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## DUAL PROFESSIONAL COMPETENCE AS A DUAL CONENT OF VOCATIONAL EDUCATION THEORETICAL FOUNDATIONS OF SYSTEM DEVELOPMENT

**Abstract:** *The level of renewal of engineering and technical knowledge and competencies is steadily growing. The time between scientific development and the introduction of technology into production is the acceleration of innovation cycles in many areas. Modern engineering and pedagogical education meets the needs of society in vocational education services on the basis of training, retraining and advanced training of highly qualified teachers for the teaching of vocational and general technical sciences, as well as vocational training, vocational education and intended for the implementation of industrial training in enterprises of higher education. The pedagogical activity of the engineer-pedagogue is dual (two-way) and involves the synthesis of professional-pedagogical knowledge and skills: engineering and psychological-pedagogical. In addition, the professional pedagogical skills of an engineer-educator can be generalized [2], so the professional competence of such a specialist should also be generalized (dual), i.e., common to the internship teacher and computer technology professionals. The content of engineering training of a future engineer-teacher does not differ from the content of training an engineer in the relevant field, which leads to a conflict between the technical direction and the engineering-pedagogical activity of graduates.*

**Key words:** *duality system, dual content, innovation cycles, technical direction, pedagogical activity, vocational training, educator.*

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### Introduction

Given that the justification and development of the dual content of the professional training of future engineers-educators in the field of computers is a complex systemic problem, it requires careful complex analysis and development. It is possible to base the presentation on the need to develop a dual content of vocational training on the basis of a systematic approach to formalize the presentation of a dual content model to conceptual general scientific principles [2; 3; 4; 5].

According to the classification of content distribution [4; 6] we use the distribution of two subsystems of the system, similar to the internal and external infrastructure, to develop the dual content of

vocational training. In our case, the main component of one of the subsystems of the content of vocational education is included in both components, primarily as an intermediate with respect to external structural elements; second, it serves as one of the external (apical) clearly expressed elements.

### Literature Review and Methodology of Research

Thus, the first dual corresponds to the structural duality of professional training of future engineer-educators, which deeply combines the content of engineering and psychological-pedagogical training and works as an external subsystem.

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The second iduality is functional and is produced first as a result of dualization of the content of professional training of future professionals in the field of education. Such dual educational activity involves the simultaneous activity of future engineers-educators in the role of a student and in the role of a teacher of technical sciences.

Thus, the dual content of vocational education should consist of two dual subsystems: structural and functional.

In his research [7], N. Lazarev confirms that the structure of the content depends on the degree of definition and definition of the basic laws and principles operating in this field. Therefore, the basic laws in the field of professional training of future engineers-teachers allow the specialist to solve specific production, pedagogical, scientific and other tasks. That is, the dual content of vocational education should include information, skills, creative experience, and experience of emotional respect for truth.

N. Drozdov [8], V. Romanov [9], V. Spitsnadel [10] to ensure the development of professional qualities of future engineers-teachers and the development of management dual content to ensure the development of professional training of future engineers-teachers Requirements for the development of dual content creation systems:

1. The content of a dual system should create a set of qualitatively different elements that can be considered as a system that forms hierarchical structures.

2. The content of a dual system should be characterized by the presence of integral connections with the qualitatively different elements of the structural system and their properties. The presence of an integral link in the dual content system distinguishes it from the binary content system, which provides a conglomeration of separate engineering objects and objects of psychological and pedagogical training and activity. The main integrative relationships in the dual content of vocational education should be such as “single-general”, “general-general”, “general-single”, “general-specific”.

3. A specific organizational and structure needs to be developed to reduce the level of uncertainty in a dual content system. Linear and hierarchical structures are characteristic for dual-level structural subsystems, and the functional subsystem has a branched, concentric, and methodological structure.

4. The system of dual content of vocational training is determined by the following features: uncertainty and emergence. That is, the impact of system performance does not affect the performance of each subsystem individually, and the primary functions of the activity of each element of the system are incompatible with the functions of the whole system.

5. A dual system must be infinitely structured according to the fragmentation of the subsystems.

6. The dual content of vocational education should be characterized by the presence of the same characteristics and methods of analysis at any level of the system hierarchy.

## Results and Discussion

In our opinion, these requirements can be implemented in the development of a system of dual content in the future through the gradual expansion of the system of professional education of the engineer-educator.

In the development of a dual content system, the separation method allows the system to be subdivided into subsystems, which in turn can be divided into components. If the subsystems resulting from decomposition are not elementary, i.e., do not exist at the level of this description for use, they should be separated later. The division of a system into subsystems in the general case can be done indefinitely, and this is determined by the composition of the separation properties and the order of their use [9].

It is the most appropriate semantic network model to express the content of vocational training. However, the ability to implement features that meet the following requirements needs to be improved:

- taking into account mental processes, mechanisms of cognition and perception of knowledge;

- universality of developed hierarchical structures of elements in the structure of vocational education;

- providing systematic links between the objects of vocational education.

The first step in solving this problem is to develop structural models of the system in the dual content of vocational education, representing the interdependence of the engineering and psychological-pedagogical components of the dual didactic process. The science of psychology has developed a sufficient number of models to represent objects. Demonstrative models by F. Klis [11] and N. Lazarev [7] are the most effective.

Let us consider a descriptive model to express concepts in the memory of F. Klis man [11]. The author makes “character” a basic concept, thus understanding the generalization of all memory units. Complex characteristics and complex relationships between memory units should be considered as characteristics. The use of functions allows the separation of the classification of concepts.

The above concepts, based on philosophical, general scientific and psychological-pedagogical methods and models, allow:

- implementation of the logical order of the elements of the content of vocational education using a system of professional dual competence;

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- Systematic dualization of the content of engineering and psychological and pedagogical training of future engineers-teachers with the help of appropriate models;

- Implementation of the dual content model through the systematic regulation of the elements of technical and psychological-pedagogical training of future engineers-teachers.

To develop a system of professional dual competencies as a component of dual content theory in vocational education, we will consider existing approaches to defining professional skills.

Training of qualified specialists is one of the main goals of the educational process [7]. Engineering pedagogical education is dual in nature [12, p. 48]. Learning is determined by the structure of the engineering object and the structure of the pedagogical object, the structure of the specialized activity in a particular field of production and the corresponding pedagogical activity. That is, the dual level of vocational training content is observed at both the structural level and the activity level. These philosophical categories correspond to the relationship of 'space' and 'time' and are considered to be their direct reflection in the educational process.

The key to the problem of developing a system with dual professional competence is the distribution of professional activities as the basis for their development.

In order to develop the dual professional competencies of engineers-educators, we will consider the main approaches to the distribution of professional knowledge.

The main idea of dual professional competence is that the main result of professional training of future engineer-pedagogues is the ability and readiness of the specialist to work effectively and creatively in various socially important situations.

The main directions of the formation of professional competence of an engineer-educator can be identified through the analysis of the content and description of their activities, as well as professional activity.

Competence is not abstract, but emerges, opens up, and disclosed in the course of a specific activity. In this regard, it can be said that competence is the ability and culture to carry out a particular activity. This situation corresponds to the position of the Department of International Education, Development and Educational Standards: competent "concept is defined as the ability to carry out professional activities ..." [13, p. 20].

According to scientists [13; 14; 15], the specific features of the main professional competencies are:

- multifunctionality (having competence allows you to solve various problems in everyday life and professional activities);

- Belonging to the field of meta-education (is an interdisciplinary and interdisciplinary competence and can be used in different situations);

- potential capabilities (competencies require the presence of general and professional intellect (potential), abstract and professional thinking, self-reflection, self-determination, self-esteem and requires others);

- multidimensional (includes various mental processes: analytical, communicative, common sense, etc.) [16, p. 43].

The development of knowledge, skills and personal qualities is a final contribution to the formation of the competence of the future specialist, which is the ultimate goal of professional training. The educational process implements a generalized model of the specific profile of the professional activity of the specialist, according to which the student must have knowledge, master certain types of activities, process and develop professionally important qualities. Competence is the collection of information about things, objects, means of activity, subjects that ensure the quality of a particular job. A set of competencies constitutes the solution of a professional task in a particular area.

Analysis of scientific works [15; 17], today focused on the issue of identification and selection of competencies that will allow to determine the lack of a systematic, structured, coordinated and consistent list of professional competencies of future engineers-educators.

However, to develop a dual professional competence system, Dj. Ravenn [17] noted that competent components are in the process of realizing interests in humanity, as well as G.K. According to Selevko [15], competencies should be appropriate to the description of human activities and, therefore, their classification to classify core activities.

As a result of professional activity, any workflow is characterized by technological and organizational operations, as well as management operations. The name of the workflow is determined by the name of the technology.

Thus, the process of engineering-pedagogical work (professional activity) is manifested by dual activity and therefore defines dual professional competencies.

Professional competence is a matter of professional training and work to measure the tasks and responsibilities of the job, the measurement of compliance with the requirements of professional activity and the basic criteria.

Since professional competence implies a sustained ability to perform a particular type of activity, it is appropriate to characterize it with an activity approach. In this context, professional competence can be understood as one of the components of professional training for a particular type of activity.

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The proactive approach focuses on the formation of active work ability, working in all forms, including professional fields. The active paradigm of education changes the role of knowledge, the main goal of education becomes its component, its main goal is the means of activity. Thus, the learning process should create the necessary conditions for the acquisition of practical skills and should be focused on the acquisition of specialized knowledge and practical skills to further improve future professional activities.

It is advisable to use round (circular) models to represent a system of dual professional competencies. This suggests that the main problem in the application of structural-logical schemes of traditional presentation of the content of vocational education is the specificity of binary specialties. It implies the existence of a large number of elements of a didactic process that have a similar structure and have similar logical objects, connections, processes, and so on. This transforms the traditional structural-logical scheme into uncontrollable chaos of objects and the relationships between them. One of the directions of solving this problem is the rejection of the traditional form, which represents the structural-logical schemes, and the transition to a circular form with the separation of the dual elements of the system. In general, we talk about the use of the n-layer circular (circular) form of structural-logical models with a combination of dual elements based on dual relationships.

The main advantage of using the n-layer circular shape compared to the traditional structural-logical scheme is the appearance of a description of the objects, processes and events of vocational training in a dual specialization. This can be explained by the fact that in the integrated integration of engineering and

psychological-pedagogical objects are used components and processes of preparation for integrated dual blocks. Existing forms of information presentation are characterized by a high degree of differentiation, which makes it difficult to present and display dual relationships. However, this does not mean that only circular forms of information and traditional structural and logical schemes should be abandoned.

## CONCLUSION

Based on the results of the development of a model of a system of dual professional competencies of future engineers-educators in the field of information technology, its practical measures will ensure deep integration of engineering-pedagogical components in the teaching of engineering activities in pedagogy. This is done by introducing elements of the methodology of teaching technical sciences.

It should be noted that the change in the structure of professional competence and the distribution of dual systems of professional competencies fully meet the requirements of state educational standards and modern approaches to the professional training of future engineers and teachers of information technology. Thus, the following can contribute to the development of a system of dual professional competencies:

- optimization of the educational process;
- The formation of the professional direction of teaching and personality of students;
- Development of students' self-reflection and, as a result, improving the quality of education in technical sciences.

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