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DEVELOPING THE PROJECT DESIGN COMPETENCE OF FUTURE TEACHERS BASED ON DESIGN THINKING TECHNOLOGY

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Abstract. The article presents the theoretical and methodological foundations for developing future teachers' design competence through the design thinking approach. The structure of design competence is defined, the stages of design thinking are aligned with the tools of engineering graphics and design theory, and pedagogical conditions, a four-stage methodological model, rubric-based assessment criteria and a sample practical assignment are proposed.
Keywords: Design Thinking, Design Competence, Engineering Graphics, Prototype, Project-Based Learning, Creative Thinking, Design Theory.

BÖLAJAK ÖQITUVÇILARNING LOYIHALAŞ KOMPETENSIYASINI DIZAYN-FIKRLAŞ (DESIGN THINKING) TEXNOLOGIYASI ASOSIDA RIVOJLANTIRIŞ

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Annotatsiya. Maqolada oliy pedagogik ta'lim muassasalarida bölajak öqituvçilarning loyihalaş kompetensiyasini dizayn-fikrlaş (design thinking) texnologiyasi asosida rivojlantirişning nazariy-metodik asoslari yoritilgan. Loyihalaş kompetensiyasining tarkibi aniqlanib, dizayn-fikrlaş bosqiçlari muhandislik grafikasi va dizayn nazariyasi vositalari bilan uyğunlaştirilgan, pedagogik şartlar, tört bosqiçli metodik model, rubrikaga asoslangan baholaş mezonlari va amaliy topşiriq namunasi taklif etilgan. Maqola talabalarning ijodiy, tanqidiy va

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loyihaviy tafakkurini şakllantirişga yönaltirilgan öquv jarayonini loyihalaşda foydalanilişi mumkin.
Kalit sözlar: *dizayn-fikrlaş, loyihalaş kompetensiyasi, muhandislik grafikasi, prototip, loyiha ta'limi, ijodiy tafakkur, dizayn nazariyasi.*

One of the main requirements currently placed on higher education is to prepare graduates not merely to reproduce ready-made knowledge, but to become individuals capable of identifying problems and finding creative solutions in unfamiliar situations. This requirement has also been established as a priority in state education policy, which aims to bring the quality of education closer to international standards, increase scientific and innovative activity, and develop the professional competencies of specialists [1]. Engineering graphics and design disciplines offer particular opportunities in this regard because they teach students not only to produce drawings but also to transform an idea into a form and subsequently turn that form into a practical object. This issue is even more relevant in the preparation of future teachers in the fields of technical drawing, technological education, and visual arts, since prospective teachers must first develop a thorough understanding of the design process themselves in order to cultivate design thinking among their future students [2]. Nevertheless, in practice, design activities are often limited to completing predefined assignments, such as producing drawings or models based on given examples. Insufficient attention is paid to students' ability to independently identify problems, generate alternative solutions, and justify their choices. The purpose of this article is to examine the theoretical and methodological foundations of developing future teachers' design competence through design thinking technology, identify the necessary pedagogical conditions, and propose a methodological model, assessment criteria, and practical assignment examples adapted to the content of Engineering Graphics and Design Theory courses.

The scientific understanding of design and design activity began to receive extensive attention in the second half of the twentieth century. H. Simon interpreted design as the development of courses of action aimed at transforming existing situations into better ones, thereby establishing it as an independent field of knowledge \[3\]. D. Schön introduced the concept of "reflection-in-action" and demonstrated that learning in design studios is based on communication, experimentation, and reflection [4]. N. Cross emphasized the existence of distinctive ways of knowing characteristic of designers, arguing that design has its own culture of thinking, different from that of the sciences and humanities [5]. Subsequently, the term design thinking became widely used and was commonly defined as a human-centered, iterative, and collaborative approach to problem-solving [6]. Studies examining this approach in engineering education have substantiated its value as a means of developing engineering design skills through teaching and learning activities [7]. Reviews of pedagogical research describe design thinking as both an analytical and creative process, highlighting its characteristics, differences between experienced and novice designers, and the possibility of developing these skills through sufficient practice, support, and continuous feedback [8]. Other studies have explored the nature and application of design thinking [9], its relationship with constructivist learning in education [10], and its role in fostering innovative thinking among young people [11]. Research conducted by Uzbek scholars has primarily focused on methods of teaching technical drawing and developing the graphic competencies of future teachers through computer graphics [2]. [12]. An analysis of existing studies indicates that methodological models systematically integrating design thinking with Engineering Graphics and Design

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Theory and specifically adapted to the preparation of future teachers have not yet been sufficiently developed. Therefore, this issue requires further scientific and methodological investigation.

The theoretical foundation of this study is based on the concepts of design competence and design thinking. Design competence refers to a student's ability to identify a problem, analyze user needs, develop ideas, represent them in the form of sketches, drawings, 3D models, or prototypes, and evaluate and improve the resulting product. This competence can be considered as consisting of three interrelated components. The knowledge component includes knowledge of the fundamentals of design theory, namely form, function, composition, color, ergonomics, and aesthetic principles, as well as projection methods, technical drawing standards, and materials. The activity component encompasses skills in sketching, 3D modeling, preparing technical drawings, constructing prototypes, and developing project presentations. The personal and motivational component reflects such qualities as curiosity, initiative, tolerance of uncertainty, willingness to learn from mistakes, teamwork, and the ability to evaluate one's own activities. Design thinking is a process that integrates these three components into a unified activity. Its sequence generally consists of understanding user needs (empathy), defining the problem, generating ideas, developing prototypes, and testing them. It is characterized by the possibility of repeatedly returning to previous stages [6], [8]. From a pedagogical perspective, this process represents a logical continuation of the experiential learning cycle, which involves concrete experience, reflective observation, abstract conceptualization, and active experimentation in new situations [13]. Research into designers' thinking also demonstrates that sketching, visualizing forms, and continuously improving solutions are integral parts of design activity [14].

There is a natural connection between the stages of design thinking and the tools used in Engineering Graphics and Design Theory courses. This makes it possible to introduce the technology not as a separate subject, but as a means of making existing course content more active and meaningful. During the empathy and problem-definition stages, students analyze the results of observations and interviews and formulate technical requirements for an object, including its dimensions, materials, conditions of use, and safety requirements. During the idea-generation stage, freehand sketching, orthographic and axonometric representations, proportions, and principles of composition are applied. Students can quickly produce several visual solutions for a single idea and compare them. At the prototyping stage, 3D modeling, representing complex shapes through views and sections, specifying dimensions and tolerances, preparing standardized technical drawings, and constructing physical models are carried out. During the testing stage, the accuracy of drawings and models is verified, while the object's functionality, convenience, and aesthetic appearance are evaluated based on user feedback. The proposed solution is then improved accordingly. In this way, graphic knowledge does not remain an end in itself but serves to solve real design problems, allowing students to recognize its practical significance.

The didactic potential of design thinking technology is manifested in several aspects. First, it organizes the learning process around real-world problems, increases students' motivation to acquire knowledge, and reveals the practical relevance of the subject. Second, the iterative nature of the process teaches students to perceive mistakes not as failures but as stages in improving a solution. Third, teamwork develops communication skills, the ability to justify one's ideas, and the capacity to listen to others. Fourth, the process from sketching to prototyping strengthens students' graphic and spatial thinking through practical activities,

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thereby fostering a conscious understanding of theoretical knowledge in engineering graphics. Fifth, since future teachers experience this technology themselves, they will subsequently be able to apply it when working with school students and will be better prepared to organize creative learning activities [10], [11]. Sixth, the availability of a final product, such as a drawing, model, or prototype, makes students' achievements visible and provides a clear basis for self-assessment.

Several pedagogical conditions must be observed to ensure the effective implementation of this technology. The first condition concerns a change in the teacher's role: rather than simply transmitting ready-made knowledge, the teacher should act as a facilitator who asks questions, guides the process, and provides timely feedback and advice. The second condition is the adaptability of the learning environment. Ideally, the classroom should be equipped as a design studio that provides opportunities for teamwork, sketching, model construction, and presentation of results. Where this is not possible, existing computer laboratories and technical drawing classrooms should be adapted to these purposes. The third condition relates to the content of assignments: project topics should be closely connected to students' future professional activities, involve real users, and allow for multiple possible solutions. The fourth condition is effective time management. Project activities should be divided into intermediate assessment stages, with clearly defined outcomes and deadlines for each stage. The fifth condition involves the clear distribution of roles within teams and an assessment system that takes individual contributions into account. The sixth condition is the rational use of digital tools, including CAD software, online collaboration platforms, and, where available, 3D printing technologies. These tools should remain means of expressing and developing ideas rather than replacing the ideas themselves.

However, the implementation of design thinking in higher education practice also presents several challenges. First, traditional curricula are rigidly structured and divided into relatively short topics, making it difficult to allocate sufficient time for project activities that may continue over several weeks. Second, many students are accustomed to completing predefined assignments and therefore experience difficulties when independently identifying problems and making decisions under conditions of uncertainty. Third, assessing project outcomes differs from traditional testing or evaluating the quality of technical drawings and requires the development of specific assessment criteria and rubrics. Fourth, the passive participation of certain students in teamwork may negatively affect overall results. Fifth, teachers themselves may require specialized training in the application of this technology. Therefore, design thinking should not be introduced as an independent objective, but rather as a step-by-step methodological system logically integrated into course content and supported by clearly defined outcomes and assessment criteria.

This study is theoretical and methodological in nature. It employs the methods of analysis and synthesis of scientific and methodological literature, conceptual comparison, a systematic approach, and pedagogical modeling. The proposed model is based on the principles of learner-centered education, the activity-based approach, problem-based learning, interdisciplinary integration, and reflection. The learner-centered principle involves taking into account each student's level of preparation and individual interests. The activity-based approach emphasizes acquiring knowledge through practical project activities rather than simply receiving ready-made information. The principle of problem-based learning involves organizing the educational process around solving a specific problem, while the principle of integration предусматривает connecting the content of Engineering Graphics, Design Theory,

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Computer Graphics, and Technological Education. The principle of reflection requires students to analyze their own activities and results at the end of each stage and represents an essential component of experiential learning [13]. Determining the practical effectiveness of the proposed model requires a separate pedagogical experimental study. This task falls beyond the scope of the present article and is identified as a direction for future research.

The proposed methodological model consists of four stages, each of which connects the corresponding stage of design thinking with engineering graphics tools and ends with a specific learning outcome. The first stage is about understanding and identifying the problem. Students monitor the need for a real user in kiçik groups, such as a school grinder or a grinder, conduct a conversation and short survey, analyze the information found and refine the problem as a clear and scalable task. The result of the raid is the user's portrait, the problem statement, and the technical riddle that has taken into account the description of the requirements for the project. In this invasion, the öqituvçi renders the students not to be disappointed in the finished yeçim, but first to understand the essence of the problem.

In the second stage, ideas are created. Each student first draws a large number of options on their own, then in a group, sketching them by hand, adhering to the principle of avoiding initial evaluation of ideas and achieving quality through quantity. Sketches use perspective, proportions, shape and function, and composition rules. The group compares the ideas based on predetermined criteria, such as user demand, ease of implementation, safety, and aesthetics, selects the most promising option, and justifies its choice. In the Uçinçi boskiç, the selected ğoya will be converted into a prototype. The student creates a 3D model in the CAD program, from which he creates a drawing according to the standard he has mastered the skills of bellows, cuts, measurements and technical requirements, and prepares a layout using simple materials or opportunity bölsa 3D printing çiqariş. This is a sketch drawn in the sleeve in the Bosque, and the computer-generated model is adjusted in moderation, through the SHU, traditional and digital methods are combined into a single system.

The törtınçi bosıçda prototype is tested and protected. Students visualize the layout or model to users and groupers, putting forward feedback on comfort, function performance, scaling and visualization, identifying kamçılıks and perfecting the intake; if necessary, the process returns to the previous invasions. At the end of the occupation, the student prepares a reflexive report: it analyzes how the initial Gula has changed, which decisions what uçun has been made and what uçun yangiça yondaşuşuşu can be the necessary declaration. The project is defended in front of the team, and the drawing, model, and presentation are evaluated together. In doing so, the student becomes a designer who can draw, test and base knowledge from a passive recipient to a teacher, which makes uçun especially important in his future professional career.

The practical resolution of the model can be visualized using the example of a sample Finder. Let's assume that the students will be given the "Çizmaçılık room uçun öquvçi Iş place convenient ixçam item project". In Birinçi and bikinçi week, the groups conduct an interview with the öquçi and the öquçi, identifying the inconveniences of the existing equipment, such as the maintenance of the chipping instruments, the immaturity of the iş surface or the illuminated issues, and making it official in the technical finding vision. Uçinçi and törtinçi each student draws at least a few sketch options per week, with the group choosing one from among them based on criteria. Beşinçi and altınçi are modeled in the selected item CAD program for the week, making a töliq çizma with bellows, cuts and scales and making a mock-up. At seven weeks, the prototype is tested with real users, and at eight weeks, the improved

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option is protected and a reflexive report is found. The subject can be customized depending on the student's specialty: a öquv gun or a bellows tool in the technological educational layout, a maişiy item or bellows poster in the design layout, and an interior element can be designed.

The system for evaluating the results of the project is based on a neça criterion and is announced to students in advance. As the main criteria, the problem can be identified and the accuracy of technical input, the patency and originality of the instructions, the quality of the sketch and drawing and compliance with standards, compliance with the requirements of the prototype and the user, the specific contribution to the collective input, reflexive reporting and the quality of protection. Each criterion is formed uçun uç-tört level description, that is, rubrika, which ensures the satisfaction of the assessment and shows the student the öz işini yaxşilaş yölini [8]. Assessment should not only be conducted at the end of the final stage, but also in the form of formative assessment conducted at the end of each stage, because feedback is an integral part of the design thinking process. The combined consideration of team and individual scores also increases the student's responsibility for self-assessment and peer assessment and reduces the risk of passivity. The special portfolio of the project allows the student to monitor the progress of the development and demonstrate the success of öz in ötiş to professional activities.

The model can be expected when the töğri is introduced in the segmented pedagogical results theoretically based on the following: students independently identify the problem and occupy it with şaklış könışmı as a specific task; because graphic knowledge is connected with a real task, they are more consciously assimilated; taking the error as a natural part of the process, they are However, these results are only a hypothesis based on theoretical analysis and existing research. To determine how effective they are in practice, it is necessary to conduct a separate pedagogical experiment, statistically compare the results of the experimental and control groups according to the criteria of the projected competence. Additionally, comparing the model with other design approaches and traditional project-based learning, and adapting it to different student groups, are important areas for future research. Together with Şu, it should be noted that design-thinking does not take away graphic knowledge and attachments, aksinça, the need for them should be emphasized, since a student who could not represent çoya in a sketch or turn it into a scratch according to the standard cannot reach the end of the project.

In conclusion, design-thinking technology is a promising tool for the development of design competence, creative and critical thinking of future agitators. Design competence was interpreted as a unity of knowledge, activity and special-motivational components, each invader of design-thinking was connected with the tools of engineering graphics and design theory. The proposed tört bosıçlı model connects the content of Science with real activity, providing a izçil ötş from the realization of the problem to the prototype through sketching and drawing, and to the testing and protection of it. The transformation of the role of etiş uçun öqituvçi, the adaptation environment, meaningful project findings, reasonable time planning and a rubric-based evaluation system were identified as necessary thresholds. It is advisable to conduct pedagogical pilot testing of the model in the future, enrich it with artificial intelligence tools and digital collaboration platforms, and study its long-term results.

References

1. Özbekiston Respublikasi Prezidentining 2019-yil 8-oktabrdagi PF-5847-son Farmoni. Özbekiston Respublikasi oliy ta'lim tizimini 2030-yilgaça rivojlantiriş konsepsiyasini tasdiqlaş töğrisida. – URL: https://lex.uz/docs/-4545884

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ISSN (E): 2942-190X Open Access| Peer Reviewed
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2. Röziyev E.I., Aşirboyev A.O. Muhandislik grafikasini öqitiş metodikasi. – Toşkent: Fan va texnologiya, 2010.
3. Simon H.A. The Sciences of the Artificial. – 3rd ed. – Cambridge, MA: MIT Press, 1996.
4. Schön D.A. The Reflective Practitioner: How Professionals Think in Action. – New York: Basic Books, 1983.
5. Cross N. Designerly ways of knowing // Design Studies. – 1982. – Vol. 3, No. 4. – P. 221–227.
6. Brown T. Design thinking // Harvard Business Review. – 2008. – Vol. 86, No. 6. – P. 84–92.
7. Dym C.L., Agogino A.M., Eris O., Frey D.D., Leifer L.J. Engineering design thinking, teaching, and learning // Journal of Engineering Education. – 2005. – Vol. 94, No. 1. – P. 103–120.
8. Razzouk R., Shute V. What is design thinking and why is it important? // Review of Educational Research. – 2012. – Vol. 82, No. 3. – P. 330–348.
9. Dorst K. The core of ‘design thinking’ and its application // Design Studies. – 2011. – Vol. 32, No. 6. – P. 521–532.
10. Scheer A., Noweski C., Meinel C. Transforming constructivist learning into action: Design thinking in education // Design and Technology Education: An International Journal. – 2012. – Vol. 17, No. 3. – P. 8–19.
11. Wagner T. Creating Innovators: The Making of Young People Who Will Change the World. – New York: Scribner, 2012.
12. Aşirboyev A.O., Abduazizov B.I. Bölajak çizmaçilik öqituvçilarning grafik kompetentligini muhandislik kompyuter grafikasi asosida şakllantiriş metodikasi // Oriental Renaissance: Innovative, educational, natural and social sciences. – 2022. – May. – B. 118–126. – DOI: 10.24412/2181-1784-2022-5-118-126.
13. Kolb D.A. Experiential Learning: Experience as the Source of Learning and Development. – Englewood Cliffs, NJ: Prentice-Hall, 1984.
14. Lawson B. How Designers Think: The Design Process Demystified. – 4th ed. – Oxford: Architectural Press, 2006.