

Design Thinking as an Innovative Method of Formation of Creativity Skills in Students of Higher Education

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Abstract

Analysis of design thinking as an innovative method of forming creative skills in students is the goal of the investigation. To write the article, general scientific methods were applied. From the theoretical pedagogical methods, we highlight the approaches of concretization, generalization and abstraction. In particular, the terminological discussions regarding the concept of design thinking are defined in the results. Also in the results it is shown the connections between the development of creativity and employment; the features of the stages of its use in the education process, the role of design thinking in the formation of creativity are elaborated. In our opinion, design thinking is a principle of joint research that influences the formation of innovative team solutions and the solution of complex problems. It is concluded, that the following criteria of design thinking are the main ones: focus on cooperation, participation, anthropology and conducting experiments. Usually in pedagogy, a certain division into stages is used in the use of design thinking: empathy, focus, generation of ideas, prototyping, testing. Modern top managers recognize that the fascination with the creative component harms production processes.

Keywords: design thinking, higher education, creativity, anthropology, innovation.

1. Introduction

The modern development of society requires the allocation of tools for rapid response to dynamic changes, development of new methods of work, manufacture of innovative products, self-development, etc. Part of the solution to these issues is the responsibility of the higher education system, which should form a modern and in-demand specialist in the labor market, ready to meet the challenges of modern production and to work in the service sector. In its turn, one of the tools to achieve this goal is considered to be the use of design thinking technology, which effectively promotes the development of students' creative work skills. The difficulty in the application of this method is considered to be its innovativeness - there are even ongoing discussions among specialists on the specific definition of this phenomenon. Under such circumstances research of design thinking, its influence on students' creative abilities is quite an actual task for modern science. Let's note that the analysis requires known consequences of this technique application because the response of the educational environment and academic community can go against the comments of employers (design thinking, despite the name, is connected not only with designers' work). The analysis of design thinking as an innovative method of forming the creative skills of students is the main purpose of the proposed article.

The theoretical part of this work is built on the examination of modern pedagogical literature devoted to innovative methods of educational development. In particular, Larraz-Rábanos (2021), investigated the main features of the formation of creativity in students and described the key strategies for the formation of creative skills. Blizard (2018) characterized the importance of creative skills for business. This specialist noted that creativity is a skill recognized as a necessity to prepare young people for the complex world of work that requires students to be creative. Blizard

(2018) also investigated modern methods of creativity formation, the researcher devoted special attention to the technology of design thinking. Note that many foreign specialists have noted the effectiveness of using design thinking techniques in modern education. Goldschmidt (2021) analyzed the methodological basis for the use of design thinking. Dam & Siang (2022) investigated the value of design thinking. In addition, these experts characterized the features of the popularity of this technique in education and business. Meanwhile, Pande & Bharathi (2020) investigated the theoretical foundations of design thinking technology. This article also built on the use of general pedagogical works. Specifically, Cherng & Davis (2019) explored the characteristics of contemporary educational development through the lens of multiculturalism. So, although there are now many studies devoted to design thinking, still the novelty of this teaching methodology requires further analysis, identifying both positive and negative sides of its application. Besides, the problem of the influence of design thinking on the formation of creative abilities in students remains unstudied. Stoltz & da Veiga (2021) investigated the motivation of student's work and study. Combelles et al. (2020) described the perspectives of design thinking in educational process. Catarino et al. (2018) also showed the positive moments of using design thinking. Especially they highlighted this method for development of creativity of engineers through the educational process. Some aspects of design thinking were analyzed by Sadiku et al. (2019). The researchers wrote about negative and positive sides of using this method.

2. Method

The research uses general scientific research methods, including cognitive methods. Using the method of analysis, we managed to divide the research subject (design thinking) into component parts (peculiarities of using design thinking technique in higher school, its application in business, the influence of design thinking on creativity development, etc.) in order to study them in detail. With the help of synthesis, it was possible to combine the previously separated parts into a whole in order to form specific conclusions on the problem under study. Based on induction it was possible to highlight particular cases of using design thinking in modern business. In addition, the work used deduction, providing the transition from knowledge of general principles to their individual manifestations. From the theoretical pedagogical methods, we will single out the approaches of concretization, generalization, and abstraction. In particular, with the help of the method of concretization, the peculiarities of the formation of creativity skills of higher education applicants with the help of design thinking technique were investigated. This work is also built on the basis of the method of abstraction. The latter involves a transition from general theoretical concepts to concrete conclusions. The method of abstraction is applied in the study of general theoretical principles of explaining the concept of design thinking and creating recommendations for its use in the formation of creativity in applicants for higher education. Separate attention in the work is focused on empirical research methods. In particular, the problem of further implementation of design thinking as a tool for creativity development is highlighted based on a predictive method. Besides, this work is built based on using a statistical method consisting of a wide analysis of the received information.

3. Results

In all spheres of social and cultural life, there is design. Due to its proliferation, it is relevant to study special aspects of design thinking development, which is a universal tool for the formation of creativity skills. Modern experts note that methods and techniques of design thinking are used in various non-standard, uncertain situations. For this reason, there is a growing need to separate design as a profession and design thinking as special design technology.

The promotion of design thinking methodology as a practical tool began at the beginning of the 21st century, primarily due to the research of Stanford University and the Hasso Plattner Institute in Postdam (Stanford d.school, 2018). The research of contemporary scholars proves that design thinking knowledge influences the implementation of practical approaches to solving modern problems and influences the formation of collective and individual creativity skills.

3.1 Design Thinking: Terminological Discussions

J. Cezzar defines design as "...the art and practice of planning, designing and approving visual and textual content" (Cezzar, 2020, p. 215) We do not fully agree with this statement because in part design is opposed to art. Note that design is related to achieving goals and helping people in problematic situations, while art mainly expresses the position and feeling of the author. Researcher Goldschmidt notes that in design it is necessary to distinguish the concept of design thinking - a systematic approach to solving atypical problems, not related to natural endowment (Goldschmidt, 2021). This is what distinguishes design thinking from art. This will further explain the universal usefulness of design thinking in various fields, including outside the art disciplines.

At the same time, there is currently no single acceptable explanation for the term “design thinking”. Different authors have different interpretations of the concept. Researchers at Stanford University School explain the term as a special way of thinking, focused on people. Its key criteria are optimistic, communal, and experimental (Stanford d.school, 2018). Researchers at the Hasso Plattner Institute believe that design thinking is a human-centered approach that impacts innovative problem-solving. It is also built on the tools used by designers to integrate people's needs and business requirements. The American researcher Larraz-Rábanos understands the category of design thinking as a methodology for implementing innovative ideas that includes interactive principles (Larraz-Rábanos, 2022). Based on the analysis of common definitions of the term, we can propose our own definition. Design thinking is a principle of collaborative research, influencing the formation of innovative team solutions, to solve complex problems.

3.2 Linking Design Thinking to Business: Employment Prospects for Higher Education Applicants

It is obvious that knowledge of design thinking influences the realization of practical approaches to the solution of modern problems influences the formation of skills of collective and individual creativity. Consequently, design thinking provides advantages for students in future employment. It is primarily about prospects in private business (Temple, 2018). In particular, international company Forrester cites several key factors for the positive impact on the implementation of design thinking skills in business. Yes, they affect better customer service, building future business strategies, and reducing time to market for new products (Kolko, 2018). Most of the employees of this company also identified that design thinking skills affect customer experience, communication with company employees, new business growth opportunities, effective teamwork, implementation and development of new products and strategies, etc. Let's note that among the companies which have made design thinking an element of their activity there are such world brands as Netflix, Procter & Gamble, Virgin Atlantic, PepsiCo, Whirlpool, Apple, General Electric, and others. These companies apply design thinking to implement unstructured, not clearly defined issues to reformat them and orient them towards the consumer. Design thinking focuses on the application of design provisions in order to innovate and form a new or surplus product (Goldschmidt, 2021). The main criteria for the application of design thinking in business are the principles of collaboration, complicity, anthropology, and experimentation (Combelles et al., 2020). The positives from using this technique are obvious. we can agree with Catarino et al. (2018), that this is especially important for technical students. In particular, future engineers need additional sociological knowledge, since their training in the basics of technology is at a high level.

3.3 Peculiarities of Stage-By-Stage Formation of Design Thinking

The process of design thinking consists of several stages. The initial stage is divergence. At this stage, the design of the main idea takes place. At the same time, everything that is relevant to the solution of the design problem is checked, the most stable points of the project are determined (Dam & Siang, 2022). Rational and intuitive actions are possible here. Students must engage in data collection, developing hypotheses, even adjusting terms of reference. There are different techniques for divergence - e.g., interview method, brainstorming, surveying, designing, etc. The brainstorming technique is used by many specialists (Sadiku et al., 2019). The main conditions for its application are a clear form question, the intensity of the team's work, and appropriate moderating by the teacher. Specialists prove that the result of the combined brainstorming techniques should be interesting ideas for solving typical problems. The next stage is the transformation period, in which the product concept emerges. If the previous stage (divergence) provides many possible moves, the transformation stage requires combining them. Changes in the starting ideas and their adjustment are likely here. The next stage is convergence, which occurs when the student improves the project, eliminates various contradictions, clarifies details. This is followed by an idea generation period, in which the student demonstrates the results obtained. This is followed by the testing phase. Here the opinion of the instructor, other students, and the addressees of the project regarding the details that have not been taken into account is necessary. The key factors in evaluating the project are its uniqueness, originality, and independence. At the same time, constructive factors also remain important. It is about the suitability of the object made for use. Aesthetic, technological factors are also weighty in the evaluation (Blizard, 2018).

Some researchers distinguish other stages into which the design thinking method is divided: empathy, focus, idea generation, prototyping, testing (Elayyan, 2021). Consequently, the focus of attention to the design object widens and narrows, it allows to collect ideas, and then select the best ones and refine them (Stoltz & da Veiga, 2021). The first stage is empathy, where the student determines the main goals of his design while exploring users' needs. In order to do this, he needs to study a particular object in detail, talk to the users in order to develop a new product or service (Subarkah et al., 2018). The main tools of empathy are conversation, interview, observation, data recordings, general information analysis. The second stage is called focus, where the process of distillation of the collected information takes place. Here the student must answer the question: what problem is he or she solving? In the idea generation

stage, many strategies are put together, including brainstorming (brainstorming), mental maps, and storytelling. The main task of this stage is to suggest as many possible ways of solving the problem as possible. At the prototyping stage, a minimum viable product is created. It is a product or service with a set of features that would be sufficient to satisfy the first potential customers. Using a minimum viable product saves two important resources for a business - time and money. This is primarily due to getting early feedback on certain services or products quickly. In the final stage of testing, it is necessary to involve end-users to evaluate the prototype or to retest the corrected version (Larraz-Rábanos, 2021). In Table 1, the main mechanisms used in a particular stage of design thinking are.

Table 1. Basic Mechanisms Which Are Used at Different Stages of Design Thinking

		Stages of design thinking				
Name of stage	Empathy	Focus	Generating Ideas	Prototyping	Testing a product or service	
Basic mechanisms	Interviews	Map of Empathy	Brainstorming	Paper prototype, business origami	Testing with the user	
	Literature research	Point of View	Stimulating questions	Storytelling	Positive and negative customer experience control	
	Observation methods	Value Proposition Canvas	Content clouds, etc.	Moodboard	Various system, virtual testing, etc.	
		Client Path Map		Various constructors, in particular, Lego Serious Play		

Consequently, design thinking strategies are often used in business. For this reason, specialists with this technique are valuable on the labor market, and firms and companies are ready to compete for their recruitment (Catarino et al., 2018). Meanwhile, it should be noted that design thinking contributes to the development of creative corporate culture, promotes the emergence of team unity around a complex topic. In addition, the technique of design thinking contributes to the staff's sense of unity, significance (Dam & Siang, 2022). The characteristic of this technique is the creation of ideas based on customer experience and the process of singing design with customers.

3.4 The Role of Design Thinking in Building Creativity Skills

We believe that one of the challenges of the modern education system is the development of students' creative skills, in particular, through the introduction of design thinking techniques. The labor-intensive, synthetic by nature process of design thinking consistently includes the analysis of the initial situation, search for an idea, development of a plan, and algorithm for the implementation of the idea. There are two approaches to design thinking. Based on the first, design occurs comprehensively, based on the simultaneous use of a variety of techniques. In spite of this, there is control over the design actions at all stages. Based on the second approach, step-by-step design is possible. Modern specialists note that it is more effective because it can be controlled and, if necessary, corrected at any stage. Nowadays the basic requirements for professional and creative competence have increased noticeably, especially taking into account the general development of the educational sphere. Consequently, the organizational pedagogical condition for the development of creativity of higher education applicants in the course of professional training is the formation of such an educational space, which will give them the opportunity to broadly master the key skills, skills, and knowledge of creative and professional work, to develop their abilities, to meet the needs of young people. (Malik & Ubaidillah, 2020). Yes, creativity is one of the important conditions for the sustainable development of any profession.

Design thinking is important for higher education applicants because it affects the formation of creativity skills (Larraz-Rábanos, 2021). The term creativity refers to a type of human activity whose consequences are novel, atypical, and meaningful. At the same time, the development of creative abilities affects the originality of the student's thinking. The strategies of modern education are to give all applicants for education an opportunity to show their skills and creative potential. We believe that the formation of creative skills is important in all periods of education. However, the process of creativity formation directly in the institutions of higher education is important, because at this time students at a conscious level choose a profession (McGrath, 2018). At the same time, a noticeable role in the formation of creativity is played by the creative educational environment consisting of various factors (presented in Table 2).

Table 2. The Main Factors Influencing the Formation of a Creative Educational Environment

Factors influencing the formation of a creative educational environment	
1. External	<p>A) social, economic, and legislative aspects of a higher education institution</p> <p>B) the position of the professional environment: the volume of the market for designers, key requirements for professional competence, and the extent of competition in comparison with other institutions of higher education.</p>
2. Internal	<p>A) educational and pedagogical conditions affect the disclosure of educational opportunities of the environment not only as a factor of education but also as a factor in the creative development of students. At the same time, the observance of humanistic-oriented pedagogical principles and accepted methodological approaches and educational standards is of great importance.</p> <p>B) material and technical support. We are talking about a set of key material and technical conditions affecting the provision of the educational process in accordance with ergonomic and sanitary requirements.</p>

Modern teachers note that many students have a latent potential of creativity, and with the necessary conditions of development and support they can reveal them or show creativity skills in a certain area. At the same time, the systematic development of creativity is possible only on such a psychological basis, which is characterized by a wide range of needs and interests of a personality, its focus on self-realization, communication, cognition, openness to everything new. In this case, a significant role is also played by the skills of flexible critical thinking, a high level of human performance, etc. The main task of modern teachers is to support and encourage a creative attitude to learning, intrinsic motivation, and the activity of students. For this reason, it is especially important to form a creative basis in students' behavior and attitudes and then already improve it with design thinking methods (Pande & Bharathi, 2020). At the same time, problems with self-motivation can become decisive when working with design thinking. Stoltz & da Veiga (2021) emphasized that independent work is impossible without an adequate level of motivation. From this point of view, the strengthening of self-control over the performance of tasks has also become important in the work of a teacher.

One of the ways to develop creative design thinking is the method of creative projects. This method is widely used in both higher and secondary schools. This method was first used in the United States in the 1920s and immediately gained considerable popularity among educators because of the optimal combination of theoretical knowledge with practical use of it to solve complex problems. In pedagogical literature, there are two types of projects: group and individual. A group project is a collaborative and creative process in which each student must demonstrate his or her original abilities. At the same time, a group project promotes the ability to subordinate one's creativity to a common interest. Obviously, this skill will come in handy for future applicants to higher education. At the same time, an individual project is created and carried out by a purely one person. The latter presents the conception and results of his/her project research independently. We believe that the project method should be fundamental to provide design thinking in the environment of students' professional training. Rational use of this method contributes not only to the formation of creativity in students, but also critical thinking skills (Mosely et al., 2018). At the same time, we believe that creative design technologies are aimed at the formation of students' unique, atypical design solutions, which in the future will affect their independence of obtaining the necessary knowledge.

4. Discussion

Design thinking is considered by researchers to be an important and effective approach to the fabrication of innovative practices in public life, business, and pedagogy. Let's note, that it can be required in use both for separate innovators and for the whole group of experts (designers, business leaders, entrepreneurs, teachers, etc.). Its effectiveness is associated with the following feature - in the processes of decision-making and overcoming problems

indirectly also involved consumers of services or buyers of goods (Malik & Ubaidillah, 2020). The strength of this methodology is, therefore, the fact that design thinking can be considered a compatible interactive approach used by consumers, designers, businessmen, representatives of different organizations, and authorities. The ultimate goal of this process is to improve business and entrepreneurship in general and improve individual aspects, improve service processes, improve their quality, but also the quality of education. However, Sadiku et al. (2019) identified the negative side of design thinking: obsession with external attributes to the detriment of functionality. This practice really, in our opinion, threatens the further use of this technique.

Design thinking today is one of the ways to solve heterogeneous issues, in particular related to the design of the newest products (services, types of work, etc.) or new productions, improvement of existing ones (Saward, 2018). This approach will solve the difficult problems that always accompany the development and implementation of new and heterogeneous business processes. Design thinking is also popular among non-business or manufacturing entities. Innovation is not only about shaping new products that exist physically (Subarkah et al., 2018). Specifically, designers create innovations in processes, services, interaction patterns, forms of entertainment, tools, and various methods of collaboration.

At the same time, the fascination with design thinking also contains certain dangers. Among leading companies, there have long been opinions that it is too risky to fight or consider exclusively “creative” departments as privileged. Modern pedagogy should pay attention to the use of creative work methods also in production processes, perhaps adapting the methodology of design thinking to direct entrepreneurial needs and capacities (Warren, 2017). Critics of the current American economic model point out that often the ultimate beneficiaries of original technological solutions are not only American companies but also owners of production facilities, usually located in China or Mexico. Moreover, in recent years, this access has accelerated considerably - the products of U.S. developments, therefore, have been used by outside companies. In this case, local businesses also gain access to American technologies and are able to compete with them (Kolko, 2018). We agree with Catarino et al. (2018) that the specified threats are real. So, under such circumstances, it seems to us quite fair to say that the development of design thinking and creative work methods should take place according to the production conditions of each country.

This can be achieved through closer cooperation between employers and institutions of higher education. It is common practice for stakeholders to participate indirectly in the training of future specialists. This happens in two ways. First of all, employers are involved in the development of training programs - even in Ukraine to pass the accreditation procedure of the educational program it is necessary to consider the wishes of potential employers, to refer to them to review some of the educational materials. The second way – is the implementation of practical skills of higher education applicants directly during the internship. Organizations and enterprises will be able to acquaint future specialists with the peculiarities of the local sphere of economy, indicate the main directions, which will require the use of modern approaches of work (including design thinking). Practical work with the application of creativity in real conditions will show possibilities of improvement of an available situation, will not create conditions for the import of the received knowledge to other territories.

Undoubtedly, in the globalized world, such recommendations are debatable, but in view of the Ukrainian experience in implementing creativity, the educational system should focus precisely on the practical component of the application of design thinking. A reasonable combination of experienced teachers, practical work, self-development, and teaching accents on design thinking practices will be able to prepare a modern specialist, ready to compete on the labor market, to study independently, and to benefit himself as well as employers and society.

5. Conclusions

Therefore, the application of design thinking influences the development of practical approaches to overcoming the problems of modernity, the education of skills of collective and individual creative work. Researchers have noted the potential of this method relatively recently so that even its definition has not been definitively approved. Based on going through the professional literature, we offer our definition: design thinking is a principle of collaborative research, influencing the formation of innovative team solutions, to solve complex problems. Modern corporations apply design thinking in order to implement unstructured, not clearly defined issues in order to reformat them and orient them towards the consumer. Design thinking focuses on the application of design provisions in order to innovate and form a new or surplus product. The design thinking technique is important for higher education applicants because it affects the formation of creativity skills. For this reason, specialists with this technique are valuable in the labor market, and firms and companies are willing to compete for their recruitment. Usually, pedagogy applies a certain division into stages in the use of design thinking: empathy, focus, generation of ideas,

prototyping, testing. Due to this, independent work of students, the actualization of their creative skills is achieved. Let us note that an important role in the formation of creativity is played by the educational environment, in particular, the use of additional methods of creativity development, for example, the method of creative projects. Today's top managers indeed admit that the fondness for the creative component harms the production processes. A rational combination of the work of experienced university professors, practical task performance, self-development, and teaching emphasis on design thinking practices can prepare a modern specialist ready to compete in the labor market.

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