Game-Based Learning in Interior Architecture Education

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Abstract

The concept of play supports the experiential and creative aspects of the design field because it is a familiar and fun phenomenon and involves interaction. The use of game-based learning in design processes will increase participation by supporting the regulation of these processes and the problematic aspects of the design studio course, which is at the heart of design education. For this reason, this study investigates the use of game-based learning methods in the design studio processes, one of the most important courses in interior architecture education. The study, which preferred the embedded theory method to develop hypotheses, one of the qualitative research methods, investigated the effects of game-based learning on the understanding of design processes and time management in a voluntary workshop with second-year students of interior architecture faculty. The study preferred a pre-test-post-test design for a single group as the data collection instrument and was supported by observations. Consistent with this preference, data collected with participants prior to the workshop were analysed and the workshop structure was created, and an attempt was made to compare the results of the game-based learning method with the post-workshop observations and survey results.

Keywords

Game based learning, design processes, design education, interior architecture education, workshops, master-apprentice learning style

Introduction

Game based learning is an informal education style for students to comprehend certain processes through experience. When using games for educational purposes according to Pivec et al., (2003) several aspects of the learning process are supported. Learners are encouraged to combine knowledge from various subject areas to choose a solution or to decide at a certain point, they can test how the game's outcome changes based on their decisions and actions, and they are encouraged to get in touch with other team members to discuss and negotiate next steps, which among other things helps them develop their social skills. In past and recent literature learning is conceptualized as a multidimensional construct which includes learning skills, cognitive learning outcomes and attitudes. Learning occurs when the learner is mentally engaged and actively participates in the game, which provides a balance of difficulty and potential future actions. We must develop an adequate education mapping to facilitate learning.

Game Based Learning

Games themselves are not new, but Kapp (2012) argues that we have reached a point when they appear to be all around us and have the special capacity to engage when we need them most. Game mechanics can be very useful for learning and growth, as well as for altering health

habits and inspiring work habits, among other things (Kapp, 2012). Most definitions of game-based learning focus on the fact that it is a kind of game play with clear learning objectives (Shaffer et al., 2005). Although it is frequently assumed that a game is digital, this is not necessarily the case. This definition has the implication that while designing games for learning, it's important to strike a balance between the desire to prioritize game play and the need to cover the subject matter (Plass, et al., 2010). This argument, according to Plass, et al. (2015), highlights the difference between gamification and game-based learning. The definition of gamification varies greatly, but one of its key characteristics is the use of game components, including incentive systems, to encourage players to participate in activities they might not otherwise find enjoyable. Like this, there is continuous discussion among academics about the precise definition of a game, particularly what does not qualify as a game (Salen & Zimmerman, 2004). A game is a system in which players engage in an artificial conflict that is governed by rules and has a quantifiable outcome, according to Salen & Zimmerman (2004). Good games, according to Plass, et al. (2015), aim for the sweet spot where players can succeed but only after some difficulty, creating what has been called a "state of flow." Good games for learning should be played in the player's zone of proximal development.

Plass et al. (2015) also suggest that there are four main functions of games that are used for learning: motivation, player engagement, adaptivity and graceful failure. All these functions are linked together. The motivational function of the games is that they contain motivating features to ensure long-term interaction of the participants. These features can be used as incentives such as stars, points, leader boards, badges, and trophies. The player engagement function is linked to motivation. When a game is used in training, what kind of participation it will involve depends on the learning outcomes of the training, the setting, and the characters of the participants. Adaptivity function can be achieved by making the game adaptive which means the participants can customize or personalize their experience. Adaptability is the ability of the game to engage each participant in a way that reflects their situation. As a function of the game-based learning processes graceful failure is an expected and necessary step in the learning process (Kapur, 2008; Kapur & Bielaczyc, 2012; Kapur & Kinzer, 2009; Plass, et al., 2010). Kapp (2012) suggests that games encourage improved learning attitudes, boost student motivation, stimulate higher order thinking, alter real-life perceptions, influence decision-making processes, and help students achieve better learning outcomes.

Interior Architecture Education

Kaptan (1998) defines interior architecture as the activity of designing and arranging interior spaces with colour, texture, material, light, furniture, and accessories according to the needs of the user and the function of the spaces within the architectural structure. Formal interior architecture education is a design-oriented discipline. The only way for students in design education to learn to design is to experience design on their own (Tuğlu Karslı & Özker, 2014). According to Demirbaş and Demirkan (2003) curriculum in architectural design education should be created in a way that facilitates and advances students' learning and program through the educational steps should provide interrelated and reinforced lessons throughout the curriculum. The architecture curriculum consists of core courses that enhance design knowledge, technological courses that enhance the scientific formation of architecture, and art-based courses that strengthen architectural expression. And design studios, which are the most fundamental part of design education, are the courses that are the combination of all three and constitute the most important part of design education (Demirbaş and Demirkan, 2003).

Demirbaş (2001) suggests that since the design studio process forms the core of the curriculum, all the courses taught in design education support the design studio processes. The design studio serves as the main teaching tool for giving aspiring architects the creative abilities to create three-dimensional spaces that are suitable for socio-cultural interactions (Salama 1995; Yurtkuran and Taneli, 2013). Design thinking typically involves a collaborative mindset, problem-solving, and an individual-centric approach (Aflatoony et al., 2018). According to Rauf, Gunce and Ozersay (2020) students that have a collaborative mindset are more able to voice their needs, goals, and address the issues that can be resolved in their assignments. Students' ability to advocate for themselves and communicate their answers to teachers is enhanced as a result. Therefore, the capacity to stand up for one's demands while being aware of one's obligations and rights is known as self-advocacy (Rauf et al., 2020).

Although design studio teaching techniques are described as participatory, this is not necessarily the case. According to Alaswad (2017), the focus on the studio in design education has been criticised for several reasons, including: (1) the distribution of student workload, (2) the reliance on the master-apprentice structure; and (3) the lack of clarity of evaluation methods.

Design Processes

The design process is not linear; repetitive models of the design process can be helpful in examining what happens during design (Oygur, 2012). For every different design area there are different design approaches and design processes. Different designers use different approaches. Throughout the literature, design processes are divided into a different number of stages and each stage was labelled with a different name. Cross (2008) determines design processes as clarifying objectives, establishing functions, setting requirements, determining characteristics, generating alternatives, evaluating alternatives, and improving details which is consistent with the interior architecture design studio curriculum. Ching and Binggeli (2012) defined the stages in the design process as Define Problem, Formulate Program, Develop Concept, Assess Alternatives, Make Design Decisions, Develop and Refine Design, Implement Design and Re-evaluate Completed Design. Oygur (2012) states that as the user is not a stable factor in an interior architecture processes there is continual interaction with the client, the information from users is constantly changing within the various stages of the design process. The designer reconstructs the user image in their mind based on the feedback from the client. Each design process and solution in architecture and interior architecture is situation specific. A project's primary occupant population and client are both predetermined. It is impossible to provide generalizable answers from the research phases because each situation is defined according to the needs and desires of these parties (Oygur, 2012).

Research Design

After the literature review, 3 main topics were selected that can work in conjunction with each other and support design education. These topics were determined as Design Education, Design Processes and Game Based Learning approach. Based on the features under these topics, a research design was created. Relationships between the research method and research topics were established with the 4 guiding research questions. The research questions are listed below.

R.Q.1. How is design education evaluated by students?

R.Q.2. How is the act of designing performed by students?

R.Q.3. How does the use of game-based learning methods in design education affect students' design processes?

R.Q.4. What are the effects of Game-Based Learning in design education? How can Game-Based Learning be effective in students' understanding and maintenance of design education?

To get the evaluations of the students for the design education, a pre-test was carried out in which the students evaluated their experiences in design studio. The problems that identified through the pre-test led to the formation of the workshop structure. The workshop structure was created to better understand how students manage the processes of the design, also by using game-based learning method to seek a solution associating the problems they currently experience during the design process. In addition to the observations made by the coordinator during the workshop, data were collected for the analysis of the students' approaches to the game-based learning method, the benefits they gained, and the problematic aspects of game-based learning with the post-test and in-depth interview method. In line with these data, the benefits and harms of using the game-based learning method in interior architecture education have been revealed in terms of students and educational structure (Figure 1).
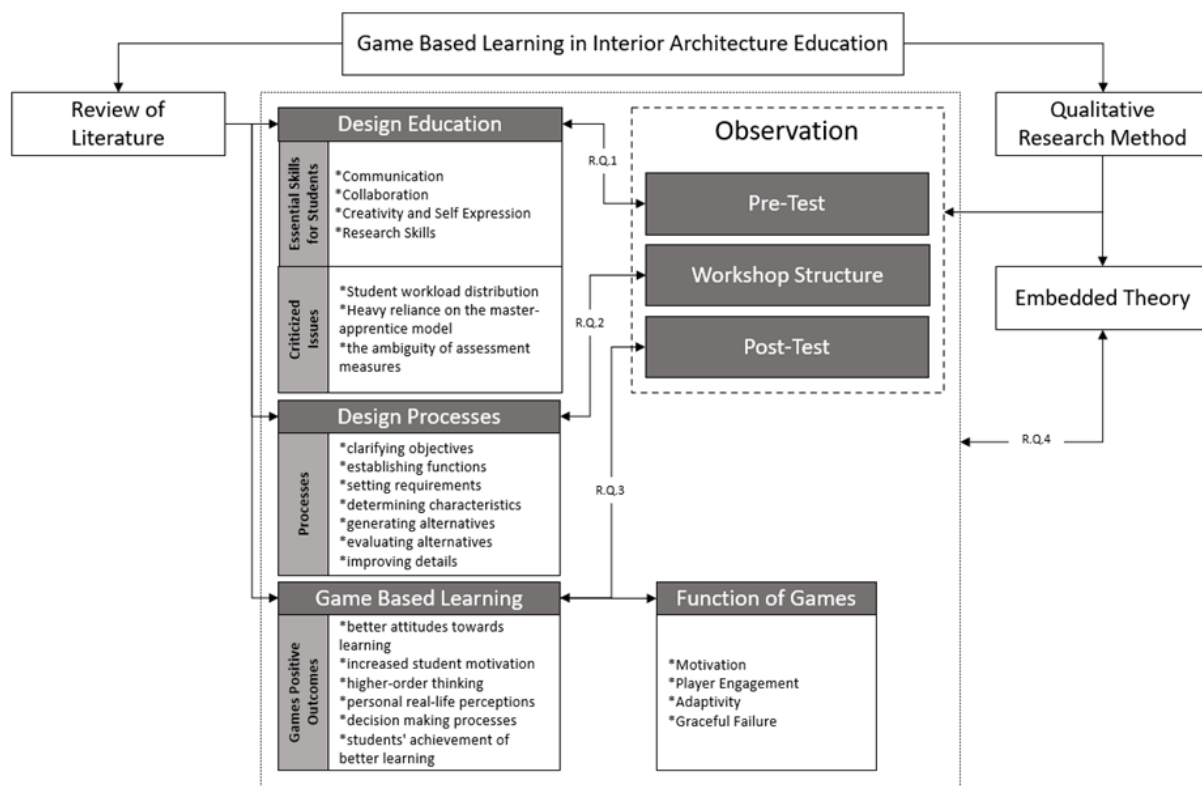

Figure 1. Research Design

After the establishing the research design, a workshop structure was created with the game-based learning method to solve the problematic aspects of the traditional design studio. As the sample, 2nd year students of the Department of Interior Architecture at Istanbul University were selected because they had previously carried out 3 projects and were at a level to evaluate these projects and evaluate new information with their current achievements. Participation in the workshop was voluntary. The participants of the study were asked to fill out

a questionnaire considering the weekly duties of the traditional design studio. In line with the data obtained from this survey, the areas that the participants had difficulty in the design process were determined and the structure of the workshop was prepared in a way to focus on these areas. While creating the workshop structure, Alaswad's (2017) skills that students should have in the design studio, the problems experienced in the design studio and the positive outputs of the learning by game method were used. The definitions of design processes were created by benefiting from the research of Oygur (2012) and Cross (2008), and the functions that a game should have by using the studies of Plass et al. (2015).

Defining the Problem: Pre-test

A questionnaire was presented prior to the workshop for participants to evaluate traditional design studio processes to complete the pre-testing process of the research. This questionnaire was delivered to the students at the end of the Design studio course they took before the workshop, and they were asked to evaluate the processes from their own perspective. Since the syllabuses of the Design Studio courses of the Istanbul University Interior Architecture Department are in accordance with the design processes stated by Cross (2008), the design process evaluations of the students were carried out through these processes. This questionnaire was created by giving Likert-type statements about their evaluation of weekly tasks in their current curriculum (Table 1).

Table 1. Current Curriculum in Istanbul University, second year first term Design Studio in relation to Cross' (2008) design processes

Week	Topic – Design Processes	Design Processes (Cross,2008)
1	Introduction: Informing about the aim and the scope of the course	Clarifying objectives
2	Research, observation, creating scenario	Establishing functions
3	Preliminary design research, concept development	Setting requirements
4	Creating alternatives for spatial organization	Determining characteristics
5	Design development studies: plans, sections, 3 dimensional models	
6	Design development studies: plans, sections, 3 dimensional models	
7	Midterm project submission-Jury evaluation	Generating alternatives
8	Design development studies: plans, sections, 3 dimensional models	Evaluating alternatives
9	Design development studies: plans, sections, 3 dimensional models	
10	Detail resolution studies	Improving Details
11	Detail resolution studies	
12	Expression and presentation studies	
13	Expression and presentation studies	
14	Preparation for project submission- critics	

The statements given were evaluated based on the "1- Strongly Disagree., 2- Disagree., 3- Neither agree nor disagree., 4- Agree., 5- Strongly Agree." Scale in a 5-point Likert type. After

the statement evaluations were completed, the participants were asked 2 open-ended questions to better understand their design process experiences and to try and create solutions to the problems during the workshop (Table 2).

Table 2. Pre-Test Statements and their evaluation criteria in relation to design processes

Design Processes	No	Statement	Evaluation
Clarifying objectives	1	When starting a project, I find it difficult to do research.	
	2	When starting the project, I have difficulties in the concept development phase.	
Establishing functions	3	When starting the project, I have difficulty in determining my user identity.	
	4	When starting the project, I have difficulty in determining the needs of the user.	
Setting requirements	5	I find it difficult to sketch when starting the project.	
	6	I find it difficult to define the concepts when starting the project.	
Generating alternatives	7	I find it difficult to work with abstract concepts when starting a project.	
	8	I have a hard time creating a mood board for the project.	
Evaluating alternatives	9	I have difficulty in determining the functions of the space given in the project.	5 -point Likert Scale
	10	I find it difficult to express the functions that I set for the project.	
	11	I find it difficult to develop different options for the project.	
	12	I have difficulty in making 1/50 scale furnishing drawings of the project.	
Improving Details	13	I have difficulty in drawing 1/20 detail scale of the project.	
	14	I have difficulty in drawing 1/10 detail scale of the project (furniture and structure).	
	15	I have difficulty in choosing materials for the project.	
	16	I have a hard time creating the presentation layouts to present the project.	
	17	I have a hard time preparing the 3D visualization of the project.	
	18	I have a hard time rendering the 3D visualization of the project.	
	19	What are the reasons for your difficulties in the areas you think you have difficulty in during the project process?	Open-Ended
	20	In your project process, what kind of changes do you think would be beneficial as a learning method?	Open-Ended

The pre-test results were evaluated according to the design processes. In this way, it was started with the idea that the evaluations of the participants about the design processes could

be understood more clearly. Since the given statements are negative, evaluations were made according to the idea that the average values between 1-3 were not problematic design processes, and the design processes with an average value between 3-5 were troublesome processes for students.

Clarifying objectives design process statements contain statements about research and concept development processes. While the statement about doing research was included in the design processes that were not problematic in terms of getting a value below the average (2,64), the statement given about the concept development was accepted as one of the design processes where the students had problems with an above average value (3.71) and took part in the workshop (Table 3).

Table 3. Clarifying Objectives design process evaluation statements

Design Process	Statement	Mean	Count
Clarifying objectives	When starting a project, I find it difficult to do research.	2,64	14
	When starting the project, I have difficulties in the concept development phase.	3,71	14

Establishing functions design process statements contain statements about user identity and user needs determination processes. The statements given for the processes of user identity (2,5) and determination of user needs (2,35) took sub-average values and included in the design processes that were not problematic (Table 4). The result is meaningful since this process is related to the research processes of the project.

Table 4. Establishing functions design process evaluation statements

Design Process	Statement	Mean	Count
Establishing functions	When starting the project, I have difficulty in determining my user identity.	2,5	14
	When starting the project, I have difficulty in determining the needs of the user.	2,35	14

Setting requirements design process statements contain statements about the processes of sketching and associating the determined concept with the project. The statements given for the processes of sketching (3,35) and the implementation of the concept in the project (3) were included in the workshop by taking the above-average and average values and taking part in the design processes where the students had problems (Table 5).

Table 5. Setting requirements design process evaluation statements

Design Process	Statement	Mean	Count
	I find it difficult to sketch when starting the project.	3,35	14

Setting requirements	I find it difficult to define the concepts when starting the project.	3	14

Generating alternatives design process statements include statements about working with abstract concepts and creating a mood board and applying it to the project. The statement about working with abstract concepts was included in the workshop by taking part in the design processes where the students had problems with an above-average value (3.28). The statements given for the implementation of the concept in the project with the mood board method (2,7) took a value below the average and took part in the design processes where the students did not have any problems (Table 6).

Table 6. Generating alternatives design process evaluation statements

Design Process	Statement	Mean	Count
Generating alternatives	I find it difficult to work with abstract concepts when starting a project.	3,28	14
	I have a hard time creating a mood board for the project.	2,7	14

Evaluating alternatives design process includes statements about processing the determined functions in the space, expressing the functions in the space, developing different options, and making 1/50 scale furnishing solutions. All the statements were given below the average and were not among the topics that the workshop focused on. However, the statements about the determining functions (2,92) and the development of different options (2,92) were determined as the topics to be discussed during the workshop in terms of their values very close to the mean (Table 7).

Table 7. Evaluating alternatives design process evaluation statements

Design Process	Statement	Mean	Count
Evaluating alternatives	I have difficulty in determining the functions of the space given in the project.	2,92	14
	I find it difficult to express the functions that I set for the project.	2,85	14
	I find it difficult to develop different options for the project.	2,92	14
	I have difficulty in making 1/50 scale furnishing drawings of the project.	1,64	14

The Improving Details design process includes statements on 1/20 drawings, 1/10 detail scale drawings, material selection, preparation of presentation sheets, and 3D modelling processes. The statement about 1/20 drawings (2,92) was determined as one of the non-problematic processes in the design processes by taking a value below the average. The statements related to 1/10 scale detail drawings (3,92), preparation of presentation sheets (3,92), material selection (3,71), rendering of 3D models (3,64) and 3D modelling processes (3,07) were among

the design processes in which the students had problems to be included in the workshop process in terms of getting scores above the average (Table 8).

Table 8. Improving Details design process evaluation statements

Design Process	Statement	Mean	Count
Improving Details	I have difficulty in drawing 1/20 detail scale of the project.	2,85	14
	I have difficulty in drawing 1/10 detail scale of the project (furniture and structure).	3,92	14
	I have difficulty in choosing materials for the project.	3,71	14
	I have a hard time creating the presentation layouts to present the project.	3,92	14
	I have a hard time preparing the 3D visualization of the project.	3,07	14
	I have a hard time rendering the 3D visualization of the project.	3,64	14

While examining the open-ended questions of the pre-test, it was determined that the situation was different in the open-ended questions, although the students' scored points on the Likert-type scale indicating that they did not have any problems with the concept. In general, there were students who stated that they had problems with the concept and that they did not know what concept means. One participant said, "Because I had difficulties in determining the concept, the other stages proceed in the form of knots that I could not solve accordingly." While another participant stated, "Creating a user ID and choosing what they do is the most critical decision in the project, in my opinion. Because all the designs, space organizations and most of the things to be done in the project are formed in line with this decision. If I can't identify a concept and user ID that I feel comfortable with at the beginning of the project, I keep thinking "should I choose another concept?", "What would it be like if I chose my user ID differently?" I can't focus on the project without thinking about the questions. " To explain what they experienced with concept creation. Another participant said, "Not knowing the design periods when creating a concept and not being able to understand exactly how it was determined makes it difficult for me." expressed their thoughts. When asked how they think it would be beneficial as a learning method to make changes in the sections they had difficulty with, one participant said, "I think we have difficulties as a class in decisions such as how to choose a user ID and what the concept of the project will be. First of all, it can be better if we may have an environment where we can discuss this more or if we have a chance to get more critiques." Concept creation and design processes were also included in the study topics of the workshop according to the answers obtained from the open-ended questions.

Pre-Test Results

When the answers given by the students to the survey are examined together with the design processes, it has been determined that they have problems with the concept development within the clarification objectives design process. It was decided to include a general lecture on concept development processes in the workshop, especially in line with the answers to open-

ended questions. Another design process that the students had problems with was determined as setting requirements, and a brainstorming session to be held as a group was included in the workshop after the user identities were determined to communicate and collaborate on the ideas in general. A side challenge was added to the workshop for the participants to better understand the abstract concepts after the abstract concepts under the Generating alternatives process were identified as a problematic issue. Another design process in which students had problems was identified as improving details. When the answers given by the students to the open-ended questions were examined, it was determined that this problem was a problem related to the perception of the detail scale, and the games in the workshop were prepared for these problems, with the suggestion that the fact that this process took place at the end of the design process might be a problem arising from the time management of the students.

As a result of the observations, it was determined that the participants perceived the design processes as a linear process and did not return to the stages at the beginning of the design processes in the later stages. Since the design processes are transformative, changing and developing processes in themselves, revisiting the processes was encouraged so that the participants could reconsider their design processes and earn points in the Bingo Board game.

Implementation of Game Based Learning in Interior Architecture Education: Game Based Learning Workshop

Workshop Structure

The workshop was prepared in the form of a 4-day design sprint during the students' semester break. These 4 days are divided by different functions. The first day is called "Idea to Sketch", the second day "Sketch to Design", the third day "Design to Presentation" and the last day "Presentation Day". Although the workshop was held in person, the game and design interfaces were run on the Miro website. Miro was used during the workshop because it is a common digital interface. Participants were able to see the changes made by other participants during the workshop and communicate with each other both face-to-face and through the digital interface. In particular, the use of digital interfaces in online education due to the pandemic of recent years has shortened distances and lengthened communication channels. The Miro interface provided a new environment for participants to express themselves and collaborate.

The group days were guided by Cross's (2008) design processes, which are most appropriate for current design studio courses. The first day of the workshop was devoted to research and sketching, the second day to supporting the designs with technical drawings, the third day to working on detailed studies and visualisations, and the final day to preparing the designs for presentation and then presenting them. First, the schedule, purpose and general rules were included in the Design Sprint Board prepared in Miro (Figure 2). There are 3 main games in the workshop process. These are called "Bingo Board", "Guess the Number" and "Look and See" and their rules and outcomes are clearly indicated on the board (Table 9).

Table 9. Educational Games and their learning aim.

Game	How to play?	Learning Aims
Bingo Board	The group that finishes the determined tasks of the day first is entitled to put the checker of their group colour on the bingo board.	*Time Management *Managing the Design Processes
Guess the Number	In the game, in which information such as construction dates, heights, and lengths of some architectural structures are tested, the groups have 1 minute to write their predictions on the first day, 30 seconds on the second and third days, and 15 seconds on the last day.	*Time Management *Multi-tasking Skill Development
Look and See	Participants are obliged to find out what and where macro shots provided by the coordinator are during the day.	*To better understand the detail scale *Learning to pay attention to details
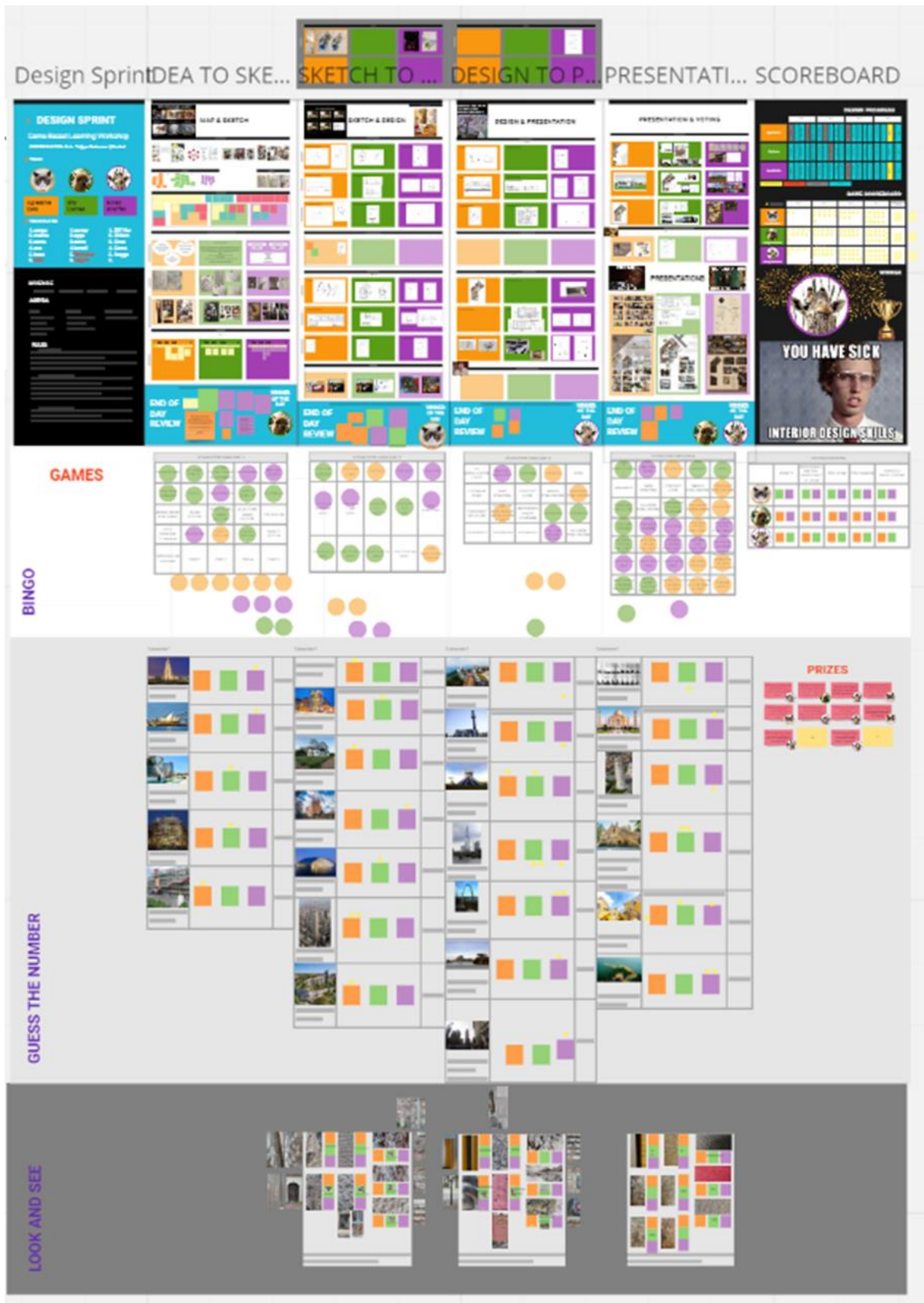
Figure 2. Miro Board for the Game Based Learning Workshop

A design process chart and scoreboard were created so that the groups could follow their progress during the workshop. The design process chart was prepared for each group to determine their point during the day or at the end of the day (Figure 3). Groups marked their location according to the colours determined as " under construction", " to be continued", " revisited" or " finished". This has always been created so that the groups can follow each other, and the groups can make their own business plans. On the other hand, the Scoreboard was created so that they could follow the stars their own groups earned and the progress of other groups throughout the workshop.
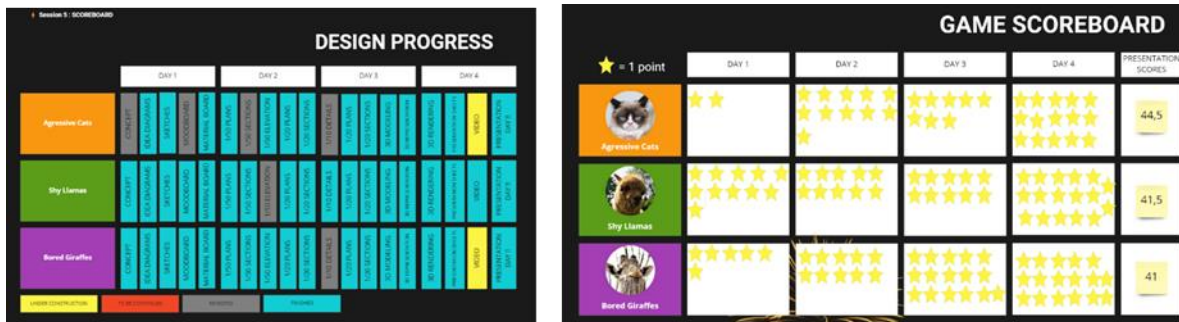
Figure 3. Design Process Chart and Game Scoreboard

Participants first determined their groups by drawing one of 3 different colours. After the formation of the groups, two people from each group formed the group names by drawing an adjective and an animal name to determine the group names. The creation of group names in this way is to ensure unity in a fun way, to define their own groups during the game and to create a sense of belonging in their groups.

After the groups were determined, a short lecture was given about the concept and user identification processes, which emerged from the results of the surveys conducted to analyse the process management in the final design studio lessons before the workshop, and then 2 minutes were given to think about different user identities. User IDs determined by different groups were opened for voting by all groups and the rule that groups should not vote for their own ideas was clearly stated. The 3 user IDs that received the most votes were assigned to the groups by drawing lots (Figure 4).

Figure 4. User Identification via voting

After determining the user identities that the groups will design, a 15-minute research period was given, then they were asked to choose one design problem from the first group and two

from the other two design problems collected under 3 main headings, and 2 minutes were given to make this choice. After the design problems of the groups were determined, these selected problems were locked by the workshop coordinator and the participants went to the 15-minute sketching process with their groups (Figure 5).
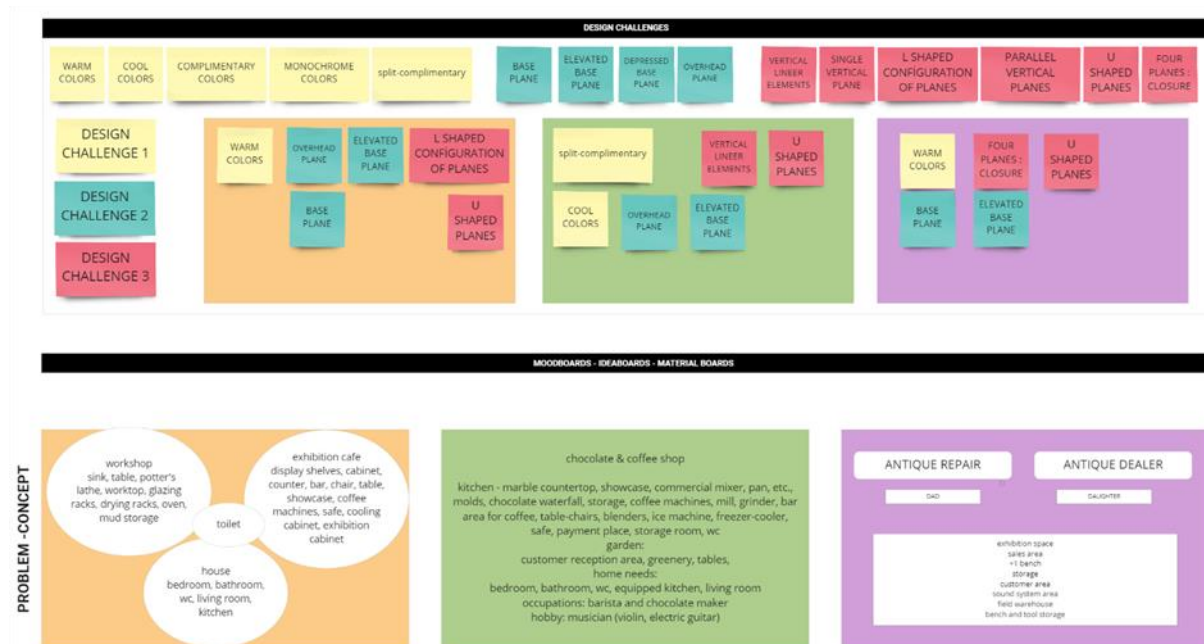

Figure 5. Selected Design Challenges and problem-solving research process for the user identity

At the end of the sketching process, they were asked to choose one of these sketches to work on in 5 minutes. A more in-depth design process was initiated on this sketch. To solve the problems related to material selection, a table with material samples was prepared and the groups were given 1 minute to find and select the materials suitable for their concepts and created their mood boards and material boards (Figure 6).

Figure 6. Sketches and related conceptual material boards- mood boards

The second day of the workshop was the day of the technical drawings of the areas whose sketches and functions were determined. While the technical drawings continued, the side challenge was given. On the third day of the workshop, detailed drawings and models were made. And on the last day, while the modelling continued, layouts were made to prepare for the presentation. At the end of the workshop, the groups presented their projects and scored each other according to the criteria determined by the coordinator. The winning group of the workshop was determined according to the stars they won from the games during the week and the points they collected from the last project evaluations, and the prizes of the winning group were given.

Design Challenges

The design problem given to the groups is the design of the sales office, which will work in a residential structure with a minimum of 2 people. During the workshop, 3 main design challenge and one side challenge were given to the participants. The first of the three main design challenges are about colour theory and requires them to work with different colour families. The groups were asked to choose a minimum of 1 from this challenge. The other two main design challenges consist of Ching's (2007) horizontal and vertical elements that define the space. They were asked to choose at least 2 of these two design challenges. After these challenges were determined, the selections were locked by the workshop coordinator and the sketch phase started. On the second day of the workshop, the groups were given a side challenge. Side challenge is an abstraction problem in which they are obliged to express a famous painting in an abstract way in their spaces (Figure 7).

Figure 7. Side challenge outcomes

Educational Games

The "Bingo Board" game is a game that allows groups to compete and is also prepared to shorten the completion times. Each day is mapped according to what is requested on that day, and as of the first day of the workshop, all the boards have been prepared in a way that can be seen by the participants. The group that finishes the determined tasks of the day first is entitled to put the checker of their group colour on the bingo board. Here, it is up to the workshop coordinator to control the completion of the required task. As it is clearly stated in the rules of the game, if the team that placed its colour on the board has not fulfilled the task completely, the coordinator has the right to withdraw the checker, and this allows the other teams to place their checkers (Figure 8).

Figure 8. Bingo Board Example (Day 1)

The game "Guess the number" is designed as a game in which the participants can use their professional general knowledge acquired in the theoretical courses they took in the previous semester and in their daily lives. In the game, in which information such as construction dates, heights, and lengths of some architectural structures are tested, the groups have 1 minute to write their predictions on the first day, 30 seconds on the second and third days, and 15 seconds on the last day. The group with the closest number to the answer wins the star. If a group gives a perfectly correct answer, that group gets two stars. While the questions were all opened to give the participants a 5-minute break on the first day, they continued to be opened one by one in the later days of the workshop when the participants did not expect it. This was done to improve the time management method and multi-tasking skills.

Figure 9. Guess the Number Example (Day 1)

The game "Look and See" is a game designed to make the participants pay attention to the details in their environment and to become familiar with the detail scale. On the day of the opening of the questions, the coordinator takes macro photos on the routes of the participants and keeps them open from the beginning of the workshop to the end of the day. Participants are obliged to find out what and where these macro shots are, whether among them or during the workshop. The group that correctly knows the place and what is entitled to 2 stars, the group that knows only one correctly has the right to receive one star (Figure 10).
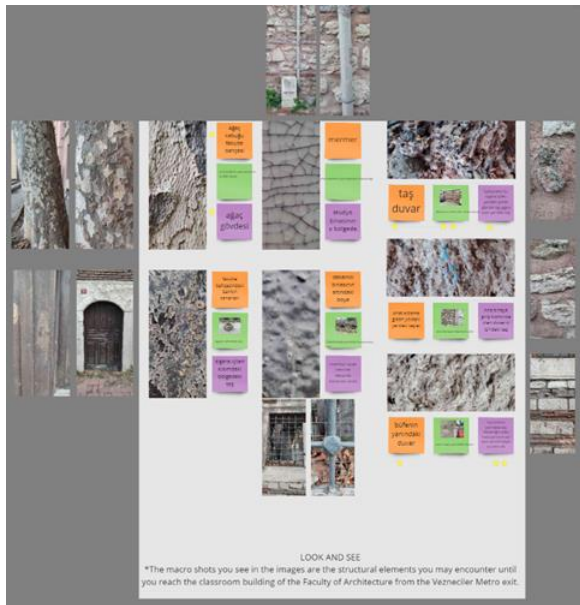

Figure 10. Look and See Example (Day 1)

In each game, the winning groups had the right to choose one of the 12 prizes or penalties under a number they chose from the prize list. The winning groups could choose when they wanted to use their rewards and punishments. At the end of the day, the winner group of the day was determined according to their success in the games and the last prize of the day was chosen, and the day was closed in the list to continue the games and the design process the next day (Figure 11).

Figure 11. Prizes for the game winners

Final Peer Review

The groups could add the problems they experienced on the discussion boards during the workshop to be solved by the coordinator or their peers. The notes they placed in this area were being removed after its resolution. While these discussion boards were used on the first day (Figure 12), the participants preferred to solve these problems by talking face to face on the other days. During the process, the groups supported each other in solving their problems, and the coordinator provided support for solving problems that could not be solved among peers.
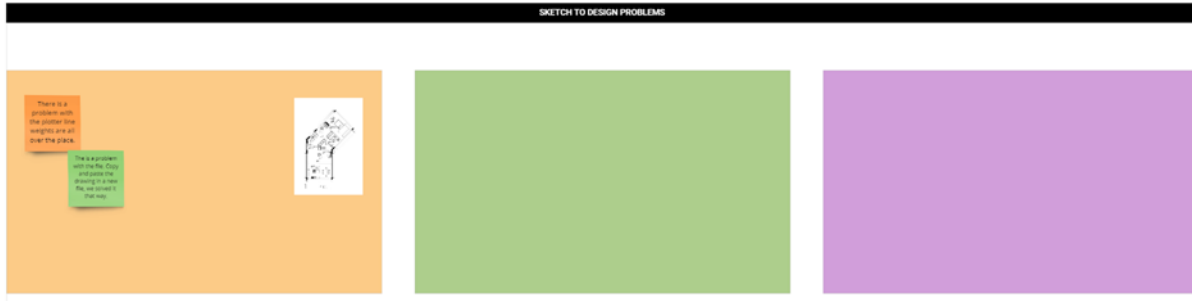

Figure 12. Discussion Board (Day 1)

On the day of the presentation, the coordinator did not participate in the evaluations except listening to the presentations after explaining the project evaluation scale to the groups. Peers evaluated each other according to the criteria given by the coordinator and gave their scores as a group (Figure 13).

PRESENTATION VOTING					
	CONCEPT	MOODBOARD - MATERIAL BOARD AND THEIR RELEVANCE TO THE PROJECT	DETAILS (1/20,1/10)	PROJECT DESIGN (CHALLENGESİ SIDE CHALLENGE, SPATIAL ORGANIZATION)	3D VISUALIZATION AND PRESENTATION LAYOUTS
(grumpy cat)	5 / 4	3 / 4,5	5 / 4	5 / 5	5 / 4
(alpaca)	4 / 4	5 / 4,5	4 / 3	3,5 / 4,5	5 / 3
(giraffe)	4 / 4	4 / 4	5 / 3	4 / 3	5 / 5

Figure 13. Evaluation criteria (Presentation Day)

Results

At the conclusion of the workshop, the post-test was distributed to the participants. The questionnaire consisted of a repetition of the statements given as a pre-test to evaluate the workshop process (Table 2). In addition, during the workshop, participants were asked to provide an evaluation of the game-based learning method and the design processes conducted that day at the end of the day.

Comparing the points given for the statements in the Clarifying Objectives design process between the pre-test and the post-test, it is observed that there is a decrease in both subjects. Since the statements given are negative, the decrease in the mean value is that the participants' experience of the processes in these areas has improved as a result of the game-based learning method (Table 10).

Table 10. Clarifying Objectives evaluation statements Pre-test & Post-test comparison

Design Process	Statement	Pre-test		Post-test	
		Mean	Count	Mean	Count
Clarifying objectives	When starting a project, I find it difficult to do research.	2,64	14	2,42	14
	When starting the project, I have difficulties in the concept development phase.	3,71	14	3,57	14

When looking comparatively at the scoring on the statements in the Establishing functions design process, there is a decline in both subjects. In particular, the significant decrease in the average score in the process of determining user needs shows that although this subject was not a focus during the workshop, the participants' experience of the processes in these areas improved as a result of the game-based learning method (Table 11).

Table 11. Establishing functions evaluation statements Pre-test & Post-test comparison

Design Process	Statement	Pre-test		Post-test	
		Mean	Count	Mean	Count
Establishing functions	When starting the project, I have difficulty in determining my user identity.	2,5	14	2,21	14
	When starting the project, I have difficulty in determining the needs of the user.	2,35	14	1,85	14

Comparing the ratings of the statements in the setting requirements design process are compared, there is a decrease in both subjects when looking at the pretest and the posttest. Specifically, in the sketching process, the significant decrease in the mean score is an indication that the participants' experience in these areas improved in the sketching process with the game method through the game-based learning method during the workshop process (Table 12).

Table 12. Setting requirements evaluation statements Pre-test & Post-test comparison

Design Process	Statement	Pre-test		Post-test	
		Mean	Count	Mean	Count
Setting requirements	I find it difficult to sketch when starting the project.	3,35	14	2,71	14
	I find it difficult to define the concepts when starting the project.	3	14	2,64	14

When the points given to the statements in the generating alternatives design process are examined comparatively, it is observed that there is a decrease in both subjects. Although the decline in the statement regarding the use of abstract concepts in design continues to be one of the problematic issues with the side challenge they carried out in the game-based learning method during the workshop, it can be said that the attitude of the students in this area has improved (Table 13).

Table 13. Generating alternatives evaluation statements Pre-test & Post-test comparison

Design Process	Statement	Pre-test		Post-test	
		Mean	Count	Mean	Count
Generating alternatives	I find it difficult to work with abstract concepts when starting a project.	3,28	14	3,14	14
	I have a hard time creating a mood board for the project.	2,7	14	2,5	14

When the scores given to the statements in the Evaluating alternatives design process are compared, when the pre-test and post-test are examined comparatively, a decrease is observed in the average value in the fields of function creation and option generation, while an increase is observed in making 1/50 scaled drawings. Although it is still not considered among the problematic subjects in terms of its sub-average value, it can be said that this increase is because the participants continued a group work and there was a time constraint (Table 14).

Table 14. Evaluating alternatives evaluation statements Pre-test & Post-test comparison

Design Process	Statement	Pre-test		Post-test	
		Mean	Count	Mean	Count
Evaluating alternatives	I have difficulty in determining the functions of the space given in the project.	2,92	14	2,14	14
	I find it difficult to express the functions that I set for the project.	2,85	14	2,5	14
	I find it difficult to develop different options for the project.	2,92	14	2,71	14
	I have difficulty in making 1/50 scale furnishing drawings of the project.	1,64	14	1,78	14

When the scores given by the participants in the pre-test and post-test in the Improving Details design processes were compared, it was observed that there was a decrease in every subject. Especially in the creation of project presentation sheets and rendering in 3D visualizations, the values fell below the average and were no longer considered as problematic issues experienced by the participants in the design processes (Table 15).

Table 15. Improving Details evaluation statements Pre-test & Post-test comparison

Design Process	Statement	Pre-test		Post-test	
		Mean	Count	Mean	Count
Improving Details	I have difficulty in drawing 1/20 detail scale of the project.	2,85	14	2,64	14
	I have difficulty in drawing 1/10 detail scale of the project (furniture and structure).	3,92	14	3,42	14
	I have difficulty in choosing materials for the project.	3,71	14	3,35	14
	I have a hard time creating the presentation layouts to present the project.	3,92	14	3,5	14
	I have a hard time preparing the 3D visualization of the project.	3,07	14	2,57	14
	I have a hard time rendering the 3D visualization of the project.	3,64	14	2,92	14

At the end of the workshop, participants' daily assessments were examined, and the concepts of time management, self-confidence, and confidence in professional relationships emerged as embedded outcomes. In terms of time management, several participants wrote that they planned their personal times and the group's times together and thus knew when and where to work and take their breaks. One participant wrote, "I find it helps with time management and group work and keeping up with distractions." Another participant wrote, "Before this course, I did not know how to spread the project over time, and I was wasting a lot of time on unnecessary things. At the same time, when competition was involved, I realized that I focused on the project much more and worked faster." Mentioned as such. Another participant also mentioned time management in relation to project management processes, "This course taught me how to manage time and project management. I realized that in a shorter period I can get a lot of things done for the project." In this context, the participants also mentioned that with the help of this workshop, they managed to design a project from start to finish in just 4 days, which made them believe in themselves. One of the participants wrote, "We fit our project process, which normally takes weeks, into 4 days. This allowed me to look at the picture from a wider perspective, frankly. We concluded the decision-making phase, which was my biggest problem, in a shorter time with the ideas of my friends. I have also experienced the division of labour. I saw the importance of this once again, as reconciling with people of different characters on the same point affects team spirit. I think that we used our time efficiently in this process and managed it very well. "And another participant said, "In the project design process, we did not need the critique process with our coordinator without realizing it. It was something we normally do a lot in design studio classes, but we didn't need it except in very difficult moments."

Conclusion

Game-based learning is a fun method that incorporates the concept of play and engages participants in the process. Design studios are heavily dependent on the master-apprentice method for their handling and provide little opportunity for the rotation processes of design processes in relation to curriculum structures.

As the number of students in interior architecture departments increases each year, the time in which instructors and students can interact in the master-apprentice model becomes increasingly limited. For this reason, it is important that peers have discussions with each other, listen to the instructor's comments during the critique process, and be able to do so with each other.

To obtain answers to students' evaluation of design education processes, which was the first of the research questions during the research process, participants were asked to complete a pre-test to evaluate their experiences in traditional design studios. As a result of this survey, it was found that participants had issues with the design processes of clarifying goals, establishing requirements, developing alternatives, and improving details. These issues were included in the workshop.

During the workshop, participants' project processes were observed to find answers to the question of how students approach the design process, which is another research question. In terms of its design, the workshop was designed in line with traditional design studios. The design processes are compatible with traditional design studio education processes. In accordance with the answers given by the participants during the pre-test, it was found that they considered these design processes to be linear and therefore did not go back and make corrections after passing a phase. For this reason, games were built into the workshop structure that required participants to go back and repeat the processes. Participants were able to better understand that design processes are transformative processes and were observed repeating these processes during the workshop. It was also observed that they preferred the method of specific to general instead of a method of general to specific, so they had difficulty understanding the design processes in the early stages of the workshop. During the workshop, they had the opportunity to experience working from the general to the specific.

The benefits of using the game-based learning method in design education and in the design process were evident from the end-of-day evaluations collected from the participants during the workshop and from the post-test completed by the participants at the end of the workshop. After the workshop, all design processes were found to have improved in general. Despite the design challenges and time constraints given during the research process, participants improved in the design processes.

In response to another research question, secondary outcomes emerged as a result of the research. These were time management skills, self-confidence, and social dynamics with colleagues. Since the design process is constantly changing depending on the client and the end user, especially in the field of interior architecture, these results are useful for interior architecture students to manage the design process. Although there may be different time intervals for different projects, self-confidence is also an important gain in professional life, where only one's preferences are not effective in the project. Part of gaining self-confidence is

that unlike in traditional design studios, participants can make their own evaluations at each stage without the need for an instructor. Gaining confidence in their own decisions allowed them to establish appropriate communication with their group peers and strengthened the communication, collaboration, creativity, self-expression, and research skills that students should have in a design studio.

The game-based learning method also emphasizes the importance of time management by allowing participants to take a break from tasks that they describe as "boring." Gaming was also used as a distraction in this workshop. Participants also strengthened their ability to multi-task by focusing their attention on the project with questions that arose during uncertain times.

This study provides limited insight into the game-based learning approach in interior architecture education. In future studies, this approach can be used in theoretical courses and throughout the duration of a design studio to better understand the impact of the game-based learning approach in interior architecture education.

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