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PROFESSIONAL COMPETENCE OF FUTURE ENGINEERS-TEACHERS: TECHNOLOGICAL ASPECTS

У статті зроблена спроба виділити з професійної компетентності майбутнього інженера-педагога одну з основних складових – технологічну компетентність і характеризувати її елементи.

Ключові слова: *технологічні знання, конструктивні, графічні уміння, проектна діяльність, педагогічні умови, проблемний метод.*

В статье предпринята попытка выделить из профессиональной компетентности будущего инженера-педагога одну из основных составляющих – технологическую компетентность и характеризовать ее элементы.

Ключевые слова: *технологические знания, конструктивные, графические умения, проектная деятельность, педагогические условия, проблемный метод.*

An attempt to select one of basic constituents from the professional competence of future engineer-teacher is undertaken in the article – technological competence and to characterize its elements.

Key words: *technological knowledges, structural, graphic abilities, project activity, pedagogical terms, problem method.*

Statement of purpose. The high level of modern technologies demands a high professional level of specialists involved in the process, their intellectual development, critical, analytical thinking, and the ability to make the right decision. Such a specialist must know the characteristics of engineering and technology of the specific branch of industrial production, possess practical skills of its implementation, and create methods of different technologies in conducting theoretical and practical training.

All of the above mentioned qualities that characterize the professional competence, should certainly be formed during the training in higher educational establishment and continue to develop in future work. The activities of the engineer-teacher are characterized by technical and technological components in a particular field of industry.

Therefore, the level of training of future specialists in many respects depends on the professional and pedagogical competence of the engineer-teacher of vocational education, emerging of a set of competencies, including the technological competence.

Analysis of recent research and publications show that the problems of formation of professional competence are given great attention by foreign and domestic researchers, who in their works involve some aspects of the formation of technological competence but, unfortunately, on the whole, the forming of this competence is studied very little. The solution of the problem of formation and development of design and technology knowledge and skills in combination with individual approaches engaged A.A. Verbitsky, D.V. Sannikov, I.A. Radchenko, G.A. Shilnikova, and V.E. Steinberg. But still the problems of formation of technological competence of future engineers-teachers of vocational education are not disclosed.

The purpose of the article is to reveal some elements of engineers and educators who are the main aspects in the formation of the technological competence of students in the learning process at the university.

The main material. Technical and technological activities of engineer-teacher provide a full implementation in a particular area of production capabilities, using the achievements of science and technology, to create and implement new production processes, technical-technological, organizational and management innovations to improve the efficiency and personal activities, and production in general.

The occupation of the modern engineer-teacher is in the system "man-man" because his activities involve besides technical and technological processes also intellectually creative character, communication skills, presence of reflection, realization of organizational and management skills. Engineer-teacher should constantly update and create new educational programs, improve and develop curriculum, syllabus of academic disciplines, look for new and upgrade existing educational technology.

The formation of technological competence of future teachers of vocational education (by branches) has much in common, but still training in each specialty has its own specifics, so the process of formation of such competence may not be the same. In this regard, it is advisable to point out two aspects in this process: pedagogical – the universal (general) for all specializations, and professional, which will be formed depending on the profile of training. The possession of these competencies will form the technological competence.

A.A. Verbitsky under the domain of technological competence understands the degree of comprehension

of the content of training and education, effective teaching technologies, ability to pedagogical innovation, including the ability to conduct research in the field of effective teaching practices and implementation of their results in practice in the process of preparation of different specialists [1].

N.N. Manko treats the technological competence as a functional system of creative and technological knowledge, abilities and stereotypes of instrumentalized activity on the transformation of pedagogical activity [2].

For engineering and pedagogical educational space, the term "technological competence" can be interpreted in two ways: from the point of view of pedagogical sciences, and from the point of view of technical sciences, as the construct "technology" is widely used in these sciences. As the teacher of vocational education has also bioprofessional direction, we believe that the concept "technological competence" of engineer-teacher should reflect both pedagogical and professional orientation, which is a work for the transformation of material and spiritual values.

This activity includes the choice of methods and techniques of teaching, development of teaching materials on different disciplines of professional training, which must contain specific information set out competently, efficiently executed drawings, diagrams, pictures. Consequently, the future engineer-teacher training while studying at the university should be formed technological competence, allowing to form a high-level technological competence in students.

Under the technological competence of the engineer-teacher we understand a universal characteristic of personality, which is a highly organized system that includes integrity of knowledge, skills, experience and personal qualities, which is linked to the quality of the teacher in technical and educational fields, allowing skillfully perform certain professional activities.

Technological competence is an integral personal and professional qualities of a person, reflected in the willingness to apply the relevant competencies for a successful, productive and efficient work with the social consequences and risks, the capacity for effective interaction with the outside world, which is a specific section of the general professional competence.

Thus, in the technological competence of the engineer-teacher professional education, we include:

1) technological knowledge and skills to develop techniques and methods of joining parts and assemble products, their drawings in accordance with the requirements, taking into account the properties of materials and processing methods, the development of design documentation for their manufacture;
2) good knowledge and skills to match necessary educational information (texts, pictures, maps, charts, tables, etc.), to create your own choices of educational information, visual teaching aids, lecture notes, reference texts, reference summaries, the choice of methods of training, special training facilities for the training session;
3) graphical knowledge and skills of creating visual tutorials and training tools at a high aesthetic level, the design of drawings in accordance with ESKD, including information and communication programs and technology.

The process of formation of technological competence must be integrated in multiple disciplines, as its components can not be formed within a single discipline. Technological competence is more focused on the practical basis for the realization of the educational process, its activity aspect. And only a constant technological activity helps students form their technological competence.

In this regard, at various cycles of disciplines it is necessary to give students the tasks associated with these activities (for example, to develop a test on a particular subject, the reference synopsis, etc.). These tasks will promote the creation of integrated knowledge on the subject and, at the same time, will form constructive skills as a component of technological competence. It will also allow when studying various disciplines to implement bioprofessional orientation of training of future teachers of vocational education, that is, to ensure the relationship of psychological, educational and professional training.

Experience shows that there is a need to identify ways and means of forming such a component of technological competence as technological knowledge and skills, as students are experiencing great difficulty in mastering disciplines related to the design of products that involve the development of design drawings based on the properties of materials and requirements to future product. In developing such drawings calculation formulas are used which you need to know and understand.

The methods of formation of technological competence should include a problematic method of teaching in which students are not given ready-made formulas for the construction of the drawing. They develop their own under the guidance of a teacher, which helps students acquire in-depth knowledge, as each calculation formula is justified, and the reasons of its occurrence are revealed. Students not only better remember the material, they form a logical chain of construction, and are able to develop a drawing without additional sources of information.

To implement the problematic teaching method it is required to use visual aids, such as an electronic summary with the effects of animation, with consistent appearance of the name of the drawing with the selected design section, and then the calculation formula, as it is in the best didactic principles: visual aids, accessibility, systematic and sequence character.

The process of formation can not be effective without regular, full and objective information about how students understand the material, how they apply their knowledge to solve practical problems. That's why, the system of students' knowledge and skills diagnostic should include different types of control: oral interview, a written test and control, including automated, etc.

Most means of teaching involve the use of drawings, so the engineer-teacher must possess not only design and technological knowledge and skills, but also graphics and models. In the conditions of modernization and computerization of education it is also important to know how to develop drawings in an automated mode. The need to use information technology faces the engineer-teacher in connection with the development of high-tech industries and innovation, which in its turn requires a systematic improvement of the educational and technological training of the workforce, clarifying the tasks that confront the vocational education system in general, and an engineer-teacher, in particular.

A special role in shaping the technological competence is given to the training of future teachers of vocational education, to the automation of drafting work, which will allow to design drawings for various training facilities, course papers, thesis projects using computer hardware and software (AutoCAD, CORL, COMPAS, etc.), and will eliminate the drawbacks of manual labor.

To judge the technological competence can only be in terms of formation of its constituent competencies, namely: design, graphics, information, technology, calculation knowledge, skills and abilities, a certain level of experience in their implementation.

In the industrial, technical and technological activities of the engineer-teacher of great importance is the activity that is leading in definition, formulation and solution of the design and engineering tasks, as well as the implementation of the results in practice. E.F. Zeer states that formation of the design skills, general pedagogical skills for the design and content of technology student-oriented education, developing the design of a training space, as well as vocational and educational planning process is the primary professional and pedagogical task [3, p. 434–435].

During the project work the students have professional and creative growth, because the projects in the specialty that are performed as a variety of forms of training are closely related to their future profession and provide creative research, design, modeling, and calculations. This contributes to the desire of the teacher-engineer to a permanent self-development and self-improvement, the ability to implement innovations, and the formation of creative thinking. The level of technological competence allows him to be creative, to show his creativity in the field of production technology, and thereby achieve high results.

Therefore, we consider technological competence as the ability of a student effectively use a system of knowledge and skills on the production of products in specific situations, observing the sequence of process steps, processing conditions, according to the books of technological standards, safety and labor protection requirements. In accordance with this, the algorithm of the formation of technological competence can be represented as a process of gradual studying by learners the essential steps: adaptation, orientation, forming, appraisal and results.

In the vocational teacher education the future teacher may form and develop competencies (formation of which occurs in professional activities) under the implementation of the following pedagogical conditions:

- if the orientation process of higher education is implemented both as a generalized model of professional competence of the specialist, and the specific competence;
- if at each stage of learning students form not individual competences, but their system;
- if the generated technological competences have signs of creativity;
- if the orientation of the educational program is implemented for need-motivational, informative and technological support for the effectiveness of the individual in the process of creative solutions of professional tasks;
- if targeted training of students able to synthesize the tasks in a simulated and real professional activity is held;
- if students develop positive personal orientation on the formation of pedagogical skills.

Under the technological competence of teachers of vocational education we understand the integrative characteristic of the teaching results associated with the acquisition of future teachers the necessary personal qualities. They are expressed in acquiring:

- knowledge, skills and abilities in vocational education;
- a simple algorithm technology activities;

as well as the ability to:

- consciously apply their knowledge and skills in practice, depending on the specific situation and carry them from one sphere of activity to another;
- to solve the technological problems by means of innovative learning technologies;
- assign, develop and implement algorithms for processing activities;
- to organize technological, cognitive, and research activity and analyze the process and its results;
- to organize and design classes in core subjects;
- to organize the activities of students and technology necessary for society to shape the quality of the individual;
- develop educational tools and use it to improve the efficiency of the educational process and monitor the results.

Conclusions. Technological competence is aimed at the formation of personality traits necessary for the implementation of educational activities and solutions of various technological challenges, the successful implementation of technological activity, with the ability to predict, design, and analyze it.

Prospects for future research is to look for the priority elements of technological competence for future professionals in the learning process, and in the follow-up activities, and an appeal to the notion of the resulting units of competencies that form the basis for the formation of technological competencies for more specific use.

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