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DESIGN AND VISUAL CULTURE EDUCATION AT TECHNICAL UNIVERSITIES

DIZAJN I VIZUALNA KULTURA NA TEHNIČKIM UČILIŠTIMA

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Abstract

Creating and producing physical and virtual objects is more than applying technical aspects of innovation and creation. Objects should be designed having in mind both technical knowledge and design principles (a combination of technical skills, expertise from social research, insights from the humanities plus the affiliation of creativity techniques).

The final results of technical process are not merely things with functional properties but objects that bring added value, "speak" to the user and create an emotional bond as "interface" [1]. The communication chain would be impossible without this dimension.

Most technical universities in Croatia seem to be neglecting the relationship between the two fields, and the importance of having design focused syllabi, not yet taking on "design as a cognitive theory" [2]. In this respect, the introduction and development of educational content covering basic design principles to a technical university is crucial. This interdisciplinary approach has proven to be successful in most innovative learning places, such as MIT Media Lab and Aalto University.

Following this concept, two new subjects were introduced at Zagreb University of Applied Sciences and both are based on social sciences and humanities in relation to design.

Keywords: *visual culture, design, interdisciplinary education, technical sciences*

Sažetak

Stvaranje fizičkih i virtualnih predmeta puno je više od primjene tehničkih aspekata inovacije i kreacije. Predmeti bi trebali biti projektirani imajući na umu kako tehnička znanja tako i principe dizajna (kombinaciju tehničkih vještina, ekspertize iz društvenih istraživanja, saznanja iz humanističkih znanosti i kreativnih tehnika).

Rezultat tehničkih procesa nisu samo stvari koje imaju obilježje funkcionalnosti, već predmeti koji donose dodanu vrijednost, „obraćaju se" korisniku i stvaraju emocionalnu vezu kao „interface" (sučelje) [1]. Komunikacijski lanac bio bi upravo nemoguć bez te dimenzije.

Čini se da većina tehničkih učilišta u Hrvatskoj zanemaruje povezanost ovih dvaju polja, kao i važnost uvođenja silabusa s naglaskom na dizajn, još uvijek ne poučavajući „dizajn kao kognitivnu teoriju" [2]. Iz tog je razloga uvođenje i razvoj obrazovnog sadržaja koji obuhvaća osnovne principe dizajna na tehnička učilišta od iznimne važnosti. Takav interdisciplinarni pristup pokazao se vrlo uspješnim na većini inovativnih obrazovnih institucija, poput MIT Media Lab-a i Sveučilišta Aalto.

Slijedeći taj koncept, na Tehničko veleučilište u Zagrebu uvedena su dva nova kolegija i oba se temelje na odnosu društvenih i humanističkih znanosti prema dizajnu.

Ključne riječi: *vizualna kultura, dizajn, interdisciplinarno obrazovanje, tehničke znanosti*

1. Introduction

1. *Uvod*

Every object that is produced has at least two functions, and one is often more obvious than the other. The first lies in the core purpose of the produced object while the other is more subtle and refers to – communication. What makes an object more desirable than another is embedded in its meaning, or better yet, its multiple layers of meanings, that correspond

and communicate with the user on an immaterial, or spiritual level. To integrate this kind of meaning and communication into a design it is important to be aware of human psychology and the socio-cultural factors. Implementing values into a design is therefore crucial for its success. Furthermore this aspect is relevant to users in process of understanding the function of objects produced.

2. The Concept Of Design

2. *Koncept dizajna*

The term design is often used in variety of contexts and is therefore sometimes difficult to define. The nature of the term and the process is implemented in everyday life since the beginning of human culture and it is inseparable from any kind of human action, whether in architecture, product design, web design or hair design. The term and the definition of design is related to the person using the term. In this respect, and considering the subject discussed in this paper, it is important to define design/a designer/the design process – from two aspects: within engineering and within humanities/social sciences.

Firstly it is important to glance at another occurring problem that lies in the multiple or fluid nature of the concept of *design* (especially in English). It can be used as a *noun* (signifying a general field, a concept and a finished product) and as a *verb* (denoting a process or action). John Heskett argued this in one sentence: "*Design is to design a design to produce a design.*" [3, p. 5].

Within the general public and sometimes even within the academic sphere, design is often (even today!) described merely as the *form* and the *aesthetic* value of an object. But a *designed object* should be: functional, usable, creative, innovative, sensible to humanistic and environmental concerns, meaningful, long lasting and user friendly. It should be able to connect with both our physical and psychological being. This in particular applies to visual communication design, product design, architecture, and it is making its way to engineering and technical sciences as well.

2.1 Design and Engineering

2.1 *Dizajn i tehničke znanosti*

To define a designer as a person, with a high level of responsibility because of his/her ideas, knowledge, and skills, means to determine several aspects of the product – the technical, economic and ecological [4]. Furthermore, design is acknowledged as an engineering activity that: "*affects all areas of human life, uses laws and insights of science, provides the prerequisites for the physical realization of solution ideas, and requires professional integrity and responsibility.*" [4, p. 1]. Other authors in the field define design as the "*process of conceiving, developing, and realizing products, artifacts, processes, systems, services, and experiences with the aim of fulfilling identified or perceived needs or desires typically working within defined or negotiated constraints*", but also as a process of "*conception, invention, visualization, calculation, refinement, and specification of details that determine the form of the product*" [5, p. 2]. Cross argues that the design process "has to provide a description of the artefact that is to be made" [6, p. 4]. This description should bear all the details of the product such as dimensions, surface finishes, materials and colors.

According to ABET (Accreditation Board for Engineering and Technology) engineering design is "*the process of devising a system, component, or process to meet desired needs, specifications, codes, and standards within constraints such as health and safety, cost, ethics, policy, sustainability, constructability, and manufacturability. It is an iterative, creative, decision-making process in which the basic sciences, mathematics, and the engineering sciences are applied to convert resources optimally into solutions*" [7, p. 27]. While this definition of engineering design still stands, ABET proposes changes in student outcomes in engineering studies that must include, among other things: "*a broad education component that includes humanities and social sciences...*" [7, p. 29]. This connection with humanities and social sciences was described by Dixon and Penny, who state that engineering design is somewhere in the middle of two overlapping streams, one beginning with science and ending in production, and the other ranging from politics to art [8]. Penny also points out that engineering design is "*concerned with the art of using science in achieving a useful end-product*" [8, p. 344].

In 2001 Faste pointed out that education in engineering should take a new course arguing that

until the end of 1980's it was a universal practice for the engineer to focus on *utility*, the industrial designer to deal with *form*, and the manufacturing engineer to manage *production*. But since the beginning of 1990's, due to changes in technology, economics, geopolitics, philosophy etc. the nature of products had also changed, which means that the nature, or the universal practice of the engineer must change as well, becoming more involved with the form-giving aspect of the product, something that was traditionally assigned to the industrial designer [9].

2.2 Design within Humanities

2.2 *Dizajn u humanističkim znanostima*

Zaccai states that a designer "*must successfully integrate all of the requirements that balance the rational, sensory and emotional expectations of the individual user and of society as a hole*" [10, p. 5]. He argues that the division of labor and specialization resulted in experts with deep knowledge in one field but a strictly superficial knowledge in all other. When dealing with "problem solving" of any kind of nature, the solution should fulfill all the desired needs we have as human beings. This means that a person with specialized knowledge in one field has to work with other experts to try and overlap the gaps (leaving no blank areas) in this narrowly focused knowledge of an individual to create a product that is satisfactory to our humanistic values.[1] The real focus, therefore, should not be on the designed object, but on the person using the object [10].

ICSID (International Council of Societies of Industrial Designers) offers a quite extensive definition of industrial design. The newest changes to the definition say that industrial design is a trans-disciplinary profession, a creative and strategic problem-solving process whose aim is to produce innovative products that provide a better quality of life. Like Zaccai, ICSID puts the user at the center of the design process [11].

From 2011 to 2013 the ico-D (International Council of Design) went through a review that made the way for a new definition of design, which is said to be the most significant outcome of the review. Design is defined as a "*constantly evolving and dynamic discipline*", while the designer as a professional who "*applies intent to create the visual, material, spatial and digital environment, cognizant to the experiential, employing interdisciplinary and hybrid approaches to the theory and practice of design. They (designers) understand the cultural, ethical, social, economic and ecological impact of their endeavors and their ultimate responsibility towards people and the planet across both commercial and non-commercial spheres.*" [12]

According to Croatian Designers Association (HDD) "*design is an interdisciplinary activity that combines social, humanistic and technical sciences with a creative and artistic component*". [13]

3. Design Education within Technical Universities in Croatia

3. *Dizajn na tehničkim učilištima u Hrvatskoj*

Since design is an interdisciplinary activity encompassing both art and technology, humanistic and technical sciences, one would assume that it is only natural for it to be, at least in some way, incorporated in the curricula of technical studies. But this is more an exception than it is a common rule. Only a few Croatian technical universities offer courses covering design – the Faculty of Forestry (Wood Technology Study Program), Faculty of Electrical Engineering and Computing, and the Faculty of Mechanical Engineering and Naval Architecture.

The Faculty of Forestry offers several courses covering design principles and methods, semiotic theory, theory of form, visual communications, aesthetics, psychological, cultural and social factors such as: *Furniture Design, Methodology of Industrial Furniture Design, Upholstered Furniture*. The aim of the courses is mastering and understanding the theoretical, practical and methodological basics of design as s complex interdisciplinary process. At the end of the course the students should be able to critically review design solutions and be independent in creating their own designs [14].

1 Including aesthetics, intellect, soul, and all of the senses.

The Faculty of Electrical Engineering and Computing introduced a new course named *Creative Laboratory* which is in essence an *interdisciplinary* course. The lecturers come from different fields which gives students the opportunity to learn how to approach a problem or a project from different perspectives and to make solutions that are innovative and truly answer the desires and needs of the population. It's a joint course that includes experts from six universities: the School of Design, Faculty of Economy, Faculty of Electrical Engineering and Computing, The Academy of Fine Arts, The Music Academy and The Faculty of Natural Sciences. The key aspect of this course is the multidisciplinary approach – artistic, designer, engineering, scientific, managerial and musical. Students are divided into groups based on two criteria – psychological tests and core faculty – making sure that the team members are diverse in respect to their character and expertise.

An example of an interdisciplinary approach to design is the International Design Conference organized by the Faculty of Mechanical Engineering and Naval Architecture in association with the Design Society. The conference was first held in 1981, and since then it gathers professionals across the fields of engineering and industrial design and covers a variety of design related topics from a cross-disciplinary perspective, ranging from engineering, industrial design, aesthetics, ergonomics, sociology and psychology.

4. Exapmles of Good Practice

4. *Primjeri dobre prakse*

"*Successful products require the presence of three things: utility, usability, and meaning*." [9, p. 328]. Rolf Faste was an Associate Professor of Mechanical Engineering and Director of the Product Design Program at Stanford University. During his academic work and teaching period he tried to sensitize mechanical engineers to understand human needs and cultural meanings of products, teaching visual thinking and "need finding" courses. Today, the Stanford University offers a handful of design courses related to humanistic sciences within engineering studies [15].[2]

In association with the d.school (Hasso Plattner Institute of Design) in Stanford, the HPI School of Design Thinking in Potsdam set a milestone in multidisciplinary teaching and product manufacturing by offering students the opportunity to engage in problem solving projects with students from other disciplines like engineering, business, creative industries, media, social sciences, humanities, life sciences and industry. The focus is on design thinking, development and dissemination of this teaching method which has proven to be very successful. After getting the basic theory of what design thinking is, students apply this knowledge to solve a real problem through a project in collaboration with external partners from industry and society [16].

MIT offers a course called *Engineering Innovation and Design* which is a core requirement in the Gordon-MIT Engineering Leadership Program. The course is project based and gives students an opportunity to learn and apply design thinking in problem solving. The course covers topics such as creativity, design principles, psychology, usability, banding, innovation and ethics etc. Students learn to communicate with high emotional impact and develop skills to lead, organize, evaluate and implement successful projects [17].

University of Technology Eindhoven (TU/e) is taking engineering and technology studies even further into humanities and social sciences introducing undergraduate and graduate programs like *Psychology and Technology and Human-Technology Interaction* with the aim of increasing the acceptance or enjoyment of using products. The programs focus on the relationship between humans and technologies, i.e. how people use and interact with technology, teaching students the way people think, perceive and behave through courses that cover psychology, cognitive sciences, perception, human factors, decision making and consumer behavior [18].

2 The curriculum includes courses like: Renaissance Machine Design, Think like a Designer, Visual Thinking, The Designer's Voice, Introduction to Human Values in Design, History and Philosophy of Design, The Designer in Society, d.science: Design for Science, Fundamentals of Design for Design Thinkers.

At the Faculty of Industrial Design Engineering in Delft the focus is on learning user-centered design and on integration of engineering, materials, manufacturing methods, design, ergonomics, business and environment. Student listen to courses like *Man and Product*, and *Design and Experience* [19].

5. Design and Visual Culture Courses at Zagreb University of Applied Sciences

5. *Dizajn i vizualna kultura na Tehničkom veleučilištu u Zagrebu*

Having in mind the importance of interdisciplinary approach to design, Zagreb University of Applied Sciences (UAS) decided to introduce two new subjects (*Design and Visual Meaning; Theory and Development of Design*) to its IT design Undergraduate Study Program positioning the design topics from the point of view of social sciences and humanities. Design and visual communications do not exist in a vacuum of technical sciences, rather, they are the core of everyday life. All products connect to users in two aspects: material and symbolic. It relates to human body, mind and soul. To communicate this twofold nature of design as practice, the newly introduced subjects cover theories and examples of visual culture and its effects on the design process. Students learn different approaches to design – anthropological, aesthetical, and semiotic; the way meanings are generated and associated with object of everyday life and changed through time and form. Topics related to design and design theory are presented as static images through presentations, but also with relevant video materials in both physical and virtual classrooms, which added dynamic to the teaching process. The students are encouraged to interact, critically observe and review existing design solutions, which should help them make their own design using critically applied principles.

The course *Design and Visual Meaning* is an introductory subject that focuses on basic terminology, theories, ideas and concepts on design and visual semantics that enables students to recognize relevant features of visual culture, especially the relation of design and visual perception to contemporary digital and multimedia environment. Topics are presented through relevant examples of visual culture, covering a broader social and cultural context. Students analyze design for logos and web sites, with regards to their socio-cultural aspects and basic design principles. Students are also encouraged to visit design exhibitions as an important way of bringing design closer to the general audience.

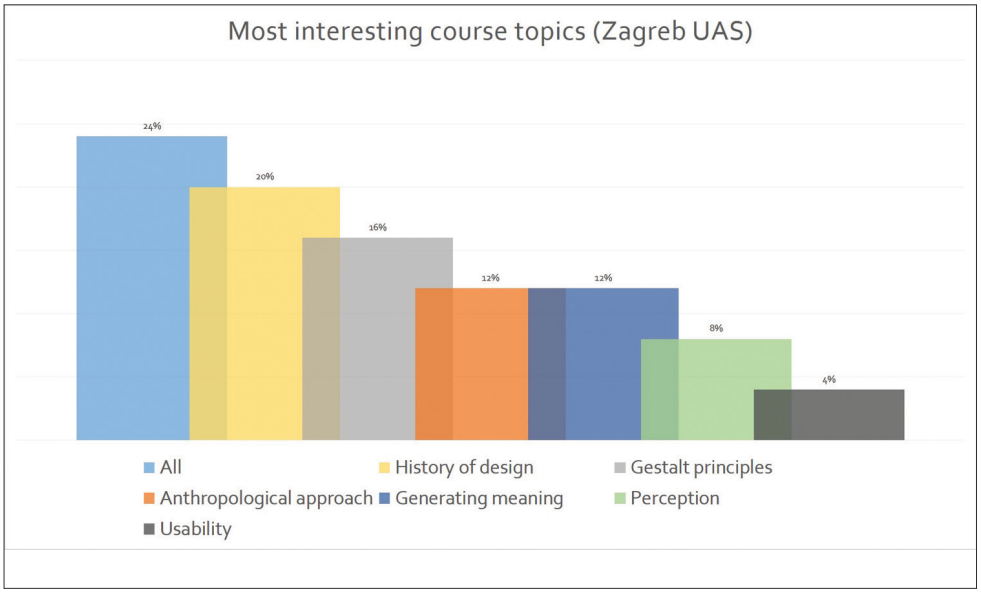
The second course, *Theory and Development of Design* deals with concepts, theories and practices related to design. Students analyze and integrate ideas and concepts on design in relation to their social and cultural context. This enables them to engage with a deeper analyses and evaluation of past design solutions. Both courses' learning outcomes try to upscale the competences of students within the field of integrated approach to science and technology as creative tools for sustaining the environment adapted to human needs.

5. 1 Questionnaire Results

5. 1 *Rezultati ankete*

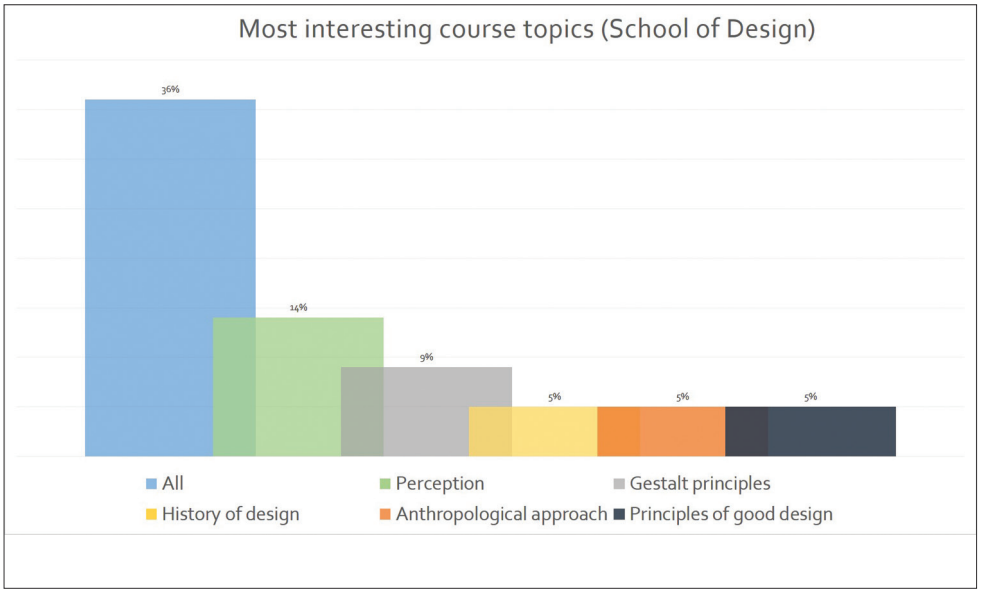
To evaluate the content and the methodology of both courses a student questionnaire was carried out during April and May 2016. The students had to grade the content and usefulness of the course on a scale from one to five (one being the lowest grade). The results (Graph 1) show they are generally satisfied with the course content (average grade: 4,52), and they found it mostly useful (average grade: 4,2). Six out of 25 feel the course content is complete, and needs no changes. Topics they found most interesting are: all (6/25); history of design (5/25); Gestalt principles (4/25); anthropological approach to design (3/25); generating meaning (3/25); perception (2/25); and usability (1/25).

The same questionnaire was carried out at the School of Design at the University of Zagreb. The students found the course content satisfying (average grade: 4,45) and useful (average grade: 4,36). Topics they found most interesting were: all (8/22); perception (3/22); Gestalt principles (2/22); history of design (1/22); anthropological approach to design (1/22); rules of good design (1/22). Even though the average grade of the course content is somewhat lower than with the students at UAS, more students from this group said they liked all topics (Graph 2).



Graph 1
Topics student at Zagreb UAS found most interesting.

Grafikon 1
Teme koje su studenti na Tehničkom veleučilištu u Zagrebu označili kao najzanimljivije.



Graph 2
Topics students at The School of Design found most interesting.

Grafikon 2
Teme koje su studenti na Studiju dizajna označili kao najzanimljivije

Furthermore, students from both universities were asked to suggest topics that could be covered within the course in the future. Students at Zagreb UAS proposed mobile app design, animation design, video and video games design, but also a topic referring to Croatian graphic and industrial design history. Most of the students at the School of Design suggested topics related to contemporary design, history of design and industrial design. Other topics they pointed out as important are: materials used in design, eco design and design for extreme conditions (such as submarines, or extremely cold climates).

6. Conclusion

6. Zaključak

Even though design is an interdisciplinary activity that has no clear borders and is an integral part of every single object produced, design education in Croatia (apart from a few exceptions) mostly focuses on one or two aspects of the field, depending on the study type. The focus of design within technical studies lies, in great part, on technical functionality and utility. This is a solid foundation for making objects that "do the job", but in today's creative and technologically

founded economy, where pretty much everything works well, mere functionality is not nearly enough. Comprehending design from the field of humanities and social sciences offers an opportunity to create objects and communication systems that have cultural "added value", which communicate and relate to users on a complex functional level. Introducing courses that cover this kind of design understanding at Zagreb UAS is a step forward towards the new type of comprehensive technological and human centered approach to creative competence, through syllabi with learning outcomes which do complement the tech topics with social and humanistic ones.

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