

## ERGONOMICS IN DESIGN EDUCATION: THE CASE OF ROMANIA AND TURKEY

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### Keywords

Design  
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Ergonomics  
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Design curriculums

### Abstract

*In parallel with the economic, social, cultural, technological and environmental changes in the world, design education is undergoing a transformation. Design education has changed with this transformation, focusing on development of new strategies and tactics based on different areas. Today, with the rapidly developing technology, the problem of design education continues to be a current issue. Therefore, it is not enough to find a solution to the problems that are encountered by gaining different perspectives by looking at past experiences. Firstly, it is necessary to take different steps, develop different strategies and take advantage of different areas with developing technology. One of these areas required in design education is ergonomics. Having ergonomics in design education brings a different perspective that aims to increase students' awareness levels, their understanding and ability and suggests human-oriented movement in designs. Ergonomic design education offers the student an experience environment and education process that not only provides information but makes students think, questions them, develops their creative potential, reveals safe environments and designs, suggests productivity and targets human focus. In this context, what is the rationale for including ergonomics in design curricula? In this study, the changing conditions of formal ergonomics teaching in the design-related undergraduate curricula of Faculties of Fine Arts in Turkey and Romania were investigated, and the perceived importance of ergonomics teaching from the perspective of students was revealed. In this context, the study firstly examined the place of ergonomics in design education, and an analysis was carried out on how ergonomics is included in today's training methods applied in modern design education in Turkey and Romania. At the same time, the perceived importance of ergonomics teaching from students' point of view was revealed.*

## TASARIM EĞİTİMİNDE ERGONOMİ: ROMANYA VE TÜRKİYE ÖRNEĞİ

### Anahtar Kelimeler

Tasarım  
Tasarım eğitimi  
Ergonomi  
İnsan faktörleri  
Tasarım müfredatları

### Öz

*Dünyada yaşanan ekonomik, sosyal, kültürel, teknolojik ve çevresel değişimlere paralel olarak tasarım eğitiminde bir dönüşüm yaşanmaktadır. Tasarım eğitimi bu dönüşüm ile birlikte değişerek, farklı alanlar üzerine kurulu yeni strateji ve taktiklerin geliştirilmesine odaklanmış durumdadır. Günümüzde hızla gelişen teknoloji ile birlikte tasarım eğitimi sorunu güncel bir konu olmaya devam etmektedir. Bu nedenle karşılaşılan problemlere geçmişte yaşanan deneyimlere bakarak farklı bakış açıları kazanarak bir çözüm yolu bulmak yeterli gelmemektedir. Öncelikle gelişen teknoloji ile birlikte farklı adımlar atma, farklı stratejiler geliştirme ve farklı alanlardan yararlanmakta gerekmektedir. Tasarım eğitiminde gerekli olan bu alanlardan biri de ergonomidir. Tasarım eğitiminde ergonominin olması, öğrencilerin farkındalık düzeylerini, anlama ve yapabilme becerilerini arttırmayı hedefleyen ve tasarımlarda insan odaklı hareket etmeyi düşündüren farklı bir bakış açısı kazandırmaktadır. Ergonomi tasarımı eğitimi içinde öğrenciye, sadece bilgi veren değil, onları düşündürten, sorgulatan, yaratıcı potansiyellerini geliştiren, güvenli ortamlar ve tasarımlar ortaya koyan, verimliliği düşündüren, insan odaklılığı hedef alan bir deneyim ortamı ve eğitim süreci sunmaktadır. Bu kapsamda tasarım müfredatlarına ergonomiyi dahil etmenin mantığı nedir? sorusuna cevap aranılan bu çalışmada Türkiye ve Romanya'nın Güzel Sanatlar Fakülteleri'nin Tasarım ile ilgili lisans programlarında mevcut resmi ergonomi öğretiminin değişen koşulları araştırılmış ve ergonomi öğretiminin öğrencilerin bakış açısıyla algılanan önemi ortaya konmuştur. Bu bağlamda çalışmada öncelikle tasarım eğitimi ve tasarım eğitiminde ergonominin yeri irdelenmiş, Türkiye ve Romanya'da günümüz tasarım eğitiminde uygulanan eğitim metotlarının içinde ergonominin ne şekilde yer aldığı üzerine bir analiz yapılmıştır. Aynı zamanda ergonomi öğretiminin öğrencilerin bakış açısıyla algılanan önemi ortaya konmuştur.*

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## 1. Introduction

The introduction of art to schools as a course took place during the Industrial Revolution. With the Industrial Revolution, design in the field of Fine Arts came to the fore with the aim of selling manufactured goods. The rapid development of the industry has also brought the need for design into the agenda at a large scale. This has also brought the issue of design education to the fore and has made it a topic that has been discussed and new strategies have been developed.

Design education, which is intertwined with abstract concepts, has a complex and contradictory structure which, by its nature, is far-reaching, not very obvious, difficult to define, understand, classify and form. In addition to teaching subjects based on traditional teaching, design education covers every parameter of design knowledge, especially while focusing on increasing students' creativity and imparting nonverbal knowledge (Hodgkin, 1985: 146) as the source of talent-based actions. In this context, if we consider design education as a big puzzle, there are many pieces that complete this whole. Some of the parts are courses that feed the artistic and aesthetic aspects of the design, which aims to improve the visual, perceptual, sensory, critical and mental aspects of students such as basic art education, design studios, aesthetics. Some of the parts consist of courses such as design knowledge, theories and concepts that support the theoretical background of design. Likewise, it is another part of this whole in courses such as building knowledge, technical drawing and narrative techniques that support the technical knowledge and language of design. Another of the most important parts of this whole is the lesson of ergonomics, which is based on the human-oriented approach and acts with the basic logic of humanizing the process and the work.

We can say that it is the profession that applies theoretical principles, data and methods to design to optimize scientific discipline and human well-being and overall system performance related to understanding of interactions between ergonomics (or human factors), people and other elements of a system (IEA, 2013). The benefits of applying ergonomic principles to the design process are quite numerous. (Taking into account the capabilities and limitations of users, such as ensuring that products are designed according to purpose by the target user/market). However, 'common sense' acknowledges and implies that good designers will, by default, apply ergonomic principles, whether or not they are included in the curriculum. In this respect, this raises the question. Do design students need to be formally taught ergonomics?

New technology and changing industry needs show that skills / knowledge characteristics expected from design students are changing. In this respect, experts on many platforms argue that they are not sure that all the skills needed in the 21st century can be found in one person. As the breadth of knowledge and skills associated with design students change and diversify, is there still a place for ergonomics in the design curriculum? or should it lead to less 'common sense' skill / knowledge acquisition while leaving ergonomics to ergonomists? Many such questions are still under discussion.

This study explores the formal ergonomics education of undergraduate programs in design-related departments at the Faculties of Fine Arts in Turkey and Romania and discusses the perceived importance of ergonomics teaching from the perspective of the students. This study also explored the potential connections of innovation-oriented equipping of graduating design students with an ergonomic skill.

## 2. Literature Review

In recent years, the literature on the importance of ergonomics in design education was examined and it was seen that there were not many studies in Turkey and Romania and that most of the research was put forward by a small number of researchers interested in ergonomics science. Some of these works are given below.

In the study titled "Ergonomics in design education: A user-centered approach" by Stephen Brown in 1985, the designers focused on ergonomics, encouraging them to include how to work more effectively. In this study, the author found the answer that the question should be exposed to ergonomics as part of the designers' training.

Iqbal et al. (2011) In his work titled "Ergonomics and design", he focuses on the effect of ergonomics on product design, working environment and industrial workstation design, the interdisciplinary nature of ergonomics and the effects of ergonomics on industrial engineering function. It also includes the importance of ergonomics for a product design.

Conklin (2001), in his article "Age of design", argued that we are in a period of transition from the age of science to the age of design. Conklin argued that the past two centuries were an obvious science-based era that focused on explaining the natural world through science and processed and transformed it with the equipment of technology and that the bad problems of the time could not be solved with the absolute realities, definitions and perceptions of science. "Like Conklin, Hatchuel advocated broad

applications of design theories and reorganization of its relations with the economy and innovation” (Hobday, Boddington and Grantham, 2012).

Karwowski (2005) emphasized many points in ergonomics and design with his work titled “ergonomics and human factors: the paradigms for science, engineering, design, technology and management of human-compatible systems”. In this article, he presented a theoretical perspective on human factors and ergonomics. The study concluded that the main focus of the human factors and ergonomics discipline in the 21<sup>st</sup> century will be the design and management of systems that meet human compatibility requirements.

Aslaksen, Bergh, Bringa and Heggem (1997) tried to develop and exemplify the concept of universal design in their reports titled “universal design planning and design for all”.

Pheasant and Haslegrave (2006) mentioned and emphasized the importance and inseparability of ergonomics, design and anthropometry in their books titled “bodyspace anthropometry, ergonomics and the design of work”.

Davies and Bingham (2013), in their study “The importance of common sense: Ergonomics in design education”, tried to find an answer to the question of what is the logic of adding ergonomics to curricula in design schools. This study explores the changing conditions of formal ergonomics teaching available in the UK's product design undergraduate programmes and explores the perceived importance of ergonomics teaching from the perspective of designers and students. The study explores the potential links between the UK's innovation-driven economy and ergonomics, while discussing the importance of designers with an ergonomic skill to address market changes and identify user-led innovation opportunities.

Zunjic et al. (2015) in their paper “the role of ergonomics in the improvement of quality of education”, they discuss the ways in which ergonomics can contribute to improving the quality of education. Various aspects of the application of ergonomics to improve the quality of education with the global approach have been discussed. Several basic sections have been identified where ergonomics can contribute to improving the quality of education of students. It was concluded that the results of ergonomic research in this area provide a good starting point, allowing for the creation of appropriate ergonomic design solutions aimed at solving existing problems in this area.

### 3. Method

Design education in ergonomics evaluation of this research in Turkey and Romania special in the examined sections of Fine Arts Faculties of the universities and whether this part of the ergonomics course and in these faculties in the students' design education was aimed to reveal determining the idea that there ergonomics is necessary.

The study group consists of undergraduate and master students in design departments in Turkey and Romania. Fashion design department students from Turkey design department students from Romania were included in the research. The participating students are 80 people (40 students from Romania and 40 students from Turkey - in 2018-2019) who are determined in two selected universities from Turkey and Romania.

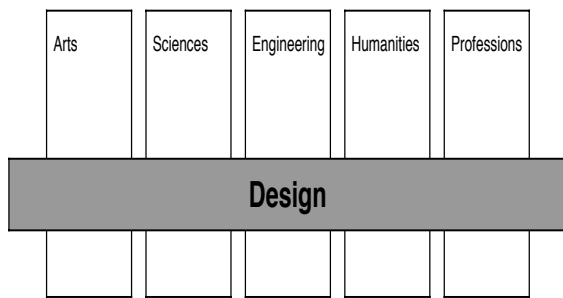
A question form was sent to 120 students as a data collection tool and 80 forms were included in the research (Data were taken within the scope of active courses (2018-2019 period)). In this form of question, the students were asked whether they had knowledge about ergonomics, whether ergonomics was an important element in the design process and whether ergonomics should be taught as part of the design curriculum. The data were presented in frequency tables, analyzed and interpreted.

### 4. Design Education

In the globalized world, the need for imagination, creativity, innovative workforce and cooperation is increasing in the transition from industrial society to information society. Design in art education is very important in terms of developing flexible and different ways of thinking, supporting emotional development and developing learning and skill acquisition through established collaborations.

The role of design gains importance in terms of both economic competitiveness and improvement of quality of life. Design has not played such an obvious role in the success or failure of businesses before. Businesses and countries are experiencing explosive growth in productivity and per capita income as a result of advances in manufacturing technology, global awareness and world trade.

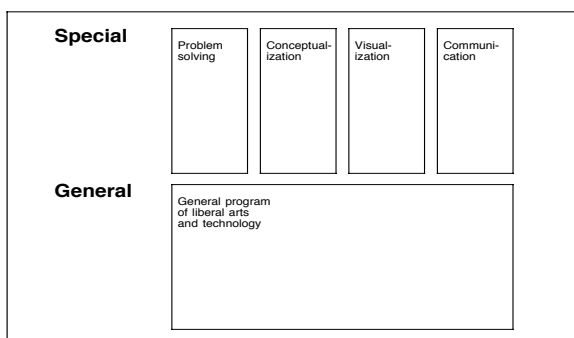
Advances in design theory and computer technology that support its application make it possible to assume more responsibility for the successful development of new products and systems. Design technology has begun to take care, finally stop shaping and use new computer-aided design tools to cope with all planning and design requirements (Owen, 1988).



**Figure 1. Education: What is Design? (Owen, 1988).**

Design is not only a discipline, it is one of the distinctive basic qualities that show the impact of human life throughout the day, from thinking, planning, taking action to all vital practices. Making a single design definition is also very difficult, because the term has many meaning steps on its own. The complex state of expression in this subject is strikingly demonstrated by Heskett's use of the English word "design" in four different terms in the same sentence. "Design is to design a design to produce a design" (Heskett, 2013: 13). The word design in the sentence refers to the general concept of the field as a whole in the first use, the process in the second, the basic idea/proposal in the third use, and the completed product/realized idea in the fourth. Accordingly, the word design can contain many meanings, from the resulting product to the process, from the idea to the planning. Its wide meaning has made design a term that incorporates many concepts and is associated with different fields such as fashion, architecture, industry, graphics, communication, interaction, information, etc.

Design education is a young discipline. This new discipline arising from the needs of an industrial economy has progressed painfully in the growth stages required. Educational programs only emerged when the value of design thinking was well recognised enough to create a demand for more than could be naturally provided from diversified sources.



**Figure 2. Education: What is Design Education? (Owen, 1988).**

Universities and design programs continue to be internationalized, determined to participate in their collaborations. Programs want to transition historically from a local focus to a much broader global context. Almost all programs and schools are required to compete on a global level. Design schools are increasingly looking for international partnerships and opportunities to create educational opportunities for their students or to differentiate their programs from competitors (Birchard, 2010).

In design education, students are encouraged to think about something different, which means perceiving things in new ways. The new learning abilities that focus on these issues are shaped on a basis of cognitive and affective strategies. Cognitive field covers the most common area of mental learning and consists of steps of knowledge, comprehension, application, analysis, synthesis and evaluation (Bloom, 1956).

The design education curriculum given in universities is shaped on 2 main bases, consisting of theoretical and practical (practical-workshop/studio) courses in general. As a result of this training, it is aimed to gain the ability of the student to comment, bring solutions to design problems, evaluate his observations and develop creative solutions. In the undergraduate programs of the Faculties of Fine Arts, the theoretical courses given in order to give students knowledge about the historical process of design as well as the practical courses are in similar content with different names such as "History of Visual Design, History of Design, History of Fashion Design". The course is based on oral expression of history about movements, artefacts and designers that led the design from the 1800s to the 2000s and is mostly conducted using two basic methods. The first method is the verbal expression of the course by the instructor, which the student is most accustomed to. In this method of unilateral transfer of information, the narrator is active, while the student is passive in the listener position. Important parts of the subject described in the lesson can be taken down by the students or the information about the topics covered by the lecture notes distributed by the instructor can be made permanent. Due to the intensive and unidirectional communication of information and the length of the subjects, the general students have a reluctant attitude towards the course. The second method is the presentation of the course content which is partitioned by the instructor to the class by the students. Students have responsibilities towards the class because they are narrators and this method makes it necessary for the student to prepare for the class. The only disadvantage of the second method, which can proceed interactively, is the accuracy of

the research on the subject, the design of the information and the success of the presentation depends on the skill of the transferring student. In both methods, the presentation of oral narratives and subject-related visuals on the screen through digital devices is the basis for the transfer of content.

Practical courses are usually transferred through practice workshops/studios, artistic and technical drawing courses. Design education in Turkey consists of theoretical and practical courses in a way that is usually described with a tutorial-centered attitude.

In Romania;

Romanian Art Education institutes also has a research center that coordinates fundamental and applied research at the University, according to national and international standards, with an emphasis on interdisciplinarity – which is highly encouraged: as an example, Visual Arts Master degree from Art Faculty, Ovidius University of Constanta (Visual Education in Study of Landscape and human Figure) is an interdisciplinary program which incorporate visual arts, art theory and also biology (an example of course is Bio-Art).

Although the traditional programs with a high heritage and background continue to attract students (we talk here about Painting, Graphics, Sculpture), with the continue evolution of society and technology, the Design programs become more and more popular.

We will present here case studies from two important Art Universities in Romania: National University of Arts from Bucharest and University of Arts and Design from Cluj-Napoca.

At National University of Arts from Bucharest, following the efforts of the professor Paul Bortnovschi, in 1969 was born, within the Faculty of Decorative Arts, the department of Aesthetics of Industrial Forms, which over the years will develop, according to social needs, to the current formula.

The Design Department ensures the achievement of the professional level corresponding to a future career in industry, in design agencies or advertising graphics. The specialization is approached methodically, the properties of the materials and the processing techniques being experienced by the students by making models and prototypes; during the years of study they develop their research skills, synthesizing and applying knowledge in a holistic way, being capable of creativity and originality in communicating design ideas. The particular relationship of the object with the space, the user or the manufacturer is studied, so as to respond both to the emotional and cultural parameters, as well as to

the economic and technological factor; this study presupposes multidisciplinary, a balance between humanistic, artistic and technical education.

After 1990, the pedagogical approach has new goals and has critically re-evaluated its methods; in the foreground are groups of major problems: the analysis of the object and the graphic sign through techniques and methods of investigating the visual; the strategy of the design object (involving the comparative study of the visual culture and of the technical-economic area, in order to identify the specifics of the socio-cultural symbols and their rhetoric); optimizing the relationship between tradition and innovation, between artistic and technical-economic support, along with the choice of techniques, the study of variants and their adjustment to the imperative of cultural and technical emancipation. Consequently, the educational infrastructure was rehabilitated and completed, being possible the introduction of new disciplines, in order to make the pedagogical offer more flexible.

Currently there are 3 main study routes: Environmental design, graphic design and product design. The disciplines taught during the workshop hours of the department are grouped into three main categories: the fundamental discipline for ensuring a basic plastic training - the study referring, through techniques and methods, practical and theoretical, to the analysis and general understanding of visual phenomena; disciplines prior to specialization; disciplines that ensure the specialization on routes within the profession (creation of industrial and environmental product, visual communications), as well as the complementary disciplines for the two specialization routes.

Main Disciplines: Specialized technologies for graphic design, Elements of descriptive geometry and technical drawing, Ergonomics, The basics of image construction, Specialized technologies for environmental design, Specialized practice, Modeling-layout, Personal project and portfolio presentation, Marketing, Management.

The University of Art and Design in Cluj-Napoca includes two faculties: The Faculty of Fine Arts and the Faculty of Decorative Arts and Design and operates in accordance with the principles of the Bologna Declaration, developing an educational process divided into three cycles: bachelor, master and doctorate.

The Design Department, similar to the other departments within UAD, is a functional unit that includes teachers with competencies in a well-defined field. The Design Department offers two study programs:

- Design bachelor degree program
- Master's degree program in design

The Design program offers students the opportunity to develop their potential as independent or integrated professional designers, in a multidisciplinary society and culture, in an atmosphere of innovation and creative research. At the same time, the program prepares specialists in the general field of design to be able to respond to the complex and constantly changing needs of contemporary society. The educational approach focuses on the formation of the skills of relating the artist with the technique, in order to achieve the creation of artistic, cultural and technical object at the same time, technologically feasible in series or as unique.

### 5. Ergonomics in Design Education

It is possible for a design process to produce the desired results, based on a sound theoretical infrastructure, strategic methods and techniques.

Design is a strategic weapon in a competitive environment, taking into account the characteristics and needs of the human being, enabling the conversion of technical and social information to advantage. Effective use of this weapon is possible through a good design strategy in which ergonomics is integrated.

Ergonomics, being an interdisciplinary science and using the knowledge and methods of different disciplines, has led to a bridge between these disciplines and design that has an interdisciplinary character. The success of a design is directly proportional to the degree of robustness of this bridge. To build this bridge in a solid way requires that the designer, who is responsible for the design process, has basic ergonomics knowledge.

Designers should work on the characteristics of the human-driven business environment and implement them in organizations where human beings play important roles. Perhaps the most important acceptance of ergonomics is the acceptance that equipment, tools, machinery and environmental conditions affect human performance and thus the performance of the human-object system. From this point on, if the products, tools, machines, workstations and working methods are designed with human capabilities and limits in mind, the result will be much better than the opposite. Although design and ergonomics are two separate disciplines, they function as complementary to each other as two parts of a whole. Since ergonomics is based on human focus in the design of products, workplaces

and systems, it is possible to see ergonomics as an approach or a philosophy and call it design for people.

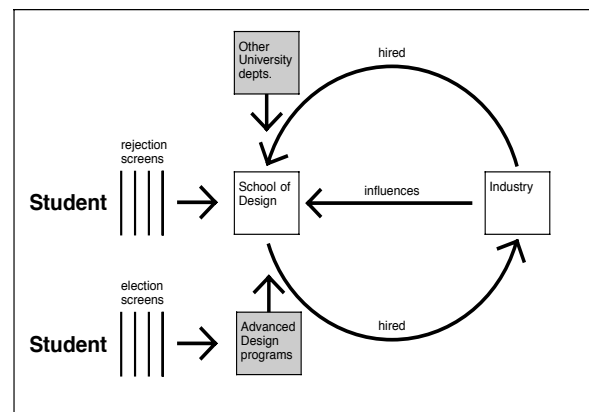


Figure 3. Education: Breaking the Loop (Owen, 1988).

The multidisciplinary nature of ergonomics is obvious. In this regard, it is very necessary for the relevant departments of universities to add ergonomics to their training modules to the course pool in today's conditions. Especially for the departments of Fine Arts Faculties related to design (such as fashion design, textile design, industrial product design, product and graphic design) ergonomics should be an extremely important and compulsory course.

This study examined ergonomics in design education in Turkey and Romania, especially in the course pool of the Fine Arts Faculties of many universities in Turkey and this course was given as a compulsory or elective. When the course pools of the Romanian Faculties of Fine Arts were examined, it was determined that ergonomics courses/modules were not included in the design departments.

At this point, the opinions of undergraduate students in design programs in Turkey and Romania about ergonomics were tried to be presented.

#### Students' Perspective

In the question form applied to the students, students of the Department of Fashion Design in Turkey were asked to fill in their views on the importance of ergonomics in the design curriculum of the Department of Design in Romania. While there is no formal ergonomics teaching within the design curriculum in Romania, Turkey has the content of formal ergonomics teaching in the curriculum. Two different countries were selected to compare opinions between students who received formal ergonomics training and those who did not. These results are summarized in Table 1.

**Table 1. Students' Questionnaire Results**

Country		Q1: Ergonomics an important consideration in the design process?			Q2: Should design students be taught ergonomics as part of their design curriculum?		
	Number of Students	Yes	No	Don't Know	Yes	No	Don't Know
Turkey	40	32	0	8	35	0	5
Romania	40	28	0	12	27	0	13

The results in Table 1 show that students in Turkey see ergonomics as an important element of the design process and should be taught as part of the design curriculum. Likewise, a large proportion of students in Romania see ergonomics as part of the design process and think it should be taught as part of the design curriculum. The difference is that ergonomics is included in the curriculum in Turkey and not in Romania.

Nevertheless, the results show a wider and clearer understanding of the role of ergonomics in design education in general, possibly unsurprisingly, between the views of the students of the two countries.

When students are asked to focus on whether or not ergonomics should be taught as part of the design curriculum, their response can actually be considered as a reflection on the necessity of ergonomics for design and its perceived importance in the design process. This is extremely important for students to understand how necessary ergonomics is to be taught because of its importance in creating functional products that are available to users. However, the necessity of ergonomics education in design programs is indisputable in order to understand the interaction between the user and the product, to have knowledge about the relationship between the user and the product, to create more functional designs and to help design products more efficiently. In this respect, it is a necessity to have ergonomics in Romanian design education curricula.

**6. Conclusion**

Design education is emerging as an important tool in developing these skills in the 21st century, when the need for creativity and cultural awareness is growing. The support and contribution of all actors working in the field is needed to develop a design education policy at the national level and to make this policy one of the priorities of cultural and educational fields.

Although the design field/profession quickly embraced the opportunities for change, design education has not always been able to adapt so quickly. In addition to continuing to address changes in technology, communication opportunities, extended application and collaborative models, design education has its own specific concerns, especially in the light of growing international contexts.

First of all, technology has shown its presence in all aspects of our lives today, the lack of course diversity and the preparation of course content and the presentation of the topics to use only printed sources and the classic slide presentations reflected on the screen are not enough for a qualified design education. A versatile and diverse form of education is needed. At this point, good programming is the primary need for things to do.

Fundamental changes must be made to the nature of design training in order to take full advantage of new capabilities. Design students should no longer be considered commercial versions of fine art students. The demands of new computer-aided design tools and the expectations of emerging design research areas require encouraging the best minds and talents to work on design. In this regard, it is very important to train multi-faceted designers to make revisions to educate students who are equipped with the courses and subjects required by today's conditions. In this context, curricula should be revised to meet these needs and new teaching and research models developed.

In this context, in this study, while investigating potential connections between design and ergonomics in an innovation-oriented world, the importance of these two different disciplines was tried to be revealed from a student perspective. In addition, while discussing the importance of designers with an ergonomic skill, the comparison of the two countries was made. The data for the two countries are summarized below.

- There are ergonomics courses in many departments of fine arts faculties in Turkey (such

as fashion design, textile design, interior architecture and environmental design, industrial design department).

- Today's Faculties of Fine Arts, especially in Turkey, revise their educational curricula and course content according to the requirements of the age.
- Students in the fashion design and textile design department of the Fine Arts Faculty in Turkey are in the design process is an important aspect of ergonomics and design students need to feel that being taught as part of the ergonomics of the design curriculum.
- Ergonomics courses are not officially included in the Romanian Fine Arts Education. However, this course is offered as an elective course through some projects or special courses.
- Although there are no ergonomics courses in Romanian Design Education, a large proportion of students consider ergonomics as part of the design process and think it should be taught as part of the design curriculum.

Ergonomics, which is the result of a people-oriented approach, has become a key role that is needed in almost every field. In this regard, this study emphasizes the importance of design education and the need to establish a common understanding between the parties who believe in the inclusion of ergonomics in design education and its indispensable role in improving the quality of education.

### Conflict of Interest

No conflict of interest was declared by the authors.

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