	2	2	13	2,6	Good
6	3	3	3	2	2	13	2,6	Good
7	4	3	3	4	4	18	3,6	Accomplished
8	4	4	3	4	4	19	3,8	Accomplished
9	4	3	2	3	4	16	3,2	Accomplished
10	4	3	3	3	3	16	3,2	Accomplished
11	4	3	4	4	4	19	3,8	Accomplished
12	4	4	4	4	4	20	4	Accomplished
13	4	4	4	4	4	20	4	Accomplished
14	4	3	3	3	3	16	3,2	Accomplished
15	4	3	3	3	3	16	3,2	Accomplished
16	4	4	3	3	3	17	3,4	Accomplished

The final points of the students in the fields of information and perception capacity, technical skills, design, research working capacity and self-evaluation and their averages are illustrated in Table 3. This table contains the breakdown of rubric applied by the researcher to the study group. 6 students with a total score of 11-15 are in the "Good" class, while 10 students between 16-20 are in the "Accomplished" class. The average of the total scores was calculated as 15.7. The median was found to be 16.0. In general, students can be interpreted as "Good" in terms of total score.

1.2. Evaluation of the research process of the researcher

SOF is used with the intention of examining the implementation process of the SL method on a participant basis and provides qualitative information.

Table 4. Observation Form Table

Student No	Design process	SL (Technical Skills)	Information & Perception Capacity	Research and Study Approach	Self Evaluation Capacity	Total	Quality
1	11	11	9	14	6	51	Satisfactory
2	13	12	9	16	7	57	Good
3	11	10	8	13	6	48	Needs Improvement
4	9	10	9	11	6	45	Needs Improvement
5	10	10	9	14	6	49	Needs Improvement
6	12	12	9	13	6	52	Satisfactory
7	12	16	12	20	8	68	Accomplished
8	15	16	12	20	7	70	Accomplished
9	12	15	12	16	8	63	Good
10	12	15	12	18	7	64	Good
11	15	16	12	20	8	71	Accomplished
12	15	14	12	18	7	66	Accomplished
13	13	13	12	16	7	61	Good
14	13	14	12	18	7	64	Good
15	12	12	10	15	6	55	Satisfactory
16	12	11	9	14	6	52	Satisfactory

SOF data in Table 4 is for evaluating the research process. Table 4 includes the breakdown of the scores obtained as a result of the observation of the study group in the fields of Information and Perception Capacity, Technical Skills, Design, Research Working Capacity and Self Evaluation. Table 4 underlines that data in SOF is totally qualified.

Table 4 shows that some students scored 45, 48, 49, 51, 55, 57, 61, 63, 66, 68, 70 and 71 in SOF scale, and these students have a total of 75%, 6.3% each. There are two students with a total 52 and 64 of SOF. In this context, Table 5 emerges.

Table 5. Observation Form Quality Table

Quality	Frequency	Percentage	Cumulative Percentage
Good	5	31,3	31,3
Satisfactory	4	25,0	56,3
Accomplished	4	25,0	81,3
Needs Improvement	3	18,8	100,0
Total	16	100,0	

In Table 5 characterizes the scores of students according to SOF; There are 5 students in the "Good" category, 4 students in the "Satisfactory", 4 students in the "Excellent", and 3 students in the "Needs Improvement" category. The average of the SOF scores by 16 students is 58,5 According to the specified ranges, the result of 58.5 can be considered as "Good".

Within this 12-week practise period the students went through and discovered SL in this research, they made numerous attempts, took risks and tried different solutions. The design process that started with avatar creation continued with 3D design, adding texture, colour, script to objects, creating a note card. According to the findings of SOF, students can creatively transform information using the internet and different digital materials and media.

According to Csikszentmihalyi and Wolfe, "The future will require individuals who can formulate new problems, find new solutions, and adapt easily to new ideas." Students encountered with many problems, helped each other and stayed in constant communication (Csikszentmihalyi & Wolfe, 2014, as cited in Han, 2017).

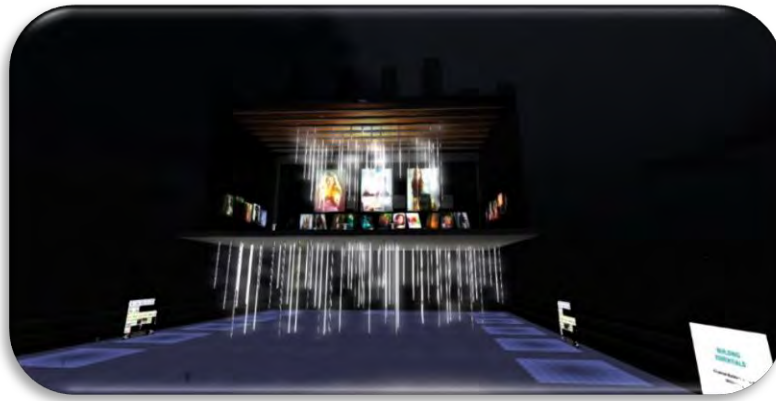


Figure 1. Student Study Number 11

Creativity is as much about the process as the result. For this reason, the observation and evaluation of the process was made with SOF. As a result of the analysis of SOF the general performance is evaluated as "Good".

2. Opinions of experts on the artistic creativity developing of students through the designs obtained with the use of the SL application

The second question regarding the purpose of the research was "What are the opinions of the experts regarding the artistic creativity that develops in the students through the designs that arise as a result of the use of SL application in art and design courses?" Findings related to rubric applied by experts and researchers from the field were obtained. In Figure 1, there is an overview of the opinions of the experts about this second question.

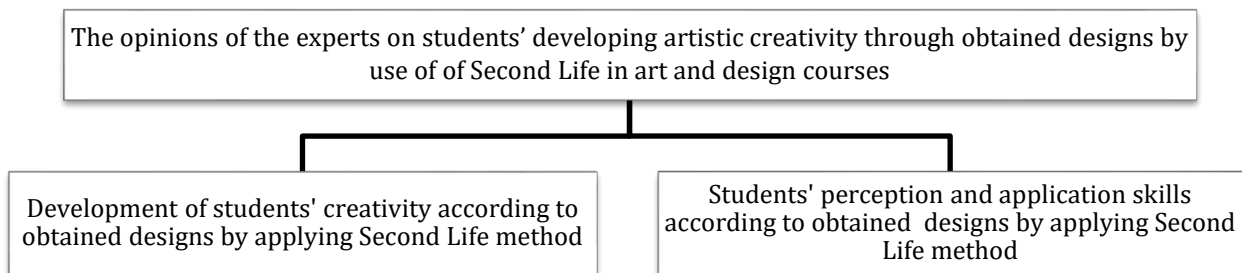


Figure 2. Experts' Opinions

2.1. The development of students' creativity according to the designs obtained by applying SL method

Rubric has been used by four faculty members who are experts in their fields to evaluate participants' ability to use SL, their exhibition designs and level of creativity.

Table 6. Expert Creativity Rubric Evaluation Results

Student No	Expert VÖ	Expert VG	Expert ŞA	Expert FG	Total Score	Mean	Quality
1	7	12	9	12	40	10	Satisfactory
2	10	12	14	12	48	12	Good
3	10	13	10	14	47	11,8	Good
4	8	11	9	9	37	9,25	Satisfactory
5	10	13	12	11	46	11,5	Good
6	7	13	7	11	38	9,5	Satisfactory
7	17	18	17	20	72	18	Accomplished
8	17	19	20	20	76	19	Accomplished
9	16	17	14	16	63	15,8	Accomplished
10	18	16	13	15	62	15,5	Accomplished
11	20	18	15	20	73	18,3	Accomplished
12	20	20	17	20	77	19,2	Accomplished
13	20	20	20	18	78	19,50	Accomplished
14	18	16	14	15	63	15,75	Accomplished
15	18	16	15	15	64	16	Accomplished
16	18	17	12	15	62	15,5	Accomplished

Table 6 illustrates the total scores received from four experts and the average of these scores belonging to each student forming the study group. Among these 16 students, there were none classified in the "Needs Improvement" class. While 3 students (18.8%) were in the "Satisfactory" class, 3 students (18.8%) were rated as "Good". The 62.5% of the group, consisting of 10 students and located at the top of the percentile, was classified as "Accomplished".

The relationship between virtual environments and creativity has been mentioned above. In this research, creativity has been evaluated according to the rubric created after the literature research. With this scale, it is aimed to measure various dimensions of creativity phenomenon. It is seen that the students in the "Accomplished" class are superior according to the analysis results of the rubric applied by the experts, which clearly proves that virtual environment has an effect on improving creativity positively as this research suggests.

2.2. Perception and application skills of students according to the designs obtained by applying SL method

According to the designs obtained by applying SL method, the averages of the "Information and Perception Capacity", "Technical Skill" and "Design" points were determined in order to measure the level of perception and application skills of students.

Table 7. Information and Perception Capacity, Technical Skills and Design Scores Mean Values

Student no	Information and Perception Capacity	Technical Ability	Design	Total	Mean	Quality
1	3	3	2	8	2,7	Good
2	3	3	2	8	2,7	Good
3	3	3	3	9	3	Good
4	3	3	3	9	3	Good
5	3	3	3	9	3	Good
6	3	3	3	9	3	Good
7	4	3	3	10	3,3	Good
8	4	4	3	11	3,8	Accomplished
9	4	3	2	9	3	Good
10	4	3	3	10	3,3	Good
11	4	3	4	11	3,7	Accomplished
12	4	4	4	12	4	Accomplished
13	4	4	4	12	4	Accomplished
14	4	3	3	10	3,3	Good
15	4	3	3	10	3,3	Good
16	4	4	3	11	3,7	Accomplished

Table 7 includes the breakdown of the "information and perception capacity", "technical ability", "design" scores and their sum taken by the participants from the researcher's perspective. As result, 11 students with an average of "information and perception capacity", "technical skill" and "design" scored between 2.50-3.49, form a total of 68.75% and a "Good" average. 5 students who scored between 3.50-4.00, form 31.25% and an "Accomplished" average.

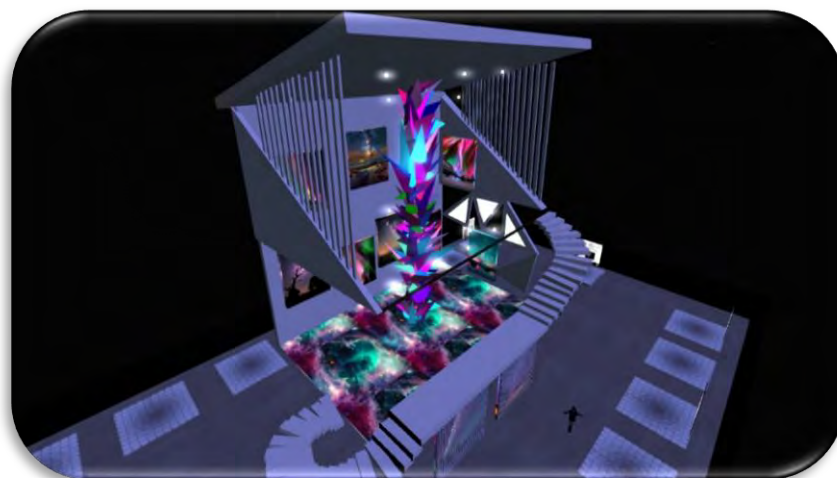


Figure 3. Student Study 13

Kluge and Riley (2008) state that virtual learning environments can be created, modified and improved through student-created content and objects. It emphasizes that students can create and learn scenarios in any field of research and experience without real-world results. With this method, students can interact both with the object and content they create and be in interaction with other students as well. It seems possible to conclude that students are more effective and independent in the learning process.

According to the researcher's evaluations shown above, students' perception and application skills have a "Good" average. Therefore, it can be said that students' perception and application skills have improved gradually after SL application. From this point of view, it is effective to produce 3D content and objects, to make 3D designs as the SL virtual environment allows easy 3D construction.

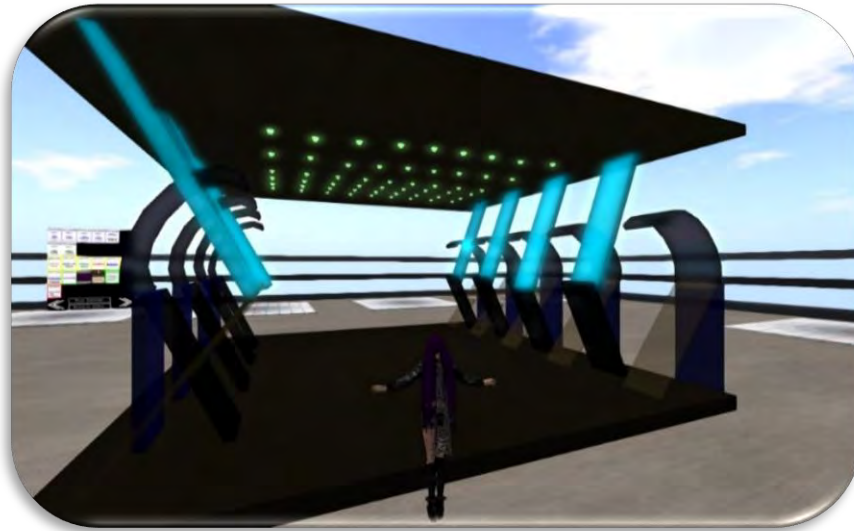


Figure 4. Student Study Number 7

Discussion

Education systems are constantly changing towards digitalization and virtualization. Developed countries aim at enabling teachers and students to use new technologies actively and to create learning environments that comply with the technological requirements of the age (Say & Yildirim, 2020). In this research using the technological environment, we aim to examine the relationship between art and design education and creativity through a three-dimensional online life simulation named "Second Life". In order to reach this target, qualitative methods were conducted, and the data were obtained with rubric and SOF of 16 students. Descriptive interpretation was made on the results obtained by classification of SOF and rubric scores.

Three-dimensional virtual worlds can be defined as environments that are visually rich (Gelibolu, 2013), can make learning remarkable, offer a nearly real-life experience (Han, 2017), real-time, having rich communication and interaction opportunities (Martín-Gutiérrez et al., 2017) provide motivation (Ozonur, 2013) In addition, while giving the user the opportunity to gain experience on issues that cannot be reached or made in the real World (Erbaş & Demirel, 2015) which provides a better concrete of abstract concepts, allowing learning by applying, experimenting and allowing a constructivist approach of learning (Martín-Gutiérrez et al., 2017) can offer educational advantages that can provide cooperative learning (Han, 2019).

Ulucay (2013) listed the difficulties caused by using digital games in teaching environments as follows: It requires large investments in terms of resources, an orientation process, more time for the implementation process than classical methods and students may sometimes be interested in activities that do not serve educational purposes by being attracted to the environment. When these items are examined, it is possible to say that difficulties such as orientation process, time required for implementation, virtual plot (for construction), cost, weak internet connection coincide with the course of this research. Han (2019) stated in her work titled "Virtual World Construction and the Relationship to Creativity in Art Education" that, she gave information to the participants about using virtual worlds and it was important to mention about the possibilities of the environment. In this research, technical information was transferred to the study group by SL. In the next process, the working group was constantly supervised and supported.

The acquisitions that can be achieved with the SL virtual environment in the higher education art and design education curriculum are mentioned below.

Using virtual worlds for art education provides an interesting environment where students can discover their creativity (Ward & Sonneborn, 2009, as cited in Han, 2019). It can be said that students can form their designs creatively due to many factors such as 3D design tools that can be easily applied in the SL virtual environment, students have the chance to make a large number of experiments, not having space and time problems while creating the design collaboration or individual study opportunities, and easy application. Considering the rubric results applied by the researcher, it can be interpreted that the majority is successful.

Bulbul, (2016) states that learning and teaching activities in SL has positive effects on triggering the creative power of students, strengthening collaboration, developing virtual literacy and communication skills. It is known that the SL virtual world allows us to produce models that look unique by enabling three-dimensional thinking and creativity to the forefront as it allows easy 3D design.

According to Vygotsky; learning is seen as a sociocultural process that takes place through interaction with students, materials, psychological tools and other people (Niemi et al., 2014). Ball and Pears (2009) stated that students who are familiar with 3D computer games can learn 3D design programs more easily, and they can make three-dimensional designs more than expected.

Stokrocki (2011) addresses the necessity of art education in virtual environments so that students can learn how to live in the worlds of art and visual culture by using the tools available in virtual worlds. It is vital that students read digital instructions and create their digital designs. Virtual worlds require and, therefore, develop operational, cultural and technological literacy (Guzzetti et al., 2010, as cited in Stokrocki, 2011). In this study, it is thought that the study group has obtained gains such as making 3D creative designs, communicating, getting information and using information, living in virtual worlds, developing cultural and technological literacy.

It is thought that the inclusion of 3D virtual environments (SL virtual environment) in the art and design education curriculum contributes to the 21st century skills of students. According to Niemi et al. (2014), in technological environments, students are both content producers and consumers. Therefore, students need to improve their skills to work in digital environments, the ability to create and discuss in virtual environments, and the skills to develop ethical behaviour. In this research, the participating students exhibited a range of work, discussion and creation skills throughout the process. For that reason, students need studying skills in digital world, creating and discussing skills in virtual media, and building ethical behaviour skills. In this research, the students have shown a series of studying, discussing and creating skills. They also created content in SL environment and used ready-made productions. What has been studied in this research process coincides with the statements of Niemi et al.

He stated that 3D virtual environments can encourage students' participation and cognitive activities in cognitive processes such as developing skills, remembering knowledge, shaping and synthesizing thought (Bair, 2013, as cited in Topu, 2015). Black and Browning (2011) stated that students are successful when they learn technology and use it to develop their artistic projects in creative ways. They also pointed out that technology does not limit students' imaginations or creativity. Moreover, they argued that art educators, teaching traditional art based on digital art and developing autonomous pedagogical approaches may contribute to teaching 21st century skills. Aksoy (2013) argues that, as a result of scientific studies, students can get the chance to develop their 21st century skills while playing games. This research includes skills such as critical thinking, problem solving, risk taking, using information technologies, making self-criticism, and being unique. As a result, it can be said that SL method has a positive effect on developing 21st century skills which include higher level thinking skills and creative thinking.

Lu's (2010) experience with his students in his classroom named Art Cafe in Second Life led him to the conclusion that Second Life is an area that should be used by art educators due to positive developments in students' discovery and collaboration skills. Participating students who use expressions such as exploring shortcuts, having fun, learning, being able to design in 3D, working to strengthen the meaning, solving Second Life, paying attention to the composition of the colours, mentioned the positive effect of the Second Life method in the learning process.

Conclusion

It can be said that today's students can easily use digital tools and environments, discover, develop and transform information creatively. As shown in detail in the results, As a result of the Rubric and SOF analyses, "How does the SL application affect the learning process in art and design courses?" It seems possible to respond this question that education in virtual environments affects creativity positively.

Development of students' creativity was measured by Rubric. Rubrics were used by four faculty members to evaluate participants' skills of using SL, their exhibition designs and their creativity levels. As it can be observed as a result of this assessment, that there is no student in "Needs Improvement" class among the participants and the fact that a large part of them are included in the "Accomplished" class shows that the level of creativity of the design studies obtained by applying SL method is high. In addition, this suggests that the application of the SL method in art and design education improves creativity.

According to the designs obtained by applying SL method, the averages of the "knowledge and perception capacity", "technical skill" and "design" scores of the rubric applied by the researcher to the design of each participant in order to determine the development of students' perception and application skills were taken and their qualities were determined. According to the researcher's evaluations, the participants are seen to be "Good".

According to all the Rubric analysis, it seems possible to answer the question of "What are the opinions of the experts about the artistic creativity that develops in the students through the designs that result from the use of the Second Life application in the art and design courses?" positively for art and design education. Of course, in order to support this result, different research results are needed that will examine the relationship between virtual environment and creativity.

Recommendations

In today's world, where the focus in higher education has recently shifted from digital literacy to digital fluency (creating content together, a much improved competence in using digital tools for creative design and adaptive problem solving) (Simsek, 2020), many things that are virtual will develop steadily over the next 10 years and become popular with the public, including educational settings (Ezawa, 2016, as cited in Martín-Gutiérrez et al., 2017). Therefore, it should be ensured that technology is integrated into educational environments in order to maximize learning outcomes. This research was conducted with higher education students. Considering the results obtained, it is suggested that SL can be considered as an educational environment for art and design educators of universities. In our research, it was necessary to learn the platform first in order to use the SL platform. Therefore, resources (such as SL curriculum, SL user manual) should be developed and provided to users so that educators can easily use such platforms. In 3D virtual environments, in order to understand the relationship between art and design education and creativity better, and to support the results obtained from this research, it is recommended that researchers conduct similar research on different platforms that will allow three-dimensional design.

Limitations

This study is limited to the "Second Life" environment, which is a multi-user, three-dimensional, online virtual environment. Participants are limited to 16 students studying at various art and design faculties. The entire design process is limited to 12 weeks. Finally, this research is limited to the data obtained by evaluating the designs made by the participants with rubrics.

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Appendix

Table A-1. Rubric

Criteria	Need Improvement 1	Satisfactory 2	Good 3	Accomplished 4	Score
Information and perception capacity	<ul style="list-style-type: none"> - Does not have sufficient knowledge of three-dimensional, online multiuser virtual environments. -Does not adequately apply the techniques and methods for creating an avatar and exhibition space in the Second Life environment. - Does not have the technical details used in the Second Life environment. 	<ul style="list-style-type: none"> - Knows very few of the three dimensional, online multiuser virtual environments. - Knows very few techniques and methods for creating an avatar and exhibition space in the Second Life environment. -Uses very little of the technical details observed in the Second Life environment. 	<ul style="list-style-type: none"> - Knows some of the three dimensional, online multiuser virtual environments. - Knows some of the techniques and methods for creating an avatar and exhibition space in the Second Life environment. - Uses some of the technical details observed in the Second Life environment. 	<ul style="list-style-type: none"> - Knows three-dimensional, online multi-user virtual environments. -Knows the techniques and methods for creating an avatar and exhibition space in the Second Life environment. -Uses the technical details observed in the Second Life environment. 	
Technical skill	<ul style="list-style-type: none"> - Not enough to analyze the material and technique to strengthen the meaning of the design. - Has difficulties in producing solutions for technical problems and does not take risks for solution. -Cannot use Second Life virtual environment, cannot create an avatar and customization has difficulties. - Not enough to make three dimensional, original models. 	<ul style="list-style-type: none"> - Rarely analyzes and uses materials and techniques to strengthen the meaning of the design. - Barely produces solutions to technical problems and rarely takes risks. -Uses Second Life virtual environment, creates avatars and customizes very little. -Can make three-dimensional, partially original models. 	<ul style="list-style-type: none"> -Analyzes and uses materials and techniques to strengthen the meaning of the design. - Sometimes find a solution to technical problems, sometimes takes risks. Uses Second Life virtual environment, creates avatar and partially customizes. - Makes three-dimensional, original models. 	<ul style="list-style-type: none"> -Analyzes and effectively uses material and technique to strengthen the meaning of the design. - Produces solutions to technical problems and takes risks when necessary. -Uses Second Life virtual environment, creates and customizes avatars. - Makes three-dimensional extraordinary models. 	
Design	<ul style="list-style-type: none"> - Having difficulties in using visual design elements and principles together with affective qualities. - Not enough to develop its ideas to reflect the other side and create a visual order. - Not enough to try and create exhibition environments in virtual environment to ensure visual integrity. - Not enough to create extraordinary exhibition designs. 	<ul style="list-style-type: none"> - Uses visual design elements and principles together with affective qualities. -Develops ideas to reflect the opposite side very little and creates a visual order. -There are few attempts to ensure visual integrity. - Creates moderate exhibition designs in virtual environment. 	<ul style="list-style-type: none"> - Uses visual design elements and principles and affective qualities effectively. -It develops ideas to reflect the opposite side and creates a visual order. -Experiments to ensure visual integrity. - Creates exhibition designs. 	<ul style="list-style-type: none"> Uses visual design elements and principles and affective qualities in an unusual and effective way. -It develops ideas to reflect the opposite side and creates an original visual order. - Continuous trials to ensure visual integrity. -Creates unique, extraordinary exhibition designs in virtual environment. 	

Table A-1. Continued

Criteria	Need Improvement 1	Satisfactory 2	Good 3	Accomplished 4	Score
Research and study approach	<ul style="list-style-type: none"> -Does not try to exhibit an extrovert, curious and investigative attitude in acquiring information. - Not willing to think in detail about the subject, to search for different solutions and to develop alternative ideas. - Cannot combine ideas with new methods. - Cannot take risks when necessary to find solutions other than unoperated. - Cannot fulfill his responsibilities regarding the learning process within the given time. - Abstains from difficulties. - Cannot contribute to the work of friends. 	<ul style="list-style-type: none"> -Rarely curious and investigative attitude in acquiring information. - Thinking in detail about the subject given to him, looking for different solutions to problems, developing alternative ideas, - Rarely takes risks in combining ideas with new methods and finding unusual solutions. - Sometimes fulfills his responsibilities regarding the learning process within the given time. -Can hesitate frequently in case of difficulties. - Rarely contributes to the work of his friends. 	<ul style="list-style-type: none"> -Sometimes they are extroverted, curious and investigative in acquiring knowledge. -Thinks about the subject given to him, sometimes looks for different solutions and develops alternative ideas. - Sometimes combines ideas with new methods. Sometimes it takes risks to find unusual solutions. -Fulfills his responsibilities regarding the learning process within the given time. - May hesitate in the face of difficulties. - Sometimes contributes to the work of his friends. 	<ul style="list-style-type: none"> -Extreme, curious and investigative attitude in acquiring information. -Think in detail about the subject given to him. -Searches for different solutions, develops alternative ideas. -Combines ideas with new methods. -Takes risks when necessary to find solutions that are out of range. - Fulfills his responsibilities regarding the learning process within the given time. - Does not give up in front of difficulties. -Contributes to the work of his friends. 	
Self-evaluation capacity	<ul style="list-style-type: none"> -Does not show a versatile critical attitude regarding his own design and technical skills. - Cannot solve the learning deficiencies adequately. 	<ul style="list-style-type: none"> - Evaluate his / her own design / work and technical skills within the framework of several criteria. - Has difficulty in solving learning deficiencies. 	<ul style="list-style-type: none"> -Can evaluate their own design / work and technical skills within the framework of certain criteria. - Aware of some of her/his needs within the framework of learning deficiencies. 	<ul style="list-style-type: none"> - He displays a versatile critical attitude towards his own design and technical skills. - Aware of some of her/his needs within the framework of learning deficiencies. 	

Score	20-16	15-11	10-6	5-0
Quality	Accomplished	Good	Satisfactory	Needs improvement