The Perceptions of the Students and Prospective Proposals in the Department of Industrial Product Design of the Technical Courses: Gazi University Case

Murat ÖNDER

Gazi University, Department of Industrial Product Design, Ankara, TURKEY

muratonder@gazi.edu.tr

ABSTRACT

In recent years several Industrial Product Design departments have been opened and are in action in Turkey. As a result of this, the number of graduate designers is increasing every day. The universities are expecting the eligibility of their graduates to be high and accordingly they are continuously undergoing improvements regarding their teaching staff and curricula. One fundamental problem here is the fact that some technical courses are implemented as part of a pool of courses, which are called 'pool courses'. This study investigated the students' perceptions of the technical courses offered in Gazi University Faculty of Architecture, The Department of Industrial Product Design based on a survey consisting of multiple-choice and open ended questionnaire method. The data collected from the survey was analyzed through interpretations of the students' opinions of the courses and the way the courses are implemented and suggestions were made regarding how the technical courses offered in the department in general should be implemented. These suggestions are that the unnecessary formulas should be eliminated from the technical courses, that the technical courses should be complemented by application-based activities, that the calculations should be done based on the designed products, and that the professors should have the necessary knowledge about the details of design processes.

Keywords: Industrial Product Design, Industrial Product Design Education, Technical Courses, Design

1.INTRODUCTION

The word *design*comes from the Medieval Latin *designare,* which means to mark out or to indicate according to Merriam-Webster Dictionary (Url, 2017). In today's sense, though, it is defined as to create and to plan out in the mind, to devise for a specific function or end, and so on.The word has come to be understood as part of the process of industrial

design throughout the course of time. The concept of design flourished as the wealth and development of western societies led to new forms of production and consumption, after the destructive effects of World War II. In parallel to these developments, the concept of industrial design came along. As the industry in the early developed countries improved, product design education also improved. Design education was first flourished in England and France (Öztürk, 2010). Within the last 30 years, the methods and application tools of industrial product design education have been subject to changes due to reasons such as rapidly developing technology, changing social structures, and environmental factors. In Turkey, art education activities started with the declaration of the Republic in two schools. These schools are today's Mimar Sinan Faculty of Fine Arts and Marmara Faculty of Fine Arts. The first Industrial Design Department, on the other hand, was founded as part of The Faculty of Architecture of Istanbul State Fine Arts Academy (İDGSA) in 1971. The curriculum of the program, considering the conditions of the period it was founded in, mainly focused on arts and crafts education. In later years, the Department of Industrial Design was under the body of faculties of architecture and fine arts. The aim of the department is to equip students with general knowledge about product design and to make them able to evaluate stages of design during their undergraduate education (Öztürk, 2010). The students who want to pursue their education at the graduate level do academic research for the industrial design program within the master's and doctoral programs offered in the department.

As nothing in this world remains unchanged, industrial product design has become an interdisciplinary field as a result of rapidly developing technology, newly discovered materials, and advancement of production methods. Accordingly, many undergraduate programs have been undergoing significant changes in their education systems and curricula in order to keep up with the requirements of modern times and to meet the needs of modern industry and world markets. Therefore, the departments of Industrial Product Design are concentrating more and more on technical issues today (Altıparmakoğlu, 2011).

There are studies in the literature about the educational content of the departments of Industrial Product Design. One of these studies is Öztürk's study, in which he proposes that in the future as a natural result of technological advancements, the boundaries will be removed and universities and classrooms will all be virtual.Starting from this proposition, he suggested that it is inevitable that there will be virtual universities and classrooms where virtual teachers with 'artificial intelligence', which are completely designed and equipped by studentsthemselves, will be teaching; based on actual applications he studied the efficiency of virtual design studios, which are supposed to

shape the future of design education (Öztürk, 2014, 2016a).In another study, Öztürk suggested that in addition to interdisciplinary undergraduate programs such as management engineering or industrial engineering, there should be undergraduate and graduate programs which would combine the disciplines of design and business administration and which would be titled as design management or management design / business administration design depending on the objectives of the program (Öztürk, 2016b).

To put it shortly, today Industrial Product Design education is offered under 'Industrial Product Design' departments of universities as a 4-year program which offers courses such as creative thinking, concept design, 2 or 3 dimensional visualization techniques (technical drawing, sketching, CAD, modeling, etc.), production methods, materials, economics, marketing, consumer behavior, ergonomics, culture, history of arts and design, modeling techniques. Also, this education is complemented by summer internship programs (Er et.al, 2010). The offered technical courses and other courses which are necessary for the product development process such as statics, durability, and mechanism and for product design such as physics are crucial for the students to be able to solve design-related problems. Moreover, as the output of the program, it is expected that the graduates of the industrial product design program will be able establish a collaborative dialogue with professionals from different occupational groups such as engineers in interdisciplinary works.

2. THE TECHNICAL COURSES OFFERED IN THE DEPARTMENT OF INDUSTRIAL PRODUCT DESIGN

Industrial design has become part of our lives after the industrial revolution; in those years, product design was performed by artists, craftsmen or people who were known as engineer artists. From the 1900's on, product design was performed by architects and engineers and as a result of aesthetic and ergonomic problems with the products in the post-World War II era, educated 'industrial designers' started to work in the product design field (Öztürk, 2014).

University students who are pursuing their education in the department of industrial product design are expected to have knowledge about form and material; therefore, most of the educational institutions have adopted the traditional industrial design education model. However, factors such as the ever-growing nature of technological advancements, changing expectations of the industry and consumers, and changing life conditions and changing behavior patterns and habits due to socio-cultural and socio-economic environments have made it necessary to have industrial designers who have

been trained in such a way to easily adapt to these changes in the future. This brings along the necessity to revise and update the curricula and course contents of design education programs. That is why traditional arts-and-crafts-centered education models are gradually taken over by science, technology, and social sciences and humanities-based industrial design education models and new perspectives are being applied in the light of technological advancements.

The objective of the technical courses in the department of industrial product design is to equip the designer with the necessary skills for the interdisciplinary works so that they can handle technical problems that may arise during the product development process through efficient and accurate use of technology in product design. What makes that necessary is the fact that some objects that people need in their daily lives are unsuccessful and problematic in terms of their design. In order for the design to be successful, it has to be based on interdisciplinary work and knowledge, and to be improvable and proper. Today, the professional fundamentals of such knowledge are provided in universities. Therefore, the curricula and course contents of design departments and perceptions towards technical courses are critically important.

Technical knowledge is also an important part of industrial design activities such as entrepreneurship, marketing strategies, and so on. Just as a product which cannot be marketed and which has unnecessary functions is useless, a technically deficient product is also useless. That is why the necessary technical knowledge should be given to the students of the industrial product design departments, eliminating all the unnecessary formulas. In this regard, Zadeh made suggestions about how to teach physics based on the products themselves so that the classes can be more effective (Zahed, 2013).

As has been mentioned above, in Turkey it seems not so likely to reach a consensus about how design educationshould be designed and implemented for the moment since there are many different approaches to product design. These differences can very easily be seen when we take a look at the product design-related programs and curricula of different universities. It can be best illustrated by the different names of the programs; program names such as ‘Product Design’, ‘Industrial Design’, ‘Industrial Product Design’, or ‘Design Engineering’ and the distribution of courses in their curricula display the different approaches to this field of study. In parallel with these different approaches, the significance and function of the technical courses also vary. The objectives and scope of the technical courses offered in these programs are designed according to the perceptions of the teaching staff towards the technical courses. Generally speaking, technical courses are taught intensively in the first and second academic year in the

department of Industrial Product Design; students are expected to succeed in their technical knowledge-based and project-based courses. To summarize, the graduates of undergraduate programs of industrial product design are expected to be able to,

- analyze the needs and expectations of users/consumers,
- follow and evaluate the development of rival products and new product trends in the market,
- generate ideas for new productsbased on these evaluations,
- transform these ideas into concrete marketable products using the available technologies in the company they are working, and
- work as part of a team of experts and officers in the company in order to implement the product concepts (Er et.al, 2010).

3. THE OPINIONS OF THE STUDENTS OF INDUSTRIAL PRODUCT DESIGN DEPARTMENT ABOUT THE TECHNICAL COURSES OFFERED IN THE DEPARTMENT

The survey in the present study was conducted with the students in Gazi University Department of Industrial Product Design. The survey aimed at identifying what the perceptions of the students towards the courses with technical content are and how much effect the way the courses are taught has on design processes. The responses of the students to the survey questionnaire were also analyzed through statistical crosstabquery. The questions in the survey and the responses of the students are given below.

3.1. Do you think the technical courses you have taken during your Industrial Product Design education are necessary for your professional development?

This question aimed at finding out whether or not the students think that the technical courses are necessary for their professional development. To the question, 81% of the students responded as 'Yes', while 19% responded as 'No'. The responses to the question reveal that the majority of the students believe that to be able to use the knowledge they acquired from the technical courses while they are designing products will be beneficial in their professional careers.

3.2. During your Industrial Product Design education did you apply the technical rules to your projects?

While 79% of the students reported that they applied the technical rules and concepts, 21% said they did not, which suggests that the majority of the students took the technical rules and concepts into consideration while they were doing their design projects during their education. One other significant factor here is the evaluation they

receive from the professors on their projects, which is called the 'critique', and the guidance they get from the jury members in their end of term project defense. In order to understand whether or not the students responded to the question consciously was verified by the questions 6 and 7. The aim of the verification was to identify how conscious the students who reported having applied the technical rules and concepts were about the designs they did, and to find out how the students who reported not having considered any rules or concepts reacted to the given examples.

3.3.Do you think the technical courses you took during your Industrial Product Design education were sufficient?

To this question, 33,3% of the students responded as 'Yes', while 66,6% responded as 'No', which suggests that some of the students believe that the technical courses offered in the department are insufficient. The responses to this question were found to be as expected considering the responses given to the other questions. The students think that these courses are necessary for their career and they take them into consideration in their projects but they find the courses somehow insufficient. The students also reported that the reason why they think the courses are insufficient is that they consider these technical courses as follow-up courses to the ones they took during their high school education. The reason for this is the fact that some of the technical courses the students take during their education are courses that they elect from a pool of courses and these are offered by visiting professors from other departments who are not aware of the educational philosophy of the department. The general opinion turns out that those so called pool courses are not designed specifically for the department but as part of a common curriculum for all departments and so they are not effective because they are based on rote learning; as for the other technical courses, they are not sufficient because their content cannot be related to product design by the students. Yet another reason for the insufficiency was found to be the opinion that the professors teaching the courses are not skillful enough to transfer their knowledge to the students although they are competent in terms of technical rules and concepts. According to the students, the technical courses are not beneficial because they are generally theoretical knowledge-based instead of application-based courses.

3.4.Which of the following best describes your opinion of the technical rules and concepts during product design process?

42% of the students reported that they do product design based on the fundamental rules and concepts they learned during their high school education, which dramatically suggests that they have not benefitted from their university education at all. What makes this response so dramatic is the fact that the students will graduate from an educational

institution where they had come to acquire a profession and become part of labor force market without gaining the necessary knowledge. 18% of the students reported that they do product design regarding only the form of the product without feeling the need to consider any rules and these students responded to the previous question in a similar way stating that they do not apply any rules or concepts while they are designing products. The remaining 40% of the students stated that their education at the university added onto what they had learned in high school. It is of critical importance that the necessary works and suggestions should be made in order to increase the rate of the students who think positively about the contribution of their university education. Moreover, in the light of this question it can be discussed for the future of the field whether or not industrial product design education is conducive to the technical side of product design.

3.5.Have you ever received any criticism regarding the lack of technical course knowledge about your design in your project-based courses?

To this question, 61% of the students responded as 'Yes', and 39% as 'No'. One of the conclusions we can draw from these responses might be that the students who reportedhaving been criticized cannot apply to their designs the technical rules and concepts they learned from the technical courses at the university or they misapplied the rules for some reason. Those who responded as 'No' stated that they successfully applied the necessary techniques and rules without leaving any questionable gaps about their designs; this rate also should be increased. Thus, it can be ensured that the eligibility of the student in the working life after graduation will be increased.

3.6. Which of the following Group A and B statements are suitable for the pruning shears?

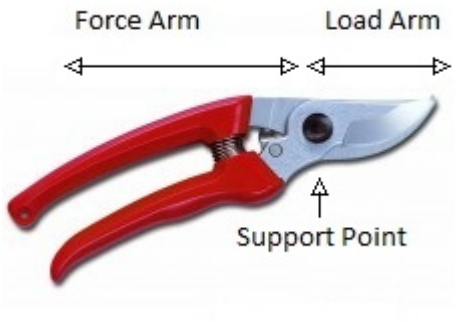

Figure 1. Shape of pruningshears

A1.The load arm should be bigger than the force distance

A2. The load arm should be equal to the force distance

A3. The load arm should be smaller than the force distance
B1.The point of support……should be thick-formed (state your reason in the space provided)
B2. The point of support ……should be thin-formed (state your reason in the space provided)

The question of figure 1was asked to verify the responses to the previous questions andto find out if the students have correct knowledge about fundamental mechanics. The students were given options under groups of A and B and they were asked to choose from both Group A and Group B. 38% of the students opted for A3, which is the correct answer; however, a considerable majority of students (62%) opted for A1 and A2, which are incorrect. This result revealed that either the students do not have enough knowledge about the basic force concept or they cannot apply the knowledge, even when they do have it, to the product. It can easily be suggested based on this result that some self-criticism about the way the technical courses are designed and taught is in order. The other question based on the same example was about the form of the pruning shears. Here, the students, at a rate of 90%, opted for the thick-formed point of support for the pruning shears, which differentiates it from other types of shears or scissors; the students displayed with the reasons they put down in the given space that they have enough knowledge about designing the form according to the function. Furthermore, when we consider the students who chose the correct option A3, 87% of them thinks the technical courses offered are necessary and 65% stated that they find the courses insufficient. These rates are consistent within themselves. On the other hand, when we consider the students who answered the question incorrectly, 76% thinks that the courses are necessary and 70% stated that they do not think the courses are sufficient. These results indicate that the students are eager to take the technical courses but there seems to be a problem regarding their ability to associate the technical rules and concepts with the design of products, or they cannot, even if they have a good command of the technical rules or concepts, reflect their knowledge while designing products.

3.7.Which of the following statements about the 2N-finger force to be applied to a simple trigger mechanism is true for you?

A1. I don’t have knowledge about the force a finger can apply.
A2. No matter where the trigger is to be used, this force is applied by the finger.
A3. No matter where the trigger is to be used, this force cannot be applied by the finger.

In this question the students were asked to state their opinions about what the numerical values mean. The numerical value 2N was taken randomly. As far as the responses are

concerned, a considerable rate of 72% of the students chose the option 'I don't have knowledge about the force a finger can apply'. This response indicates that the product designer will not be able to create a relationship between the user and the product or he or she will misidentify the user-product relationship with this poor level of knowledge. For instance, the finger force to be applied to a speargun or any other hunting weapon and the finger force to be applied to a keyboard are different; a designer should know what such numerical values mean. The results obtained from the crosstab query in the previous question were found to be almost the same for this question. The students who gave the correct answer can associate the numerical values with the product, while those who answered incorrectly cannot make such an association in spite of the fact that they find the technical courses necessary. The conclusions and suggestions that were drawn from the analysis of the survey results are given in the next section.

4. DISCUSSION AND CONCLUSION

According to the results that were obtained from the questions given above, it can be stated that a designer should be able to establish an accurate product-user relationship; this can be ensured by doing calculations and applications on the product in the technical courses; that is, by designing the content and instruction according to the requirements of the profession. In other words, it will be beneficial for the students' perceptions of their vocational education and their future career when the technical courses are presented based on everyday products considering the relevant issues, concepts, and rules through the products themselves and the applications are done considering the internal mechanisms. Also, the courses that are cluttering the curriculum since they are based on rote learning and do not serve the students for their future career should be eliminated from the curriculum and the concepts which are more vital in terms of product design should be focused on.

The Professional Organization for Industrial Product Designers define industrial design as follows: industrial design is, first of all, developing product ideas and then designing products as new products which are produced in the industry and intended for the end user considering criteria such as their functionality, likeability by the target group and suitability to the needs of the users. Industrial design is a profession which aims at establishing a relationship between people and products which are produced through industrial methods. Industrial product design is an interdisciplinary profession; yet, designers are expected to "know more of the fields of science and engineering without losing their special talents that make our everyday life delightful" (Norman, 2010) and this requires that the content of the technical courses offered in design education should be revised and changed. Moreover, considering the competitive nature of product design

field due to technological and social changes, the importance of technical courses should be emphasizedduring any future revisions to the curricula of the industrial product design programs.

The results of the survey showed that although the students seem to have a consensus about the necessity of the technical courses, their answers to the technical questions failed to live up to the desired expectations. The reason for this seems to be that the technical courses are generally formulas-based rather than product design-based and the classroom instruction is somehow found ineffective. Industrial design is a process which combines knowledge base and technical requirements with aesthetic considerations, and which produces products and systems and ensures their development and continuity. Along with these suggestions, though, it should be kept in mind that product design includes artistic activity and for a designer to produce successful designs technical knowledge and the expectations of the society have to be taken into consideration. Therefore, technical knowledge is an indispensible part of product design education. To conclude, the suggestions regarding how the technical courses should be designed and implemented in accordance with the underlying philosophy of industrial product design education without, of course, disregarding the artistic aspects of the profession are summarized below.

1. The technical courses should be presented through resources based on everyday examples rather than those based on mathematical formulations. Thus, a designer would know what kind of a numerical value he should use and what those numerical values mean in a design application as in Question 7.
2. The technical courses should be complemented by application-based activities such as videos or workshop applications. Thus, learning can be more permanent and the students can develop their visual memory which will make it easier in the future for them to visualize the designs in their mind.
3. It is necessary that the professors teaching the technical courses in the Department of Industrial Product Design should be knowledgeable about the details of design processes. Thus, the needs of the department regarding the fundamental design details will be met in a better and more effective way; otherwise, working on the design of a product which can never be produced would be nothing more than a fantasy sketched on paper.
4. The content of the technical courses should be recovered in project-based courses and it should be reminded to the students based on applications how to establish a relationship between technical courses and applications and how to transfer what they have learned in the technical courses to the application process.

5. REFERENCES

Altıparmakoğlu, Y.,Özyurt, M., Gülen, E.,(2011). *Endüstride, Tasarımda, Eğitimde 40 Yıl*. MSGSÜ Department of Industrial Products Design Symposium Proceedings Book, Turkey.

Bayazıt, N. (2008).*Tasarımı Anlamak*, İdeal Kültür Yayıncılık, İstanbul.

Er, H. A., Er, O., Baser, S.,(2007). *Endüstriyel Tasarım Kılavuzu*, İstanbul Chamber of Industry, İstanbul

ZADEH, M. (2013). Endüstri Ürünleri Tasarımı Eğitiminde Uygulamalı Fizik Temel Kural ve Kavramları. *Master Thesis, İstanbul Technical University Graduate School of Science, Engineering and Technology*, İstanbul.

Norman, D. (2010).Why Design Education Must Change, Fromhttp://www.core77.com/blog/columns/why_design_education_must_change_17993.asp

Öztürk, E. (2010). Online distance education: A new approach to industrial design education". *Master Thesis, Middle East Technical University Graduate School of Natural andAppliedSciences*, Ankara.

Öztürk, A., (2014). Endüstriyel Tasarım Eğitiminde Yeni Yaklaşımlar, Anadolu Uluslararası Sanat Eğitimi Sempozyumu (Sanat Eğitiminde Dönüşümler), Eskişehir.

Öztürk, A., (2016a).Tasarım Stüdyosuna Teknolojinin Entegrasyonu: Sanal Tasarım Stüdyosu, *Journal of Research in Education and Teaching*, Vol. 5, No.1, pp. 266-273.

Öztürk, A., (2016b).Tasarım Eğitiminde Disiplinlerarası Yaklaşımlar ve Tasarımcı Düşünüş Modeli, *International Journal of Interdisciplinary and Intercultural Art*, Vol. 1, No. 1, pp. 57-72

Url, 2017. https://www.merriam-webster.com/dictionary/dictionary (Accessed: 15th Agust 2017)