Mobilya ve Ahşap Malzeme Araştırmaları Dergisi
Furniture and Wooden Material Research Journal
Research Article - Araştırma Makalesi 2024 - 7(1), 121-135

Human-centered approach for furniture design studio course in interior design education: A case study

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ABSTRACT: This study at Antalya Bilim University's Interior Architecture and Environmental Design Department explores an innovative educational model that combines the "Human Factors in Interior Space" and "Furniture Design" courses. This approach aimed to construct a bridge theoretical understanding with practical application for third-year students focusing on ergonomic design principles to create functional and human-centered furniture. The study employs a two-phased methodology. In the first phase, students engage with traditional anthropometric methods to construct a standard-sized seating element. In the second phase, they advance to digital techniques including photogrammetry to design a custom cardboard seating element tailored to individual needs. The incorporation of digital tools such as Agisoft and Autodesk ReCap alongside traditional plaster molding facilitates a comprehensive understanding of ergonomic design. This educational model highlights the importance of integrating manual and digital methodologies in interior design education enhancing students' ability to innovate and adapt to modern design challenges. It aims to prepare students with the skills and knowledge necessary for creating ergonomic and user-centered designs ensuring that they can meet the demands of contemporary interior design.

Keywords: Furniture design, human-centered design, interior design education

İç mimarlık eğitiminde mobilya tasarımı stüdyo dersi için insan merkezli yaklaşım: Bir vaka çalışması

ÖZ: Antalya Bilim Üniversitesi İç Mimarlık ve Çevre Tasarımı Bölümü'nde yapılan bu çalışma, "İç Mekânda İnsan Faktörleri" ve "Mobilya Tasarımı" derslerini birleştiren yenilikçi bir eğitim modelini araştırmaktadır. Üçüncü sınıf öğrencilerini hedefleyen bu yaklaşım, teorik anlayışı pratik uygulamayla birleştirerek, ergonomik tasarım prensiplerine odaklanarak işlevsel, insan odaklı mobilyalar yaratmayı amaçlamaktadır. Böylece öğrencilerin antropometri ve ergonomi kavramlarını birleştirmesine olanak sağlar. Çalışma, iki aşamalı bir metodoloji kullanmaktadır. İlk aşamada, öğrenciler geleneksel antropometrik yöntemlerle standart boyutlu bir oturma elemanı oluştururlar. İkinci aşamada ise, fotogrametri gibi dijital tekniklere geçerek bireysel ihtiyaçlara uygun özel bir karton oturma elemanı tasarlarlar. Agisoft ve Autodesk ReCap gibi dijital araçların yanı sıra geleneksel alçı kalıp yapımının kullanılması, ergonomik tasarımın kapsamlı bir şekilde anlaşılmasını sağlar. Bu eğitim modeli, iç mimarlık eğitiminde manuel ve dijital metodolojilerin entegrasyonunun önemini vurgulamakta, öğrencilerin modern tasarım zorluklarına yenilikçi ve adapte olabilme yeteneklerini geliştirmektedir. Amacı, öğrencilerin ergonomik ve kullanıcı odaklı tasarımlar yaratmak için gerekli beceri ve bilgileri kazanmalarını sağlamak, böylece çağdaş iç mimarlık taleplerini karşılayabilmelerini güvence altına almaktır.

Anahtar kelimeler: Mobilya tasarımı, insan merkezli tasarım, iç mimarlık eğitimi

Article history, Received: 16.05.2024, Accepted: 27.05.2024, Published: 30.06.2024, *email: hakan.bal@antalya.edu.tr

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To cite: Kahraman, M.U., Şekerci, Y., Bal, H. & Bakır, K.E., (2024). Human-centered approach for furniture design studio course in interior design education: a case study, *Furniture and Wooden Material Research Journal* , 7 (1), 121-135. DOI: 10.33725/mamad.1485323

1 Introduction

The Gestalt principle "The whole is greater than the sum of its parts" resonates strongly in the fields of design and education demonstrating the crucial interconnectivity of various pieces within a system. This approach is particularly relevant in the context of curriculum development for interior design education where the integration of related courses can considerably increase the learning experience and outcomes for students (Ozmehmet & Alakavuk, 2016; Kaup et al., 2013; Afacan, 2013; Guerin & Thompson, 2004; Smith et al., 2009; Liu et al., 2005; Basa, 2010; Caldwell, 1992; Clemons, 2002; Beşgen et al., 2011; Schwarz, 1997; Halstead-Nussloch & Carpenter, 2004). The courses "Human Factors in Interior Design" and "Furniture Design" are crucial to this integration within a junior class of an interior design department. They serve as exceptional representations of how integrated learning may create a more thorough understanding of design ideas and methods.

"Human Factors in Interior Design" is a basic course that aims to give students a thorough understanding of anthropometric data and ergonomics. This understanding is critical for interior designers because it affects how spaces and furnishings are built to fit human requirements and limits. The course emphasizes the necessity of taking into account numerous human measures and ergonomic principles when creating living and working settings ensuring that designs are not only visually appealing but also useful and comfortable for all users.

In contrast, the "Furniture Design" course requires students to use their theoretical knowledge in a practical setting with the expectation that they make 1:1 scale furniture models or even full-size productions on an annual basis. Students are encouraged to take physical measurements (with equipment like tape measures) to collect anthropometric data important to seating designs using the anthropometric and ergonomic ideas taught in the "Human Factors in Interior Design" course. This hands-on experience is supplemented with exercises that compare their measurements to standard dimensions reinforcing the practical application of theoretical information.

Building on these manual procedures, the next step introduces students to digital methodologies for collecting anthropometric data and building 3D models of persons. Students work in pairs to create a chair that meets their partner's precise anthropometric criteria putting their knowledge of the human-centered design method into practice. This dual method, which combines theoretical teachings with practical, hands-on and digital techniques, aims to improve students' grasp of anthropometric data and its application in design while also raising awareness of how academic information may be applied in a variety of ways. Furthermore, it encourages students to stay up to date on technology breakthroughs and get familiar with the digital tools that are becoming increasingly important in the design process.

The interior design program's integrated educational approach seeks to build a holistic understanding of design that is responsive to human needs, varied in knowledge application, and forward-thinking in its use of technology (Watson et al., 2003; Guerin & Thompson, 2004; Case & Matthews, 1999; Kucko et al., 2005). This methodology not only trains students to handle the demands of today's design world but also instills in them a greater awareness of the interconnection of human aspects and design emulating the Gestalt principle in a modern educational context.

Under these conditions, this paper suggests an educational paradigm that connects the “Human Factors in Interior Design” and “Furniture Design” courses. The “Human Factors in Interior Design” course begins with a theoretical explanation of anthropometry and

ergonomics followed by manual anthropometric measurements. Then, these anthropometric measurements are acquired using digital and other means for a chair design assignment in the "Furniture Design" course. The outcome includes reviewing the chair products and debating the methodologies taught in this course model is intended to improve the understanding and application of these integrated disciplines.

1.1 Anthropometry & Ergonomics

The technical design process is fundamental to the ergonomic design. It prioritizes the needs and features of humans in shaping structures. Furniture especially seating and resting pieces forms part of an anthropotechnic system comprising the human body and the furniture. Therefore, the design process must ensure the product functions well by considering all interactions between the user and object including visual, auditory, and tactile stimuli. When designing new furniture, it is essential to critically assess its form, construction, technology, functionality, and ergonomics focusing on the human-technical relationship (Smardzewski, 2015).

Under these circumstances, it is understood that anthropometry and ergonomics are two closely related sciences that play an important role in designing products and surroundings that are appropriate for the human body. Anthropometry is the measuring and analysis of human body dimensions, proportions, and physical abilities (Karwowski, 2005). This data is used to create standards and recommendations for designing everything from furniture and apparel to cars and work environments. On the other hand, Ergonomics is concerned with producing goods and systems that are designed for human usage taking into account elements such as posture, movement, and comfort (Haubner & Haubner, 2015). Ergonomics by incorporating anthropometric data into the design process guarantees that products and settings are custom made to a wide range of users, reducing the risk of discomfort, injury, and inefficiency. The use of anthropometry and ergonomics in the design process is critical for optimizing product functionality and cost ratio (Chen, 2011; Incorporating Anthropometry into Product Design, n.d.; Dianat et al., 2018). Ergonomics, which incorporates anthropometric data into the design process, ensures that products and settings are adapted to a wide range of consumers. This technique increases user pleasure, improves user performance, and reduces physical strain. Furthermore, anthropometry and ergonomics contribute to persons' overall safety and well-being by lowering the risk of musculoskeletal illnesses and other work-related ailments (Dianat et al., 2018).

There is a misconception that is stated as "designs are satisfactory for average people thus be satisfactory for everybody else". Human-centered design is an essential aspect of ergonomics contrary to this misconception and it mainly focuses on experimentation and user participation. Therefore, anthropometric dimensions and physical characteristics of users that are revealed by measurements provide essential data for "tailored designs" (Pheasant, 1996).

1.2 Anthropometric measurement techniques

Individual anthropometric measures can be taken in a variety of ways. In traditional methods, designers prefer easily shapeable materials such as sand or foam to take an exact mold of the body to create custom and ergonomic seating units like chairs. For example, Turkish sculptor and designer Sadi Özis, who designed the 'Flying Rumi' chair in 1964 (URL 1), used sand in his workshop to find the most accurate measurements needed for chair design. He sat on the sand and conducted trials to find the most comfortable measurements. Once the ideal measurements were found, he took a plaster mold. He created plaster casts from this mold and tested the accuracy of the forms by having everyone sit on them. Then, he

arranged iron rods on these molds to explore the inclinations of the chairs and armchairs (Özkaraman Şen, 2015).

Similarly, Danish designer Hans Wegner found himself at the beach using a shovel to carve out the sand and find the perfect reclining position in 1949. Upon discovering the ideal lean-back angle for relaxation by the seaside, he decided to translate this comfort into a more durable form. This led to the creation of the Flag Halyard chair which featured a steel frame wrapped in rope typically used for flagpoles. The ergonomic, spaceship-like design, later enhanced with a sheepskin cover offered a versatile and comfortable lounge chair. This design allowed users to sit in various positions with Wegner himself adding two side pillows and a signature neck rest for added comfort (URL 2).

Moving into more recent times, Italian designer Fabio Novembre created the 'Him & Her' chairs in 2008 which are molded in the form of the human body. These chairs inspired by classic Eames chairs emphasize the contours of the human figure creating a striking and intimate design. Novembre's work showcases the ongoing evolution of ergonomic and human-centered design highlighting how contemporary designers continue to innovate by using the human form as a central element in their creations (URL 3).

Following this trend, American designer Kelly Wearstler introduced the 'Butt Stool' as part of her 2021 holiday collection. This playful yet sophisticated design takes inspiration from the human body specifically the lower torso and transforms it into a functional piece of art. The stool available in various colors emphasizes the aesthetic appeal of the human form while providing a unique seating solution (URL 4).

As can be understood from these examples, designers have been striving to perfect the art of ergonomic seating by carefully capturing body measurements and molds for nearly a century. The success of those, who have mastered this approach, is evident in the timeless appeal and enduring functionality of their furniture which continues to grace our living spaces today. Therefore, it is crucial to instill human-centered and ergonomic approaches in furniture design courses for students ensuring that they carry forward these essential principles in their future designs.

As technology advances, more precise and efficient measurements are now possible using digital anthropometry instruments and software. These technologies can provide extensive information about body dimensions and proportions enabling even more custom made and optimized designs. Furthermore, photogrammetry and photo-to-3D technology are being used to gather precise body measurements resulting in a thorough grasp of human body shapes and sizes for design reasons. For example, Park et al. (2001) showed that a critical assessment of a comfortable mattress should include evaluating the shape of the spine line, the size, and the distribution of pressures on the human body, and the quality of the mattress. Deformations of the spine line were studied by comparing the spatial (3D) image of the shape of the spine of the user during sleep with the 3D shape of the spine of a standing person using the Root Mean Square (RMS) method. These advancements in assessment techniques enhance our understanding of ergonomic design and improve our ability to create furniture that supports the human body more effectively.

Incorporating these advanced anthropometric measurement techniques into the design process provides a more comprehensive understanding of human variability resulting in products and surroundings that are better suited to a wide range of users. This can lead to even greater benefits in user satisfaction, performance, and overall well-being.

Photogrammetry is based on creating 3D models from photographs. Basically, multiple photographs of an object from various angles are taken, and these photographs can be referenced with the help of photogrammetry software. A 3D model of the object can be created with different levels of details after referencing these photographs. The advantage of this method is relatively accessible and easy to apply. A camera and photogrammetry software are enough to create 3D models from photographs. Furthermore, these 3D models can be imported to another modeling software for further processing such as detailing and prototyping (Mongeon, 2016).

The resolution and number of photographs, and correct positioning of frames determine the model quality and its details. In general, the algorithm of photogrammetry software mostly depends on bringing common parts of the photographs together and sensing dimensions according to the angles of photographs and positions of the camera. Thus, the object must not be moved during the photography. If the number of photographs is inadequate to triangulate surfaces or create other triangles, there will be possible missing parts and details of the 3D model. Correct lighting of objects is another important factor for retrieving details. Shadows or poorly lit areas prevent gathering geometrical information of the object and cause foreground-background distinction problem (Foster & Halbstein, 2014).

2 Method

In this case study, a multi-purpose program has been designed and examined due to the nature of the concept of interior architecture. One of the courses subject to the study of Furniture Design course is taught through the concept of "seating element" and is directly related to anthropometric user measurements and ergonomics. On the other hand, the Human Factors in Interior Space course deals with standard human measurements, ergonomics and standardized design approaches in accordance with these dimensions as well as user-specific measurements required for a personalized design.

These two 15-week courses were taught in the first 8 weeks taking into account the concept of "average user" and standard human ergonomics and anthropometric measurements. In this section, it is planned to examine the seating action and the seating element designs that allow it and to design and produce a solution in accordance with the standards in real dimensions (1/1 scale) by the students. Thus, it is aimed to reinforce the concept of "universal standards". The concept of "custom made" is taught in line with the user's body measurements and the ergonomic solutions required by these measurements in the following 7-week period. In this part, it is planned to practically design and produce a personalized real size seating element designed by students as a result of measurements taken from the user's own body. This section aims to reinforce the concept of customization.

On the other hand, one of the important skills required by the discipline of interior architecture is the ability to solve problems. In this context, it is planned to solve two different seating element problems given to students within the scope of the furniture design course by blending conventional (manual) and innovative (CAD) methods. In this context, it is aimed to gain a new perspective for students by introducing some software and applications used in fields such as surveying and scanning. Then, it is aimed to have a practical experience about concepts for the students such as creative approaches in producing solutions by combining these computer skills with manual methods such as mold making. In addition, since all these productions are planned to be carried out with cardboard material, how the cardboard material should be used to support human weight was experienced in practice. Here, it is aimed to reinforce the concept of design in accordance with the nature of the material. Another aim of

the study is to gain unique experiences that can be obtained in the process from a simple measurement data to a realized design product prototype.

2.1 Course structure and project phases

The project is divided into two distinct phases aligning with the coursework over a semester.

2.1.1 Phase 1: Foundation in anthropometry: human factors in interior space course

A wide range of topics at the intersection of humans and design are covered over 15 weeks in the Human Factors in Interior Space course. The course content and the assignments conducted within the course are shown in Table 1.

Table 1. Human factors in interior space course's 15-week course curriculum

Week	Chapter Topic	Take-home Exercise
1	Introduction to Human Factors	N/A
2	Environmental Psychology Theories	N/A
3	Place, Sense of Place, Place Identity, and Place Attachment	N/A
4	Spatial Behavior: Crowding, Privacy, Personal Space, and Territoriality Behavioral Mapping and Tracking	Redesigning the studio environment to create the place attachment and positive emotions.
5	Student Presentation &Critiques	Finalizing the design, doing the research
6	**Physical Factors** **Detailed review for human dimensions and anthropometrics- anthropometric data**	Taking the anthropometric dimensions of the pair.
7	**Detailed review for human dimensions and anthropometrics- anthropometric data**	N/A
8	Midterm Submission	N/A
9	Principles of Universal Design National and International Universal Standards and Codes	N/A
10	Universal Toilet Design	Creating a universal public toilet design
11	Accessibility in Built Environment	N/A
12	In class exercise on Accessibility: Experiencing Antalya Bilim University Dosemealti Campus with wheelchair	Creating a report on the campus's deficient/problematic areas in terms of accessibility.
13	Presentations *Deciding which student will go to which coffee/restaurant	Visiting one coffee/restaurant and creating a report in terms of accessibility/universal design
14	Student Presentation &Critiques	N/A
Final	Final Submission	N/A

Initially, the course covers topics related to the mental and psychological aspects of humans, space, and design falling under the field of environmental psychology. The focus shifts to the physical relationships concentrating entirely on anthropometry and ergonomics in weeks 6 and 7. In these course weeks, students focus on understanding and applying standard anthropometric measurements and traditional methods (Figure 1A) for designing seating solutions. This phase emphasizes group collaboration to design and construct a 1:1 scale model of a standard-sized seating element using cardboard (Figure 1B). This hands-on experience allows students to apply standard ergonomic dimensions learned in the course ensuring the design's comfort and functionality.

A

B

Fig. 1. Students' taking the anthropometric dimensions of their friends by manual methods (**A**), Students' 1/1 cardboard standard-sized seating elements' model examples (**B**)

2.1.2 Phase 2: custom made cardboard seating element design: furniture design course

The Furniture Design course is separate from the Construction Techniques and Materials of Furniture course. It is like a regular design studio course with critique-based sessions conducted by the instructors. The course runs for 3 hours each week. Two main topics focusing on furniture design are covered over 15 weeks in the Furniture Design course: one for standard size bench design and the other for custom made seating element design. The course content and the assignments conducted within the course are shown in Table 2.

Table 2. Furniture Design course's 15-week course curriculum

Week	Chapter Topic	Take-home Exercise
1	Introducing the Design Subject (Groups will build up a standard size bench)	Finding design concept, theme
2	Concept presentation of each group and critiques	Design proposal and progress
3	Group critiques for concept and cardboard bench	Design progress
4	Group critiques to the standard size bench	Design progress
5	Group critiques to the standard size cardboard bench	Design progress
6	Prejury	
7	Group critiques to the standard size cardboard bench	Development for Midterm
8	Midterm Jury (Group submission for the built standard size cardboard bench)	N/A
9	**Introducing to the second subject of the course and grouping to pairs** **Designing a custom made seating element design**	Finding design concept according to the group pair Analyzing the user optimum comfort dimensions, needs, expectations and likes etc.
10	**Presentation of the concept/ The user needs, expectations and likes**	Design studies according to the user ergonomics
11	**Critiques on Design Development**	Continue with Design Development
12	**Critiques on Design Development**	Continue with Design Development
13	**Prejury for the custom made seating element**	Finalizing Design Development
14	**Last critiques**	Preparation for Final Jury
Final	**Final Jury**	N/A

Students investigate the sophisticated realm of digital measurement techniques within the "Furniture Design" course essential for crafting a "Custom Made Cardboard Seating Element" in the second half of the semester. A process blending technology and manual methods were designed for this "custom made cardboard seating element" design study which was carried out in pairs of students. Apart from the standards, the primary purpose here is to design a seating element that is suitable for the user's individual anthropometric measurements. The

experience of blending traditional and contemporary approaches to find original solutions for one-of-a-kind issues through the seating element in question serves as the secondary goal. However, students have been given the task of resolving the requirement by taking into account the goals of the study to gather personal data such as the user's preferred sitting height, posture, and sitting trace to figure out the ergonomic design of the seating element.

In this context, two solution methods of plaster molding and photogrammetry have been used together. The first method was the photogrammetric approach which is the science of gathering accurate data on an object's or surface's characteristics by collecting patterns of electromagnetic radiation energy mostly in the form of photographic images (Schenk, 2005). The most crucial point in digitizing the created mold and students in a seated position was to ensure that the photographs were taken from all sides and in high resolution. In this context, videos demonstrating how to take the shots were shown (Figure 2).

Fig. 2. A video shown for informational purposes about how to take photographs in the course content (Autodesk ReCap, 2014)

The user's optimal sitting height and position captured by a series of photos taken from different perspectives have been translated into processable data through straightforward apps and 3D modelling programs developed specifically for this subject (Figure 3). On the other hand, the second phase employed the conventional plaster molding procedure to process the user's “sitting trace” mold in the computer environment (Figure 4).

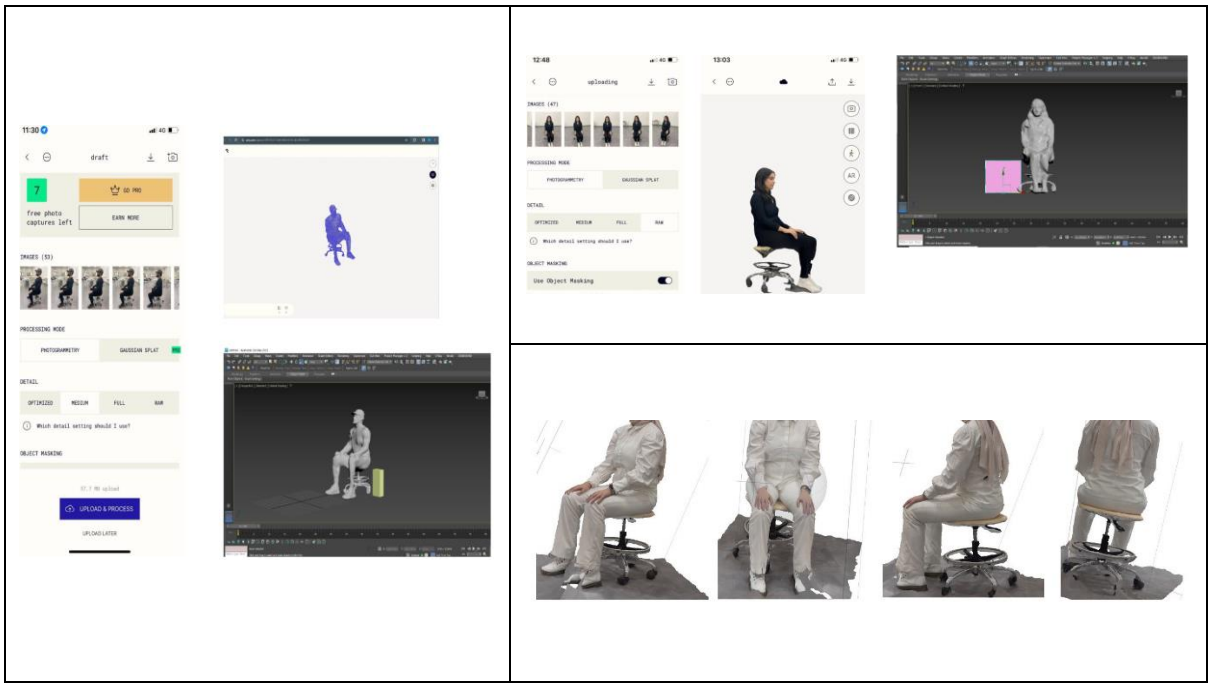


Fig. 3. Transferring the captured photographs to three-dimensional modeling software

A **B**

Fig. 4. A and **B** examples of a mold created with mortar

The user's unique ergonomic mold obtained from the sitting trace left by the user was imported into the computer environment using photogrammetry while the user was seated at the proper height in a plaster filled container. The curves of the mold surface were transformed into data with the aid of software resulting in a 3D model that could be used in the CAD environment (Figure 5). At this stage, it was decided that the parametric design approach, which is a computer-based method that views the design's geometric elements as variables, was suitable for carrying out the study further (Schumacher, 2015).

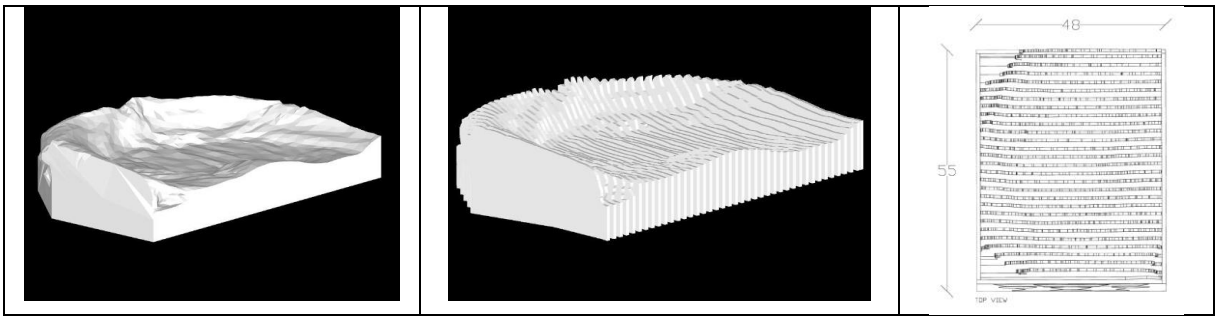


Fig. 5. Transferring the mold model to the 3D program and dividing it into slices

As a result, slices of the 3D ergonomic seat surface were created accounting for the thickness of the cardboard selected for construction (Figure 5). Each slice was ready for CNC cutting as numbered and supported with necessary technical drawings with the appropriate ergonomic curvature (Figure 6). The process to be followed is left open even when the components other than ergonomics are fashioned in accordance with user expectations. The majority of the students still favored CNC cutting. The students assembled these parts and applied the final touches.

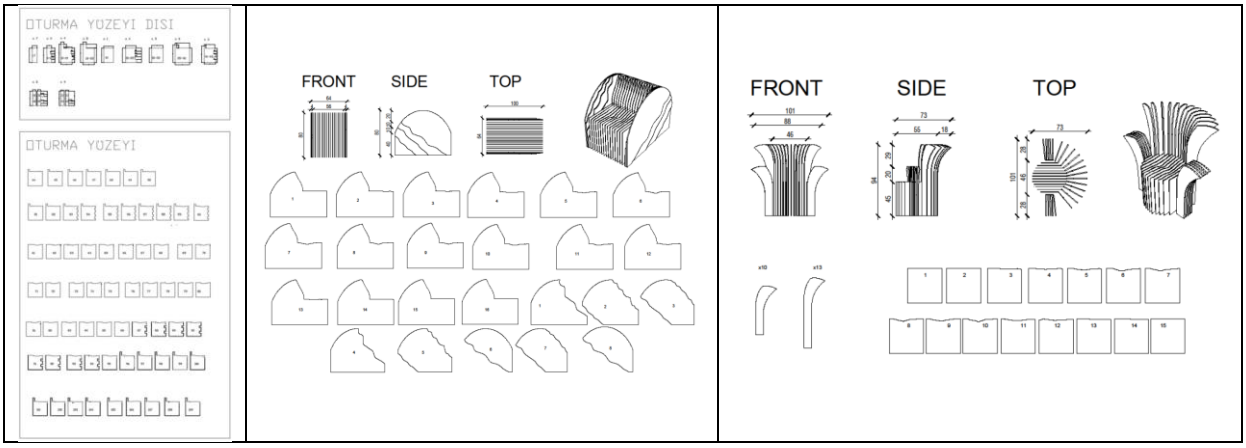


Fig. 6. Numbering the created slices and supporting them with technical drawings

3 Results and Discussion

Each student project in Figure 3 was created with consideration for the groupmate's expectations, individual body measurements and the custom-made design approach. In the beginning, the photogrammetry approach was used to transfer the user's determined "comfortable" sitting height and posture to the 3D software environment. Subsequently, the plaster mold process was used to collect the required dimensions for customization including the user's sitting trace in the same position and its depth and curves. Once more, the mold surface was processed for CNC cardboard cutting after being transformed into data using the photogrammetry approach.

"A seating element that can be used while camping in nature and can stand properly on uneven ground is portable in size and has a compartment where camping equipment can be placed" was the user's expectation which served as the foundation for the design in the Student A's work (Figure 3). The sitting component is made to resemble a stool without backrests or armrests for mobility. Additionally, the form of the seat surface follows the user's

sitting trace. Footings that may pierce soft floors were added in consideration of a sturdy stance, and the storage compartment is situated in front of this stool. This allows for convenient access to the contents of this compartment while seated. The study was able to finish the ergonomics and expectation process effectively in terms of function but it was unable to base its look on its concept and maintained a poor shape.

"A seating element themed around the comic book character Dr. Strange and suitable for home use" was the user expectation for Student B's work (Figure 3). Dr. Strange is a superhero who employs magic and a variety of talismans within the theory of multiple universes and astral realms. The magical safety chest idea was developed with a "seat" placed on top that is also appropriate for use at home. There are no backrest or armrest components in this design which features Dr. Strange-related talismans all over its surfaces. The footing was designed as a solid whole due to the user's "home use" expectation. Smooth surface is intended using it on a flat. On the other hand, the surface of the seat is custom made to meet the specific ergonomics of the user. While its functionality fulfills the requirements of tailored ergonomics and user expectations, its cosmetic look design may be argued against.

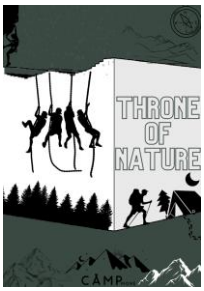
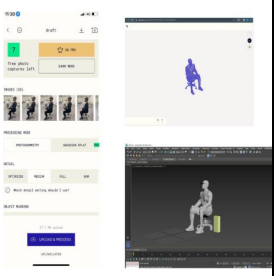
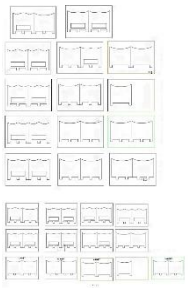
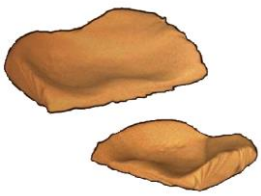
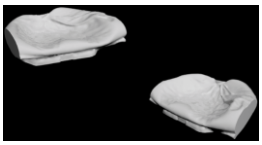
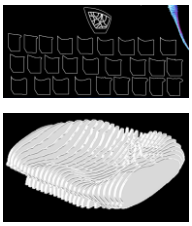
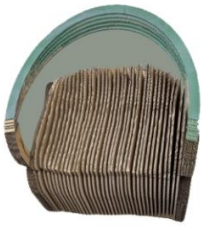
	Concept chosen by the student	**Exporting to 3D programs**	**Dividing the mold into slices**	**Render**	**Product**
Student A's work	-  "Throne of Nature"				
Student B's work	 "Dr. Strange"				
Student C's work	 "Loki"				

Fig. 7. Students' works

The user expectation was defined as a seating element suitable for home use themed around “Loki" a superhero character in Student C’s work (Figure 7). The most well-known figure in Norse mythology among these comic book characters is the god of mischief, Loki. He is dressed in a green colored costume with a dark green cloak, and his helmet features exquisite golden horns that curve back. The sitting aspect of the student work was modelled after a small throne fitting the godlike nature of the Loki figure. Therefore, the continuously curving armrest design at the sides, which is inspired from the horns of Loki’s helmet, also turns into a back post component at the back side of the seating element. Its one-piece solid footing design for levelled surfaces has been chamfered slightly on the front edge considering the heel distance to provide an effortless "stand up" action. It has been determined that the study is functionally effective in terms of user expectations and custom made ergonomics. Furthermore, the design of its appearance has also been evaluated to be rather good with its overall form in comparison to other student works.

4 Conclusion

- The "Human-Centered Approach in Interior Design Education" project at Antalya Bilim University has demonstrated the efficacy of integrating theoretical coursework with practical design exercises in preparing students for the challenges of contemporary interior design. This study conducted within the Interior Architecture and Environmental Design Department has reinforced the Gestalt principle that the whole is greater than the sum of its parts by synergistically combining the "Human Factors in Interior Space" and "Furniture Design" courses.
- Students engaged with both the conceptual and tangible aspects of design beginning with manual anthropometric methods and evolving into advanced digital techniques throughout the semester. The hands-on experience with plaster molding and photogrammetry allowed for a profound understanding of ergonomic considerations directly influencing the design and functionality of the final seating elements.
- The dual approach employing both manual and digital methodologies has equipped students with a versatile skill set. Students not only have learned to assess and implement anthropometric data but also have become adept at using sophisticated software for design conceptualization and execution. The process from molding to model construction—using software like Agisoft, Polycam, Autodesk ReCap, and the 3D Scanner App culminated in the production of seating elements that are a testament to personalized ergonomic design.
- This holistic educational model has implications beyond the classroom. It fosters creativity, encourages the adoption of emerging technologies, and emphasizes sustainable practices of all crucial components in the development of future interior design professionals. As students transition from academia to the professional sphere, they carry forward the lessons of functionality, user-centered design, and the seamless integration of technology in creating spaces that enhance human well-being and productivity.
- Moreover, the collaborative aspect of the project, which is partnering with peers, sharing feedback, and iterative design, instilled in students a deeper appreciation for collective effort and the iterative nature of design. The educational paradigm suggested by this paper not only aims to improve students' understanding and application of integrated disciplines but also prepares them to contribute meaningfully to the evolving field of interior design.

- As we reflect on the accomplishments of this project, it is clear that the integration of human factors and furniture design within an educational setting can significantly elevate the students' learning experience equipping them with the knowledge and skills necessary for success in the ever-changing landscape of interior design.

Author Contributions

Mehmet Uğur Kahraman: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing, **Yaren Şekerci**: Conceptualization, Data curation, Investigation, Methodology, Project administration, Resources, Validation, Visualization, Writing – original draft **Hakan Bal**: Data curation, Formal Analysis, Investigation, Methodology, Visualization, Writing – original draft, **Kadir Emre Bakır**: Data curation, Formal Analysis, Methodology, Writing – original draft, Writing – review & editing.

Funding statement

No financial support was received for the study.

Conflict of interest statement

The authors declare no conflict of interest.

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