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THE ESSENCE OF GRAPHIC COMPETENCE OF STUDENTS OF TECHNICAL UNIVERSITY IN THE CONDITIONS OF INFORMATIZATION OF EDUCATION

Mamanov Sirozh Kakhramonovich
Teacher of the Department of applied mathematics of the Jizzakh branch of the National University of Uzbekistan named after Mirzo Ulugbek
sirojmamanov92@gmail.com

Abstract: Modern conditions of development of society determine special requirements for training engineers in a technical university. In the process of organizing professional training, the following conditions act as necessary: formation of specified levels of competence, professional culture of a specialist, development of his needs for continuous professional self-improvement. These conditions are basic for the effectiveness of professional activity in a competitive environment. This paper reveals the essence of graphic competence of future graduates of a technical university in the context of informatization of education. A diagnostic system for the development of graphic competence in studying graphic disciplines based on three-dimensional modeling is proposed.

Keywords: Training, competence, competency, graphic disciplines, three-dimensional modeling, computer programs, professional orientation, skills, knowledge, abilities.

INTRODUCTION

The current level of development of the post-industrial society necessitates strengthening the requirements for the training of highly qualified technical specialists. Of interest to employers in the labor market is currently a technical specialist with professional competencies that correspond to the level of development of modern design and engineering technologies. Employers declare their intention to participate in the formation of the content of training of future technicians and make a number of demands on the level of training of young specialists; they express dissatisfaction with the level of professional and psychological readiness of young specialists to participate in production activities.

Main part. Digital technologies are that part of the new knowledge infrastructure, which is currently steadily integrating into everyday life. Digitalization of education is an integral part of the process of training a modern specialist. The

transition to a digital society imposes fundamentally new demands on new competencies of specialists and the conditions for the formation of these competencies. The study of problems related to the transition from computerization of education to its digitalization is of particular importance. Digitalization is based on the widespread introduction of electronic resources and digital technologies into pedagogical practice, which opens up wide opportunities for the formation of students' competence.

The increased attention of researchers to the concepts of "competence" and "competence-based approach" is explained by a number of reasons: the need to create a new concept of education, the orientation of higher education towards the formation of not only subject-specific, but also "supra-subject" (the most universal and generalized methods of action) competencies in a specialist, ensuring the ability of a young specialist to self-improvement and successful work in a competitive environment.

Issues related to the formation of competence in professional education and the competence-based approach were studied by V.I. Baydenko, I.D. Belonovskaya, A.S. Belkin, I.A. Zimnyaya, E.F. Zeer, E.A. Klimov, V.V. Kolga, A.Ya. Nain, R.M. Petruneva, Z.S. Sazonova, V.V. Serikov, A.V. Khutorskoy, S.E. Shishov et al. E.P. Vokh considered graphic competence in the context of cognitive activity, P.A. Ostrozhkov identifies factors of graphic competence formation related to independent work of students. It should be noted that this issue was considered in relation to specialists of a particular field, and the concept of "graphic competence" was not considered and was not identified as a separate component of professional competence for a graduate of a technical university. Although the need to consider the process of formation of graphic competence as an integral part of professional competence is absolutely obvious, since it is caused by the needs of modern production practice. The purpose of our study was to substantiate the need to form graphic competence of future engineers when studying graphic disciplines in a technical university. The conducted analysis of research on the competence-based,

activity-based approach, the theory of step-by-step skill development, works on professional orientation of the content of disciplines in engineering graphics and descriptive geometry, informatization of professional education and functional analysis of the activities of specialists in various areas made it possible to identify in the concept of professional competence its component part - graphic competence, and to give its definition.

MAIN PART

The competence-based approach to training and education orients the education system towards the development of certain knowledge, skills and personal qualities in students that are necessary for society and a person, expressed in competencies [3, 5]. The requirements for the results of mastering the main educational programs in the third generation standards are based on the identification of general cultural and professional competencies [2]. Let us consider the concept of professional competence.

Professional competence is manifested in the readiness to act independently and adequately in a changing professional situation in accordance with accepted standards and is considered as a characteristic of the quality of specialist training [6]. The concept of professional competence expresses the unity of theoretical and practical readiness of a specialist to carry out professional activity. One of the components of professional competence of a modern programmer is graphic competence.

Graphic competencies are the competencies aimed at mastering generalized methods of action based on knowledge, skills and abilities in applying standards and rules for drawing, the ability to freely use design documentation, allowing one to quickly navigate it and apply it in the professional activities of a future engineer. Graphic competence is characterized by production culture and engineering thinking, manifested in the qualification competencies of professional activities: production and technological, organizational and managerial, scientific research, design and

engineering. The concept of graphic competence is revealed in the focus on the professional development of a technical specialist and provides for the possession of special knowledge, graphic skills and practical skills using modern computer technologies of 3D modeling, necessary for the successful activity of a competitive specialist. Graphic competence is a whole system, which includes the study of various types of graphic images. Graphic competence includes the necessary components: graphic literacy - the ability to read with the help of graphic means, to make various design and technical documentation; graphic information is data obtained from various technical and technological literature; graphic knowledge - concepts about the methods of graphic representation of products, processes, phenomena, about norms and rules in accordance with the systems of standards; graphic skills - a person's readiness to operate spatial images created on various graphic bases, to accurately express their own and read the thoughts of another person according to technical documentation; graphic skills - mastery of work techniques and software tools of graphic editors. One of the requirements of modern employers for engineering positions (engineer, designer, designer, etc.) is the use of three-dimensional modeling methods in the design and construction of various engineering objects. A three-dimensional model of the geometric image of the designed object is its digital analogue, which can be rotated and viewed from all sides. A digital model allows you to see the composition of the product with imitation of the movement of its parts. Three-dimensional models created using graphic editors allow obtaining design documentation in the form of associative working or assembly drawings located in projection links, as well as local views, sections, sections, callouts, etc.

When changing the shape or size of the model, the image on all associated views changes. Parametric solid modeling allows you to get a complete picture of the object and examine any part or product to detect errors. The use of modern computer-aided design systems in the study of graphic disciplines is determined by the specifics of the discipline. Currently, computer graphics are widely used in the training of

specialists in various fields. The results of our study of existing approaches and methods for using computer graphics showed that, mainly, it is used as a means of visualizing decisions made and is practically not used as a means of obtaining new knowledge and information about the world around us. However, modern graphic packages can be used additionally as a means of intensifying the process of obtaining new information about the real objects around us. We know that the drawing of any volumetric body is an imitation of three-dimensional space on a flat two-dimensional sheet of paper.

The use of three-dimensional computer modeling makes it easier to understand the construction of a real volumetric body, and also makes it possible to trace spatial lines of connections using a wireframe model of the object and, ultimately, to obtain a realistic visualization using the imposition of textures and patterns. The use of three-dimensional computer modeling allows students to create visual images of geometric concepts themselves. Many concepts known from descriptive geometry, presented intuitively so far, reveal their essence more deeply and become understandable precisely on the basis of their figurative perception. One of the important stages in developing the methodology was the selection of a graphic package that meets the requirements of the teaching methodology. We defined the following as the main requirements: the ability to create two-dimensional drawings; a diverse range of tools for modeling volumetric objects; the ability to decompose a three-dimensional object into a plane using viewports; visualization of the model from any point of view; accessible tools for editing the shape and proportions of the model; the ability to tint the model, change its illumination; user-friendly interface; accessible machine resources; a price affordable for educational institutions.

RESULTS AND DISCUSSION

The use of three-dimensional solid modeling allows you to create a visual image of an object, use color, animation, but, nevertheless, should not distract the attention of students from solving the tasks. The ability to analyze an orthogonal

drawing of a geometric object, to dismember its complex shape into simple constituent geometric bodies - will allow you to easily move from 3D models to flat drawings, while significantly simplifying the process of editing drawings. The AutoCAD package is used by many universities, as well as many enterprises, construction and architectural firms, firms designing furniture, interior design, landscape, etc. The AutoCAD system is a powerful graphic core, on which many application packages are based, both from Autodesk itself (Mechanical Desktop, Architectural Desktop, Land Development Desktop, etc.), and a huge number of programs and systems from Autodesk partners and independent manufacturers.

The main task is to teach students to use this graphic package, bringing their skills to the level of performing drawings of any complexity. Users who have mastered flat drawing, in most cases, believe that three-dimensional modeling is something complicated, requiring special efforts and costs to study, and that drawing in space itself is much more difficult than drawing on a plane. In fact, everything turns out to be exactly the opposite, which they are convinced of immediately after mastering spatial drawing [47].

Let us list some of the main advantages of spatial modeling in the AutoCAD environment:

Visualization. A spatial model always looks more realistic than a flat one, even if it is far from a real object. A spatial model can be viewed from any side and from any point in space, you can make it continuously rotate around the axis of rotation at a given speed. It is possible to check the interaction of its individual parts with each other and view the model from the inside by drawing flat sections. The ability to remove hidden lines and create a realistic view is especially effective if you use the coloring and tinting methods.

Possibility of conversion to 2D. A spatial body can always be converted into flat views, which combines both drawing methods well.

Simultaneous reflection of changes. An undoubted advantage of spatial drawing is the synchronous reflection of changes on all types of the model when they are made on one of them.

Possibility of output to devices for creating volumetric bodies. Computer models in AutoCAD can be used to create real physical objects on special machines.

Creation of presentations and documents. Spatial models can be realistically colored and tinted, which is used to check the correctness of the created model and when creating presentations, advertising materials and all kinds of reports and documents.

Possibility of conducting engineering analysis and extracting characteristics such as area, mass and moments of inertia required for production. Particularly useful is the ability to obtain all moments of inertia relative to arbitrary coordinate axes.

Three-dimensional coordinates. There is a full-fledged possibility of entering Cartesian, cylindrical and spherical spatial coordinates.

User coordinate systems. To work at different points in space, you can use a movable coordinate system, to which you can repeatedly return if necessary, if you assign it a unique name. The graphic area of the screen can be divided into multiple viewports, in which you can view the spatial model from different points and directions in space.

Possibility of using three types of spatial models. Wireframe models consisting of combinations of arc segments, circles, ellipses and other graphic objects placed in space. These models seem to be made of pieces of wire connected to each other. You can stretch a surface over the frame, which is very convenient to do, since there are already ready-made points for its binding.

Surface models. This is the next step in creating realistic objects consisting of a combination of various surfaces, of which there are a huge number in the program.

Solid models, which are similar to a real object and consist not only of lines and surfaces, but also of volumetric bodies.

Graphic competence includes personal qualities of students aimed at adequate application of knowledge in professional activities. To be competent means to be able to make a conscious and creative choice of optimal ways to solve professional problems from a variety of alternative approaches, taking into account its consequences for the enterprise and society, to be able to think systematically, comprehensively, independently on the basis of modern means and methods. When designing the educational process for training future engineers in graphic disciplines, we identified the following foundations for the formation of graphic competence of technical university graduates:

1. Working with information sources, including graphic:

1.1. knowledge of what information sources exist;

1.2. ability to use various elements of graphic information;

1.3. ability to use applied graphic computer technologies;

1.4. ability to find the necessary source of information not only in educational tasks, but also in real professional activities.

2. Processing and presentation of results:

2.1. ability to highlight unreliable and questionable results of solving graphic problems;

2.2. ability to find alternative and additional information; 2.3. ability to generalize, compare and contrast data from graphic problems, express your opinion on the issue under consideration and argue it;

2.4. ability to create a graphic document (drawing) and present the results of your work.

3. Use of computer technologies:

3.1. ability to read graphic documents on a computer, work with drawings in various graphic programs or import them into another graphic program;

3.2. ability to enter and design design documentation on a computer;

3.3. ability to work with Internet tools.

In the course of the study, we developed a system of diagnostic tasks to identify the development of graphic competence of future engineers through the subject "Engineering Graphics and Descriptive Geometry". Carrying out this methodology does not require specially allocated class hours; it is enough to include these tasks in the course of practical classes in the semester. For each indicator, two types of tasks have been developed: basic and advanced, and correct answers, a score and a definition of the levels of performance are presented. For example, as an answer to the question "the ability to use applied graphic computer technologies", it is proposed to select the necessary buttons on the AutoCad toolbar to complete a given drawing. The score is higher if all the buttons on the toolbar are used and their purpose is described. Another example of an answer to the question "the ability to highlight unreliable and questionable results of solving graphic problems". In the proposed drawing, it is necessary to highlight and correct errors, the student receives the highest score for the ability to find and correct all errors. This technique is of an original nature, can be used at various stages of the formation of graphic competence. Evaluation of graphic competence is complicated by the fact that the object of evaluation is the ability of students to perceive, evaluate and process information that varies in nature, content and quality. When assessing graphic competence, it is necessary to consider the totality of knowledge, abilities, spatial thinking skills, actions, decisions made. The key component in this case is skills, because what has been learned must be applied in real professional activities.

CONCLUSION

An important factor in the formation of graphic competence is the ability to select tools and skills in using them in the process of studying special disciplines in senior courses when solving professionally oriented problems in course and diploma projects. During the experiment, positive dynamics of the values of graphic competence levels for the identified indicators was noted, as evidenced by the results of diploma theses and master's studies, positive feedback from managers and teachers of disciplines in the specialty. The study covered only one of the areas in solving the

problem of teaching graphic disciplines at a technical university and determined the need for further development and theoretical justification of a more complete set of technologies for the formation of professional competence and diagnostic methods in order to improve the quality of training highly qualified specialists. The formation of graphic competence is expressed in the possession of modern automated design tools, the presence of stable motivation to use modern computer technology, possession of skills that ensure the effectiveness of professional activity in a modern competitive environment, and the creative focus of professional activity.

REFERENCES

1. Белоновская И. Д. Инженерная компетентность специалиста: теория и практика формирования: монография. – М.: Дом педагогики, 2005. – 253 с.

2. Зеер Э.Ф., Павлова А.М., Сыманюк Э.Э. Модернизация профессионального образования: компетентностный подход. – М.: Московский психологосоциальный институт, 2005. – 216 с.

3. Зимняя И.А. Ключевые компетенции – новая парадигма результата образования. – М.: Логос, 2003. – 34 с.

4. Федотова Н.В. Изучение графических дисциплин как фактор формирования профессиональных компетенций будущего инженера // Психолого-педагогические основы профессионального становления личности: всероссийская научная конференция. – Махачкала, 2010 – С. 166–170.

5. Гусева, В.Е. Изучение графических редакторов как средство формирования профессиональной компетентности менеджера // Ярослав. пед. вестник. – 2012. – Т. 2, № 4. – С. 206–208.

6. Федотова, Н.В. Формирование графической компетентности студентов технического вуза на основе трехмерного моделирования: автореф. дис. … канд. пед. наук. – Тамбов, 2011.

7. Тангиров Х.Э., Маматкулова У.Э. Значение мотивации в использование электронного средства обучения по математике //Научная дискуссия: инновации в современном мире. – Т. 8. – №. 28. – С. 114-119.

8. Тангиров Х.Э., Саттаров А.Р., Шукуров Э.Х. Методические аспекты применения информационных технологий обучения //International scientific review. – 2016. – №. 8 (18). – С. 82-83.

9. Тангиров Х. Э., Хасанов З. Ш. У., Баходиров З. И. У. Интеграция уроков английского языка и информатики //Science and Education. – 2022. – Т. 3. – №. 5. – С. 1389-1391.

10. Tangirov K.E., Jomurodov D.M., Murodkasimova S.K. The importance of e-learning and e-learning resources in individualized learning // Asian Journal of Multidimensional Research (AJMR), 2021. Vol 10, Issue 3, March, 2021. – pp. 464-469. http://dx.doi.org/10.5958/2278-4853.2021.00176.2

11. Tangirov, Kh E. "The use of electronic educational resources for individualization in the process of teaching algebra in schools." European Journal of Research and Reflection in Educational Sciences. United Kingdom: Progressive Academic Publishing. Vol7 3 (2019): 43-48.

12. Tangirov, K.E., Mamatkulova, U.E., & Khasanov, Z.S. (2022). Possibilities of individualization of learning in interactive electronic information and educational. Mental Enlightenment Scientific-Methodological Journal, 2022(1), 166-175.

13. Tangirov K.E. Using Electronic Educational Resources for Individualizing Algebra Teaching Process at Schools // Eastern European Scientific Journal. – 2019. – №. 1.

14. Tangirov, K. E., & Rakhimov, O. S. (2023). Considerations On Modern Programming Languages. Mental Enlightenment Scientific-Methodological Journal, 4(03), 180-187.

15. Ergashevich, Tangirov Khurram, and Khasanov Zafar Shavkatovich. "Use of electronic educational resources in the educational process." Cutting edge-science (2020): 89.

16. Tangirov H., Sattarov A., Shukurov E. Methodical aspects of application of information technology training // «International scientific review». (2016): 82.