



A Literature-Focused Study: The Furniture Structure Course in Design Education

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Abstract

Structure, which is the system that defines the configuration of furniture and supports it with its constructive features; plays a decisive role right from the first stage of design. Having a correct understanding of the structure directly affects this process and the resulting product. Although the structure is considered a technical requirement, it also strengthens furniture designs aesthetically. This study focuses on analyzing and evaluating the functional performance of the ICM 220 Structure in Furniture course, which is given in the undergraduate program of MSGSÜ Faculty of Architecture, Department of Interior Architecture. The content of the course encourages the students to be creative in design education and supports the design processes. In this sense, the syllabus of Structure in Furniture, which is one of the courses serving the Project process, is explained in general terms. The students who took the course in the spring semester of the 2021-2022 academic year were surveyed within the framework of the principle of voluntariness, and the results of the survey were evaluated within the scope of the experiences they had with the studies they had done during the semester, the outputs and achievements of the course. With these evaluations, it was tried to make determinations about the process by examining the effects of students' learning, using the right source and method, expressing themselves and literature-oriented work on the design process. It has been seen that working with a common roadmap supported by detailed research allows students to have a say over the performance of the course in question. With interactive information sharing, it was possible for students to consciously manage the design process.

1. INTRODUCTION

Interior Architecture education is a holistic system fostered with course content that is updated and self-developed in parallel with the requirements of the age and technological developments. Interior Architecture education started with the addition of the Decoration Department to the Sanayi-i Nefise Mektebi (Mimar Sinan Fine Arts University) in 1924 [1]. Today, 5187 students in 77 universities, 24 of which are state and 53 are foundation universities, are given Interior Architecture education throughout Turkey. In the Turkish Republic of Northern Cyprus, 320 students from 8 universities were entitled to receive Interior Architecture education in 2022 [2].

The first studies to establish a National Qualifications Framework in higher education in Turkey were initiated in 2005 under the name of the Bologna Process [3]. *Since the Bologna Process is a system that ensures the traceability of the courses in particular, the Bologna Process creates a structure that keeps the courses constantly renewing, the questioning of "what", "how" and "for what" in a dialectical process* [4]. With the transition to the Bologna process in education, updates were made in both the syllabus and coursework, and improvements were made to enable students to express themselves by using their time and talents more efficiently and accurately. These improvements were direct interventions on students' creativity. With the change in the education model; face-to-face lessons in classrooms are fed with more intense personal research, individuality is replaced by teamwork, the traditional teacher profile is replaced

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by the guide-mentor, the traditional content evolves into an active content and method variety that updates itself [5], [6]. Furniture Design courses, which are complementary to many courses, especially Project and Spatial Design courses in the Interior Architecture Department curricula of both state universities and private foundation universities, were also affected by these method changes.

In furniture design, a designing strategy is accepted and the first step is taken by making use of design methods. In this sense, design activity is a very comprehensive process consisting of several layers and this process is a path, shaped uniquely by the designer. As Demirarslan and Demirarslan stated in their book [7] "Design and the Design Process", the design process stages are quite excessive and the designer can develop a different direction according to their vision. To prepare a detailed requirement list should be a priority in this path... *design process is considered as an activity, in which the designer integrates his/her creativity, intellectual strengths, data he/she collects from the environment and his innate abilities as a whole. The most significant part of this process is creativity due to the fact that creativity in design is defined as the notions of multidimensional thinking, stepping out of the boundaries of instructed thought and constructing different ideas than others* [8].

When considered as a psychological term, creativity is the presumption of inclination that pushes the individual to create something and it is accepted that it exists in every individual [9]. In this sense, various knowledge transfer and teaching methods are applied in design education, which mostly requires a one-to-one working process with students. Discussion, criticism, decision, research, problem solving, demonstration and self-study are among these methods. The design process is directly related to the designer's knowledge of the discipline. Owen [10] argues that design is a creation; a discovery phase. According to him, these stages should focus on researching, discovering, seeing the problem, finding and producing solutions to this problem. If design is a problem-solving activity based on knowledge, the necessity of having a certain knowledge for solution proposals for this problem should also be accepted [11], [12], [13]. Bayazıt [14] divided the design into various stages as observation (pre-program), understanding the problem (analysis), creating (synthesis), comparison and selection (evaluation). When Casakinn and Kriet's [15] studies, which refer to the relationship between flexibility and creativity, are examined, it is seen that working with different methods increases creativity. It can be easier to construct the next steps in all processes with a correctly defined conceptual infrastructure. The ability to think flexibly and fluently, to decide between associations, to use visual images correctly and appropriately, to manage the process efficiently and to present the product are important in this sense. Design is representation. Traditional drawing, model making, writing, sketching, collage, computer modeling etc. includes verbal techniques. The characteristic of representations is that they are reflective tools that establish communication with oneself and enable questioning of content and form [16].

According to Schön [17], creativity is a dynamic process that spreads over time. In this process, a knowledge-oriented approach is displayed that will allow students to differentiate from each other. In this sense, ideas can be developed with various techniques and methods in the creative design process. Some of them are:

- *Thought-centered intellectual methods focusing on the creative idea and process, in which creativity is increased by thinking* [6],
- The *metaphor method* that allows abstract concepts to be expressed in a concrete way,
- The *informal education model*, which is the situation of revealing the personality by opposing what the existing-system dictates,
- The situation of subconscious interaction with the concepts of disposition-similarity-contrast, the *connotation technique*,
- The development of the work with in-group sharing of ideas *brainstorming*,
- *Sharing ideas of timid members, writing down ideas at the point of developing their definitions* [6],
- *Sharing and evaluating studies in the classroom environment method...* However, Tracey and Hutchinson [18], *the approach that the student needs support to explore the idea formation process reveals the importance of both focusing on verbalizing it while giving theoretical information in the course content and doing supportive studies in practice with different methods.* This difference is an acquisition that can bring students to the forefront in their professional careers in addition to the competence they gain during

their undergraduate education and is the way they show their ability to realize themselves. In the light of all these creative design methods, in the infrastructure of the work is based on; the techniques listed in the section titled “Creativity and Creativity Techniques” by Bert Bielefeld and Sebastian El Khouli in their book “Step by Step Design Ideas”. These techniques are brainstorming, writing down ideas, displaying and reviewing [19]. With the technique applied, students were provided with a more detailed look at images/furniture designs depending on the selective perception, and they were supported to reach the original in their own designs. In this way, as Bayazıt [20] stated, the key to learning is being a good observer and using the perceived information in the right place when necessary. Literature review is also important in this sense.

According to Demirci [21], trying to obtain information that will be useful for the study by finding and examining the works in addition to the previously published articles and historical records on the researched subject constitutes a literature review. Again, according to the author's quote from Bourner [23] conducting a literature research supports the researcher to;

- recognize the needs within the scope of the research and to identify gaps,
- by mastering the studies that have been done on the subject before to avoid these repetitions, not repeat the same mistakes that have been made before, and therefore saving time,
- grasp the existing and take it further,
- recognize, know and defend the rights of previous researchers on the work,
- increase knowledge on the study,
- reach and determine the benchmark information that exists in the study that has guided the study,
- be able to associate the work with other studies by providing enlightened content,
- revealing the contrasts in the study,
- add depth to the study,
- support the previous studies in terms of demonstrating accessibility.

When we look at the literature, in the studies conducted specifically on structure and furniture design; Akçaova, A., Sungur, M. [23]; handled the structure at the point of integrating it into interior architecture project courses. With the questionnaire they applied, they concluded that the combination of architectural structure and model increases creativity positively.

Özel, Y. & Ürük, Z. F. [24]; explains that the first step in furniture design is function, and then the form is reached in his works, and emphasizes the importance of structure in materials and construction methods.

Bulut, D.M., Canbolat, T. [25]; shared his research on a technology that enables the transition from 2 dimensions to 2.5 dimensions by bending, cutting and brazing steel material with each other. Applications where 3D designs can be achieved by applying air pressure between 2,5 dimensional steel molds with FiDU technology were shared.

Gunduz, G. & Canbolat, T. [26]; made a research on the senses by following a different path in the furniture design approach. Patrick W. Jordan, one of the approaches in the emotional design literature, used the satisfaction approach and the survey method. In the study, it is aimed to measure the instant feelings created by the seat elements with different features and the adjectives chosen without any experience.

Canbolat, T. [27]; in this study, what is defined as the flat-packable detachable structure approach is actually a fragmented structure. The literature on the structure was reviewed in terms of portability, ease of installation, and sustainability.

Ertaş, S., Sonmez, E. [28]; dealt with the structure specifically for the design of interior architectural components and elements, and concluded that the use of the structure affects the shaping of the designs, the material, and the structural features. The study emphasizes that the structure can be used as a design element in interior architecture.

In this study, it is aimed to update the basic objectives and principles of the course in the face of new developments and changes, and to identify and eliminate the emerging problems, deficiencies and inadequacies in order to continue the furniture design education and experience gained in long years in a well-established institution that provides design education. In this sense, the reason for the literature research coming to the fore in the course is; the student's ability to analyze, question, interpret, develop and customize knowledge.

2. ICM220 STRUCTURE IN FURNITURE COURSE

The second year of design education at Mimar Sinan Fine Arts University, Department of Interior Architecture is very intense. With the start of the project studios, students have the opportunity to work with their friends from different periods, share information, and gain familiarity with spatial projects that can be solved with different details. In order to design furniture for a place in projects within the scope of Interior Architecture education; first of all, the general parameters about the space should be known, the function of the space and the user profile should be defined and understood correctly; in addition to all these, it is necessary to have ergonomic data that will provide comfort conditions. Because they need to use correctly defined and designed furniture so that people can be happy in the places they live in. In this respect, according to Ching [29]; *furniture adds comfort and coziness to the interior, making the spaces useful and contributing to the visual character of the interiors. Its form, colour, texture, size and spatial arrangement play an important role in establishing the identity of a volume.* While Demirarslan [30] defines furniture as an accessory used for actions such as sitting, eating, sleeping and working, which are necessitated by daily life; she mentions that this equipment element should be designed considering aesthetic and ergonomic concerns and that it should provide convenience, comfort and functionality to these mandatory actions. Furniture supports the integrity of design with the right relations it establishes with the space and other furniture in the space. In this context, the fact that all kinds of projects can work and be applicable is directly proportional to the extent to which furniture design education is given. In this context, the fact that all kinds of projects can work and be applicable is directly proportional to the extent to which furniture design education is given. In the program, studies are carried out that will continue in other periods and that will add knowledge and experience to the previous practices in terms of content. Information about furniture design begins to be given to students in the fall semester of the 3rd semester under the name of "Introduction to Furniture". The preparation phase is completed by making presentations on furniture classifications, anthropometry, furniture-furniture and space-furniture relations. Afterwards, a period of intensive application is spent with programming sketches, which are important for furniture design. Students who are successful in this course continue their education in furniture design by taking the Spring Semester, Structure in Furniture course.

Furniture design is an act of creating a structure that is thought to fulfill the functions required by daily life. This action requires a study in accordance with the function, purpose and design style of the furniture. With its material and construction method, it keeps the furniture standing and gives it a form. In this sense, the "structure", which defines the installation system of furniture, which is a space reinforcement, also plays a decisive role from the first stage of the design. This role is not necessarily designed to create a structure or to show any part of the structure differently, but to serve the design it is in. Keyser [31], *who mentions that it is not right that this structure should be designed to create a structure, or that the design should proceed to show any part of the structure differently, says that the right structure should come intuitively from the forces affecting it by focusing on the functional structure of the furniture.* In this case, the choice of structure and its correct use; is defined depending on which material and technology the furniture to be designed will be produced by, whom it will serve and in which space it will be located. Keyser [31], who mentions the importance of the conscious association of units and modules when he says *“the form of the design element, the parts that bring it together, the way these parts come together and the meaning that the whole of the design gains with these parts is the content of the structure of the design”*. The aim of the course is to instill in the student the ability to establish this unity.

In this sense, the following can be listed regarding the function of the course within the scope of the study:

1. To encourage students to follow the production techniques and especially technological developments in order to carry the limited knowledge about furniture design forward,
2. To help creating products consciously by combining personal experiences with intensive research by breaking the preconception within the scope of material use and form relationship,
3. To recognize and follow the designs and designers, specific to or related to the research topic,
4. To be brave for creative experiences while synthesizing the knowledge acquired for achieving the unique,
5. To raise consciousness and increase awareness by observing yesterday, today and tomorrow,

6. To gain a perspective on design as a result of the awareness created by the student about the furniture designs around him,
7. To establish the relationship between space and furniture by paying attention to the size and scale requirements,
8. To learn and master the technical information about the detail analysis of designs,

In the course that proceeds with the hypothesis that the literature-focused study will directly contribute to the cognitive development of the students, specific to these 8 items listed above; students are expected to analyze information in a process-oriented manner, to question within the limits of their own creativity, to interpret the existing and to produce a furniture idea with the suggestions they have developed on this interpretation.

With this approach, a limitation has been brought about the structures to be worked on during the period. When the written sources are examined, it is seen that the classifications of the furniture structure vary. Şanivar and Zorlu [32] classify wooden furniture as solid, contra, grille, complete and frame structures; Efe and Kasal [33] limit it to box, frame and combined structure. On the other hand, Onur [34] quoting from the lecture notes of Önder Turan MSGSÜ Furniture Design and Söğüt [35], sharing a similar approach; He preferred to define it by dividing it into a large number of titles as suspended-tensioned, continuous, interlaced, mixed, environment-dependent, fragmented, filled, monoblock, textured, inflatable structures. In Demirarslan's book [30], structures are with a similar classification; carved, masonry, frame-skeleton, shell-monoblock, suspended-tensioned and knitted, inflatable and filled, mixed, continuous structures. In this sense, it is thought that there may be updates in the classifications as the materials used in the design diversify and the technology develops.

The updated course introduction form is shown in Table 1, and the weekly course flow is seen in Table 2.

Table 1. Information about the Structure in Furniture course

The Aim of Course	Starting from the basis of "Introduction to Furniture", it is aimed to reinforce the basic knowledge of furniture structure with in-class practices by researching the production methods affected by the materials and developing technology in furniture.
Course Learning Outcomes	<ol style="list-style-type: none"> 1. Researches and examines the materials and developing technologies used in furniture design. 2. Produces projects with applications over various structures. 3. By bringing a different perspective to the system that sustains the furniture, the infrastructure is created for a conscious approach in the act of designing furniture.
Course Content	In-class applications are made through the design programs created according to the types of structures in furniture and they are examined with corrections.
Course Teaching Methods and Techniques	The subjects are handled practically by sharing the homework given every week through theoretical examinations.

Table 2. Weekly flow of Structure in Furniture course

Weeks	Topics
1	Overview of furniture structure variants
2	Overview of furniture structure variants
3	Student presentations and application evaluations on suspended-tensile and fixed structures
4	Student presentations and application evaluations on suspended-tensile and fixed structures
5	Student presentations and application evaluations on component and tongue and groove structures
6	Student presentations and application evaluations on component and tongue and groove structures
7	Midterm
8	Group work on a single venue
9	Group work on a single venue
10	Student presentations and application evaluations about the foldable structure
11	Student presentations and application evaluations about the foldable structure
12	Freelance work with 2 student-selected structures
13	Freelance work with 2 student-selected structures
14	General evaluation

The Learning Outcomes of the Course are as follows:

- The student gains awareness in his research on materials and technologies used in furniture designs.
- The student realizes correctly defined and standing furniture designs within the program.
- As the student starts to think about furniture design through the structure, his perspective on existing designs changes and his vision increases.
- Learns to reach accurate data by making on-site comparisons between sources and to present them within the framework of ethical rules.

3. MATERIAL AND METHOD

Furniture includes movement in terms of the meaning of the word. In addition, many furniture from history to today can be solved together with the space, can be fixed or semi-movable, and can be used dependent on its surroundings from one point. I believe that in Keyser's [31], *design is as much thinking as sketching, drawing or building. I think a lot of thought should be directed towards any problem before any drawing is made*, its approach is supported. The method of the model based on this approach is shown in Table 3.

Table 3. Research Method

PURPOSE	HYPOTHESIS	SUBJECT	METHOD
To reveal the effect of literature research on the types of structures studied within the scope of the course on furniture design.	-Literature-oriented work in furniture design increases creativity. -It is positive that interior architecture students gain awareness about structural design by taking the Structure in Furniture course.	Students enrolled in the Furniture Structure course in the 2021-2022 Spring Semester. *Evaluated with the results of the survey conducted on 54 students.	- Likert scale - Brainstorming - Putting ideas into writing - Display - Review

In the design phase, the focus was on the student's extensive research of the literature and the process of creating knowledge and reusing it in the creation process.

The survey study was applied to the students of ICM220 Structure in Furniture course in the 4th semester undergraduate course program of MSGSÜ Faculty of Architecture Interior Architecture Department in the spring semester of 2021-2022 academic year. This research; according to the Ethics Committee of Mimar Sinan Fine Arts University, in Article 4 of the directive; is in accordance with the principles such as devotion to scientific discipline, respect for life, not harming, informing all concerned about possible harm, and risks, responsibility to humanity and society. With the decision of the Ethics Committee numbered 13.01.2023-93280, the application of the research, which is the basis for publication, was allowed. It has been observed that students who design furniture by considering the structure first adapt to the design process faster and work more consciously.

The questionnaire consisting of 4 parts;

The 1st part; is the section in which students state which of the structure types they have more difficulty in the research process. It contains a multiple choice overview question.

In the 2nd part; 5-point Likert scale questions used to measure attitudes were asked to students to indicate how difficult they were while working with different types of structures.

In the third part; in addition to closed-ended questions about the design process,

In the fourth part; there are questions that include a 5-point Likert scale regarding the achievements of the course and require expressing opinions from Nothing to Much. In the last section that continues, answers to general opinion questions are sought.

In design education, where research methods are very important, 6 questions were prepared for students to research with the approach of reaching and classifying the right resources. These questions were shared in order to form the basis of the presentations that the students will make in groups. Thus, the framework of the presentations has been clarified with the created base. Although the types of structures change, the content and especially the things to be researched remain the same. During the research process, which will last approximately 3 weeks, the base distributed for the questions that students will seek answers to both theoretically and visually is as follows:

1. How is the definition of structure made in different disciplines like natural sciences, architecture, furniture, medicine, industrial products, etc.? Please explain.
2. What are the factors that determine which structure we will choose when designing furniture? Please comment. How does the chosen structure affect the production process? Explain with examples.
3. Which systems/methods are used in structure-based designs?
4. Which structures need which materials and production technologies?
5. Examine the similarities/differences of local/foreign designs in terms of design approach and usage factor.
6. Support with examples in which places your chosen structure is used the most.
7. Be sure to prepare a "references" for the definitions, images and information you use.

Framed by the answers to these questions, the research sought answers to the following questions:

1. Literature research/ Did the student's literature review-oriented presentations affect their furniture design understandings/approaches in the process?
2. Preparing and presenting the presentation file/ Did the student's access to information, understanding it and sharing it with classmates by evaluating it in his/her own filter had an impact on both himself and the audience during the design process?
3. Techniques such as models and sketches of furniture, etc. / Did shaping the furniture step by step with questions and reasons through 3D volume affect their creativity?
4. Identity – location selection/ To what extent was the relationship between space-furniture, furniture-furniture taken into account in the studies? Are the designs more meaningful and suitable for the identity with on-site observation?
5. Program preparation/ Thinking in furniture design, did adding the structure to the design phase, as well as the program created during the data collection phase, affect the process?

At the beginning of this study, which includes all applications and presentations during the term, the students were informed by sharing current examples with the types of structures and application methods that stand out in furniture design. Due to the high class attendance, the first two weeks of the working process, which is usually carried out in groups of 2-3 people, were evaluated first by the presentation of the lecturers in charge of the course, and then by the students sharing their research to start the first structural work. Before each structure topic started, the groups were presented and general lines were drawn, and then they were given time to think about the title of the furniture in the sources they saw and researched, to prepare the ground for brainstorming, to write down their thoughts about the designs in particular, and to make presentations to their friends in the classroom environment. At this stage, the students had the chance to learn the archiving technique with a certain method while collecting visual sources. Each visual used in research assignments contains data on the designer's name, name, design date, material used and production technique, and type of structure.

4. STUDENT STUDIES FOR THE DESIGN PHASE

The aim of the study is to understand how students manage the design processes and what they experience while reaching the final product. In this section, the design process was examined by focusing on three student projects. In the selection made, primarily the performances during the period were taken into consideration. In addition, groups studied in different techniques and titles were selected to support the research results. In order for the knowledge gained on building structures to evolve into furniture design skills, it is important to carry out drawing-based application studies within the scope of this information and to evaluate the results of the study and to share and discuss with the student for feedback.

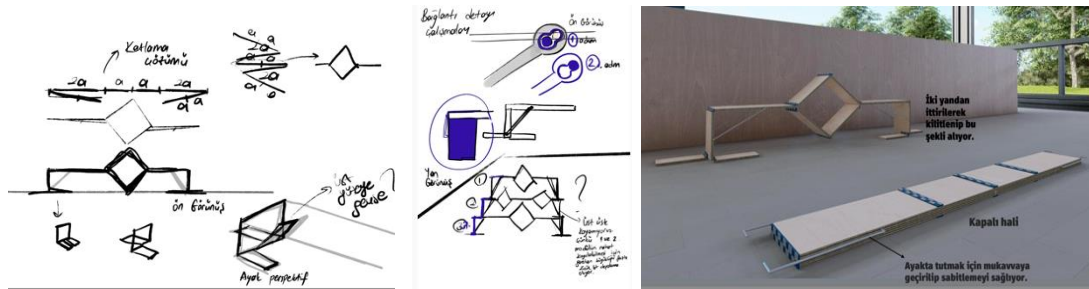


Figure 1. Free structure work – foldable structure work

In the first project seen in Figure 1; A storage-organization element design with a collapsible structure has been studied. With the structure that allows the volume to be reduced exponentially, the students chose design students as users and carried out a study considering their needs. The students, who reached many examples about the structure in the literature, stated that they had no difficulty in the research phase of the process in this sense. It was easy for them to determine the details that they can integrate into their work by making comparisons over the features of techniques, material, form, etc. used in the present examples. While sharing their detailed presentations with their friends in the classroom environment, giving examples from many designers caused their friends to increase their knowledge. The design process, which started with a hand sketch, was completed at the last stage with the use of a three-dimensional program on the computer. In sketches made with freehand drawing, which has a very important place in design education; by paying attention to the size/ratio relationship, the connection of the furniture with the space was taken into consideration. Afterwards, information was given about the material used by coloring it and adding some notes on it. With freehand drawing, students were able to reach very fast results at this stage. Stating that they carried out a harmonious group work in the process, the students stated that the researches had a positive effect on their perspective on design and shared that their awareness had improved. They also emphasized the portability of the structure by choosing light materials such as cardboard and plywood in their designs.

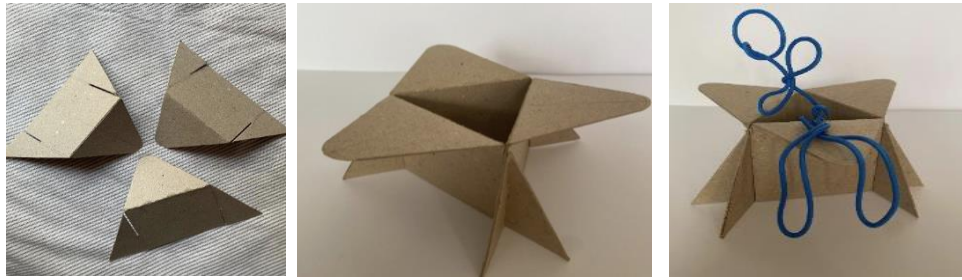


Figure 2. Model work on the tongue and groove structure

In Figure 2, the student work that carries the installation of the model and furniture to the 3rd dimension is seen. Based on Schön's [36] the design process "*must be learned by doing*", he emphasizes the importance of the model, which appeals to the senses of sight and touch at the same time, in structural design. Thanks to the model, which gains dimensions by embodying two and three-dimensional design thoughts in the mind, students are able to manage the design processes by producing and reproducing. With this approach, the induction method was used in the student project with the paper material chosen due to its easily accessible and shapeable features. The student, who took the material and transformed it into the form he wanted, was able to reach many alternative usage surfaces with the unit design. He did not use any auxiliary/binding material in the seating element he designed with a plug-in structure, he fixed it by inserting it. While examining the examples related to the subject in the literature research, the students stated that they had a serious confusion at the beginning and they were stuck. Solving the joint detail without using spacers was challenging. The structure, which requires examination by finding a large number of images, has extended the process in this sense. Afterwards, they stated that they overcame this blockage by thinking about the unit in the design, not the general one. In this sense, brainstorming, learning by doing, trial and error have accelerated the solution. Fast installation, portability and the absence of the need for additional parts in the furniture considered for the campus supported the accuracy of the structure selection.



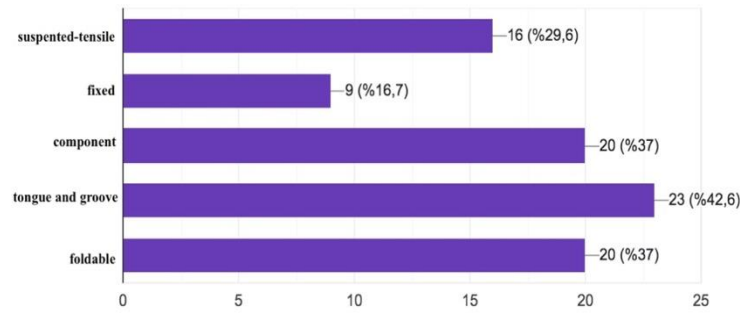
Figure 3. 3D work with a computer program

When we look at the studies in general, it is seen that most of the students use computer technologies effectively in the idea development process. It has been determined that some students approach the models made by hand more distantly. As in the example of Figure 3, the student handled his work in 3D from different angles in the computer environment. The group, who thought that they could not express the organic form they chose in a model or hand drawing, determined the representation method that would express themselves by modeling in a computer program. The furniture designed for the exhibition area provides diversity by using different levels-widths and forms. By adding a figure to the model, an idea of scale and ratio was given in the presentation.

5. FINDINGS AND EVALUATION

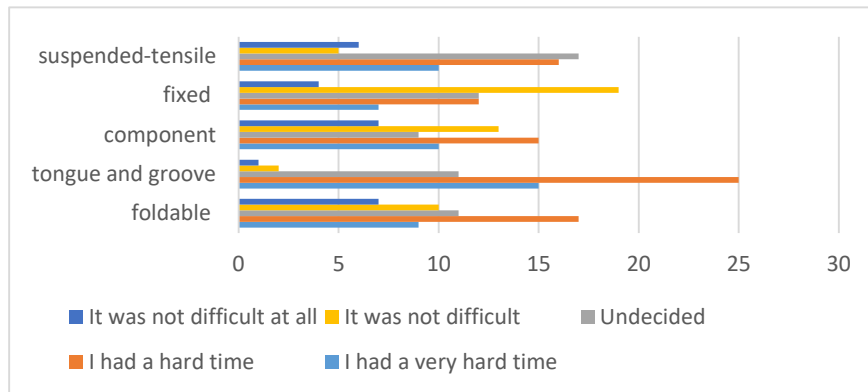
62 students enrolled in the Structure in Furniture Course in the 2021-2022 Spring Semester, 2 of these students did not attend the course and 6 of them did not take the final exam by voluntarily not meeting the requirements of the course. For this reason, a total of 54 students enrolled in the course, 3 of which were repeated, were evaluated with the results of the survey study.

Table 4. Structures that were difficult in the literature research process



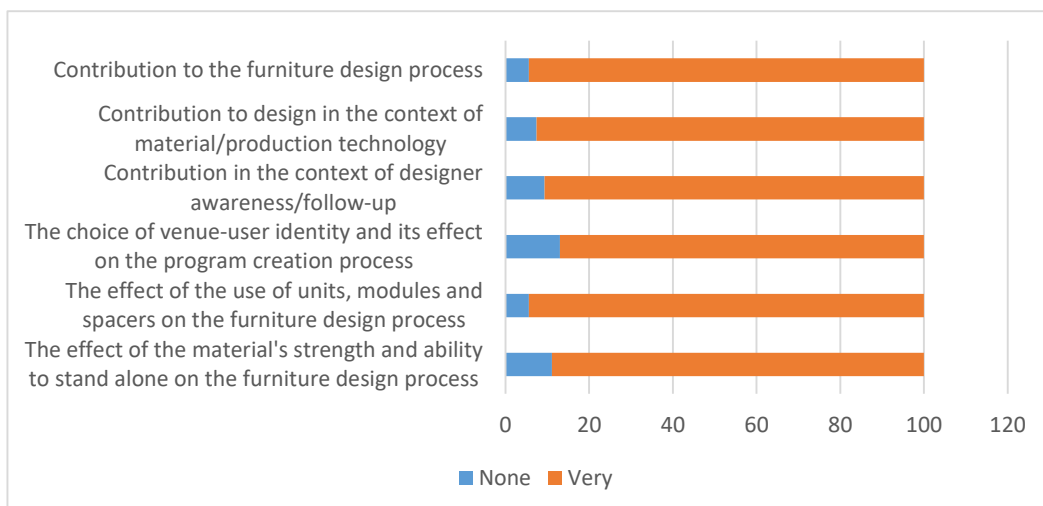
During the semester, the students continued their work in collaborative working groups with more than one person for the 5 different structural studies that progressed within the curriculum and at the end of the semester, they evaluated the process. As seen in Table 4, the students stated that they had the most difficulty in the snap structure during the literature research process. In the next sections; the statements directed to the participants were asked to be coded with linear data as “1-I had a very hard time”, “2-I had a hard time”, “3-Undecided”, “4-It was not difficult” and “5-It was not difficult at all” and findings related to the section evaluations formed by the coding of 54 participants were obtained. In the following Chapter 2, they stated how difficult they were in the literature research process in particular for these structures, and in Table 5, again, the thrust (tongue and groove) structure had the highest percentage.

Table 5. Difficulty in the literature search process



In the 3rd section that follows, closed-ended questions containing the answers of "Very" and "None" were asked to the survey participants and it was observed that the study had a positive effect on the process to a large extent, as seen in Table 6,7,8,9,10,11.

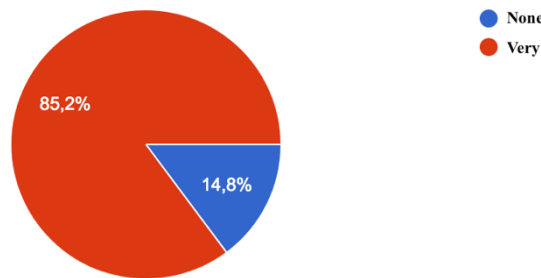
Table 6. The role of structure-oriented literature research



The graph in Table 6 shows that 92.6% of the participants have a positive effect on the structure-oriented work in defining the relationship between the furniture designs within the scope of the study and the material selection and production technologies.

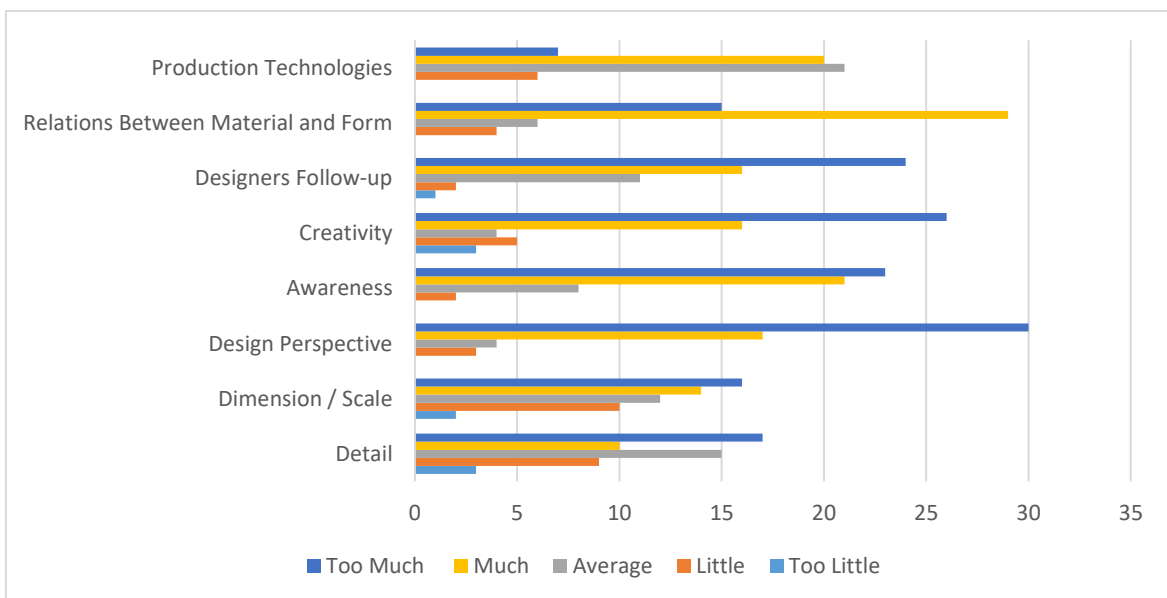
In this process, which allows students to work together, Table 7 shows that the study supported teamwork. At the same time, the rate of cohesion among teammates is high.

Table 7. *Compatibility in the process with colleagues*



In the 4th part of this study on structure-oriented literature research supported by the academic program of the course, there are questions about the learning outcomes of the course, which also include a 5-point Likert scale and require opinions from Too Much to Too Little. With the data in Table 8; this research process, which students have done to develop their visual libraries, has positive effects on the ability to think about existing examples and definitions, to find a way to improve their creativity in design by adding their own knowledge and comments, to control the process with the right programming, which is the first step, and to change their perspective on design by thinking about furniture in its space.

Table 8. *Effects of structure-oriented literature research*



In the next part of the survey, the participants were asked whether the applications made during the period were sufficient for the structure-oriented study and the results in Table 9 were obtained. After this level of satisfaction, Table 10 shows that the students found structure-oriented work suitable for them.

Table 9. The adequacy of the number of applications during the semester at the point of clarity of the subjects

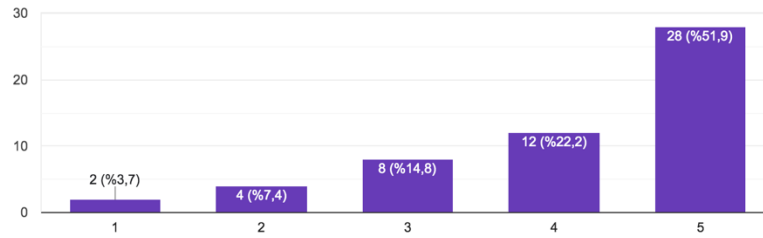
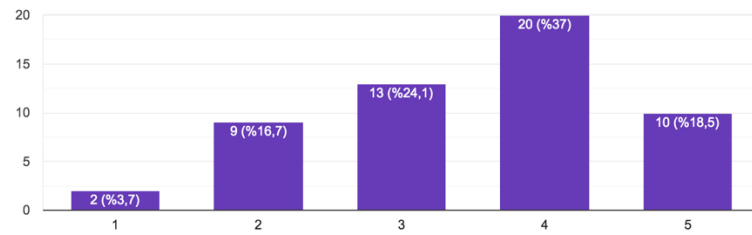
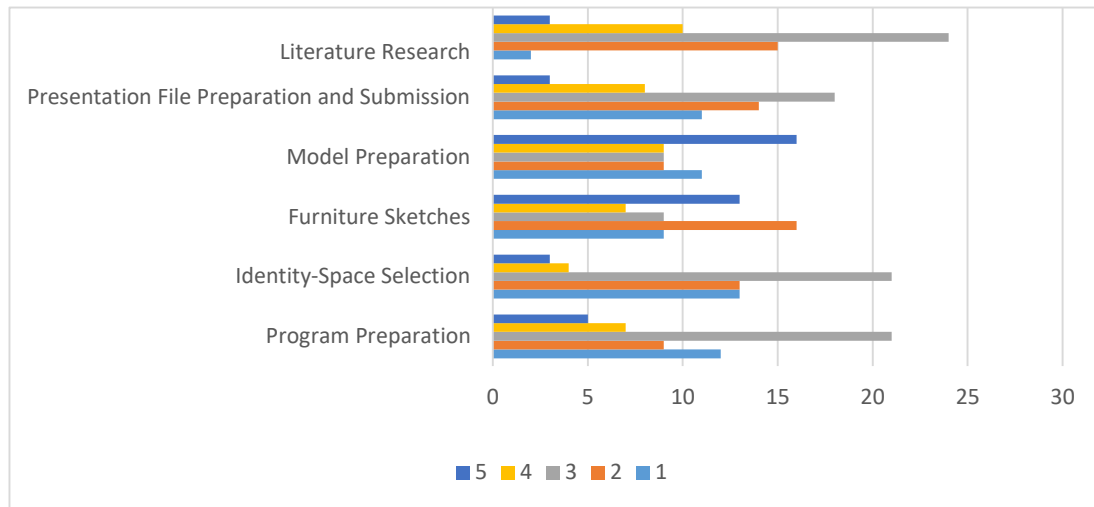


Table 10. Suitability of structure-oriented work for students



The last part that continues is; the answers to the general opinion questions were sought, continued with the evaluation of the difficulty levels, which were asked to the participants and asked to score between 1 and 5, and the answers that the participants coded with linear data were shown.

Table 11. In general, the degree of difficulty of the stages in the teaching of the course



According to Table 11, as a result of the evaluations of the participants, the average values in the degree of difficulty were observed, and the students carried out the stages easily with this curriculum built on the course of the lesson. The medium difficulty level in Table 10 is supported by the fact that there are a lot of applications in the furniture structure lesson to see whether the student understands the subject and the way he/she should follow in the design, while at the same time working on techniques to express himself/herself better. In addition to listening to the traditional theoretical lesson, the studies made for the student to gain the practice of preparing a presentation by doing research on the subject kept the process alive. Also, the progress of the students by completing their studies regularly during the term has been a supportive method in this regard. In the period studies, which were fed with theoretical and workshop studies, the sketching stages, which were made at the point of establishing the correct relationship between space-furniture and furniture-furniture, were completed fluently by mastering the anthropometric data and paying attention to the scale requirements. In the course, besides the materials and new technologies used in furniture design, the emphasis on creating a program and creating an identity played an important role among the practices made to create integrity in design.

5. DISCUSSION and CONCLUSION

This study, which was carried out to emphasize the importance of literature research while defining the connection between furniture design and structure under the influence of developing materials and production technologies, has developed a proposal that can be included in the programs of many schools providing interior architecture education. The importance of the structure, in other words the system that keeps the furniture up, is emphasized. In this sense, the data obtained as a result of the study has an effect on the efficient processability of the course. These can be counted as providing a suitable working environment (in terms of workshop capacity, health conditions, technological facilities, etc.) in order to obtain the desired efficiency in the application studies, as well as the content of the theoretical explanation made by the faculty member, the technology support in the research results and presentation forms of the students.

While Schön [19] emphasizes the importance of change, the society that the future needs; he mentions that he should have features that can learn, adapt and transform. A designer who is beneficial to society needs to be able to transform himself and adapt to the future. This transformation, which serves the purpose of change advocated by the course at this point; freedom develops the power of thought to evoke unlimited design possibilities. Because; flexibility in structure-oriented designs, development in parallel with technology and changeability depending on needs are possible by using the acquired structure knowledge effectively and to increase creativity.

The aim of all the applications carried out during the period is to remove the borders, to get rid of the patterns and to make conscious decisions about the subject in order to design more freely. For this, the priority is to conduct an in-depth literature search. Because only by observing the development process from past to present with literature research, important data can be reached and future predictions can be made in the light of these. The prepared presentation base serves as a guiding map for the students about which questions they should seek answers to. In this research phase, whose experiences on each topic differed, students shared the information they obtained with their classmates and an interactive information sharing environment was created.

- When the submissions of the students who prepared a presentation on the literature research were examined, it was observed that there were great differences in the page layout, flow, background and color selection, font and size of each group, and mastery of the subject.
- The success of the work has increased visibly when the correct distribution of tasks within the team is made. On the contrary, it has been seen that it is very difficult for researches conducted in isolation from each other to come together and form a meaningful whole.
- Students who researched the existing literature were also able to get involved in the subject by making their own definitions. The opportunity to express his opinion in writing received positive feedback.
- During the presentation, the student will be able to complete the words of his teammate, answer the questions, interpret the criticisms and turn them into positive, speak to the community, etc. was able to perform many actions at once. With the question-answer environment created in the classroom, the topics became more memorable, and the sharing class encouraged harmonious working as a team.
- It has been seen that the effect of giving the desired effect with 3D modeling programs and achieving a realistic product with color-texture-light is dominant. The fact that the student does not know where and how to shape the material while making a model, and the emergence of forms limited by manual dexterity, has been pushed into the background, considering that it will cause a negative process for many students.
- In some studies, not being able to reach enough resources on the subject of structure creates a problem, while accessing too much data has also caused congestion in programming.

- Being able to criticize by sharing ideas has accelerated the design processes.
- Focusing on the relationship with the space by adding other types of furniture to the studies on the sitting element enriched the content and the lesson got rid of monotony.

In the result of the study;

- In order to reach the *Learning Outcomes of the Course* aimed in the “Structure in Furniture” course; theoretical explanations, which are enriched with visual examples and updated every semester, are supported by student research and presentations as well as practice and drawing studies.
- The necessity of sharing and discussing the evaluations of the practices with the students has emerged clearly. With this application, while students have information about the work of other groups, they can also make self-criticism about their own work.
- It has been determined that the critical environment provides students with an intellectual perspective and provides the opportunity to associate the knowledge acquisition process, which starts with literature research, with the final product, to gain depth, and to reveal contrasts.
- It has been decided to introduce a flexible curriculum that can adapt to developing technologies so that the course can be taught more efficiently. This flexible curriculum has turned into a roadmap for the student to follow and the point that the student will reach at the end of the term is foreseen.
- According to the data obtained from the survey results, it has been understood that it is possible to directly intervene in the process in a very busy period. This intervention revealed that the alternative approach brought to the furniture design process aimed within the scope of the study had a positive effect on the students.

Every intervention in the creative design process has reached the goal of improving the student's vision and guiding the cause-effect relationship.

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