

Theoretical Analysis of Algorithmic Competence as an Object of Pedagogical Analysis

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Annotation: In this study, the algorithmic competence of students is theoretically analyzed as an object of pedagogical analysis.

Key words: Competence, competence, paradigm, competence-based education, competence-based approach, interactivity, dynamism, personal character, multidimensionality.

In the Republic of Uzbekistan, the development of higher education in the context of the formation of a digital economy is given close attention. This is evidenced by the adoption of a number of government documents. In particular, on October 5, 2020, Decree of the President of the Republic of Uzbekistan No. UP-6079 "On approval of the Digital Uzbekistan-2030 strategy and measures for its effective implementation" was adopted.¹

The study of the competence approach is devoted to the work of domestic and foreign scientists, such as: A.E. Abylkasymova, M. Zh. Zhadrina, K. Zh. Aganina, B. K. Igenbaeva, G. K. Bekkozhanova, R. A. Shakhanova, V. A. Bolotov, A. A. Verbitsky, I. A. Winter, V. V. Kraevsky, O. E. Lebedev, V. V. Serikov, A. V. Khutorsky and R. Barnett, J. Raven, W. Wester et al. [].

According to E. Zeer and E. Symanyuk, the priority orientation of the competence-based approach is aimed at learning, self-determination, self-actualization, socialization and development of individuality.² The main ideology of the competency-based approach is the focus on the result of education in the form of a set of competencies. At the same time, the competence-based approach does not contradict the traditional approach in education. Gaining knowledge, acquiring skills and practical skills is an integral part of vocational training. The implementation of the competency-based approach is impossible without obtaining a knowledge base and elements of functional literacy. We are talking about the practical application of this knowledge and skills, about their mobility in the constantly changing world of information and technology.

The study of the competence-based approach is devoted to the works of V.A. Bolotova, A.A. Verbitsky, I.A. Zimney, V.V. Kraevsky, O.E. Lebedeva, V.V. Serikova, A.V. Khutorsky and others [].

We will identify the main aspects of competence-based education by analyzing the works of O.E. Lebedev:³

- ✓ the purpose of competence-based education is to develop the ability to independently solve problems in various fields based on personal and social experience;
- ✓ the content of education - "didactically adapted social experience in solving cognitive ... and other problems";
- ✓ the meaning of the organization of the educational process lies in the organization of conditions for the formation of the experience of independent problem solving among schoolchildren or students;

¹. Указ Президента Республики Узбекистан от 5 октября 2020 года № УП-6079 «Об утверждении стратегии «Цифровой Узбекистан-2030» и мерах по ее эффективной реализации» // Народное слово. 2020.

². Зеер Э. Компетентностный подход к модернизации профессионального образования / Э. Зеер, Э. Сыманюк // Высшее образование в России. – 2010. – №5. – С. 23-30.

³. Лебедев О.Е. Компетентностный подход в образовании / О.Е. Лебедев // Школьные технологии. – 2004. – №5. – С.3-10.

✓ Assessment of the achieved results – determination of the level of education.

One of the distinguishing features of the competency-based approach is the formation of the student's ability for further self-education and self-learning.

Summarizing the above, we specify the goal of modern vocational education - the formation and development of general and professional competencies of students. At the same time, the training of specialists within the framework of the competency-based approach implies: an emphasis on the result of education, the activity nature of education, and the practical orientation of training.

Existing in pedagogy, the variety of interpretations of the concepts of "competence" and "competence" and the approach to learning based on them allows us to accept the interpretation of this concept that corresponds to the purpose of the study and is most suitable for building the theoretical basis of the methodology for developing competence. Some scientists (A. A. Verbitsky, V. A. Bolotov, V. I. Baidenko) consider these concepts as synonyms, while others (A. V. Khutorskoy, I. A. Zimnyaya, E. F. Zeer) as different concepts.

In the framework of this study, it is proposed to separate the concepts of "competence" and "competence", taking into account the point of view of I. A. Zimnyaya, who argues that "competence" is a broader concept than "competence": competence in the development process is integrated with other competencies, enriched with personal experience in practical activities, understanding aspects of this activity, taking responsibility for the result, the need for self-development, thereby "develops into competence".⁴

Summarizing the presented interpretations of the concepts of "competence" and "competence", in this study we will understand the concept of "competence" as a set of requirements for a person, the development of which is necessary to perform productive activities, and competence is an integrative, dynamic, personal quality of a person that determines his ability and readiness for this activity.

In order to determine the essence of algorithmic competence, let us consider the main characteristics of the generic concept of "competence", identified as a result of a theoretical analysis of the work of domestic and foreign scientists:

- interactivity;
- dynamism;
- manifestation in two aspects: resource (knowledge about the objects of activity, knowledge about methods and programs of action) and productive (ability and willingness to apply knowledge and skills in practice);
- personal character;
- Interaction with other competencies.

Since the main idea of the competency-based approach is to improve the quality of professional education, it is natural that the concepts of "competence" and "competence" initially have a professionally oriented context. The idea of a competency-based approach is an attempt by the education system to overcome the gap between the results of education and the requirements of society for the professional training of specialists. A specialist who has a certain creative, constructive and personal experience is in demand.⁵ The training of such a specialist,

⁴. Зимняя И.А. Ключевые компетенции – новая парадигма результата образования / И.А. Зимняя // Высшее образование сегодня. – 2003. – №5. – С. 34-42.

⁵. Болотов В.А. Компетентностная модель: от идеи к образовательной программе / В.А. Болотов, В.В. Сериков // Педагогика. – 2003. – №10. – С.8-14.

according to the competence-based approach, is the formation of professional, technological, social and civil competences of the individual.

Scientists-teachers who study the structure of competence (I. A. Zimnyaya, Yu. G. Tatur, A. V. Khutorskoy) define the following components of competence (including professional):

- cognitive component (possession of knowledge of the content of competence);
- axiological or motivational-value component (mobilization of forces for the manifestation of competence);
- praxeological or activity component (experience of manifestation of competence in standard and non-standard situations);
- Reflexive-evaluative component (self-assessment, self-control, self-development management, self-regulation of behavior and activities).

In this study, we consider it acceptable to represent competence as an integral structure of components: axiological, cognitive, praxeological and reflective

The main direction in the development of the algorithmic style of thinking is the development of the cognitive abilities of students. Authors A.I. Gazeikina and I.N. Slinkina identified the components of algorithmic thinking:

- the ability to formalize the task;
- the ability to break the task into separate composite logical blocks;
- the ability to determine the relationship of these blocks;
- the ability to build a solution to the problem based on blocks using the design method "bottom-up" or "top-down";
- The ability to analyze each blocks of solving the problem and suggest ways to optimize it.⁶

Exploring the educational activities of schoolchildren, V. Ya. Vilenkin introduced the concept of "algorithmic line" into consideration: he revealed the algorithmic nature of educational actions and proposed to introduce actions with algorithms when working with younger schoolchildren. We consider it appropriate to note that in the course of school mathematical training, the leading content-methodological lines are: the computational line, the functional line, the graphic line, the line of identical transformations, the line of inequalities, the line of equations and the algorithmic line. The characteristic features of any content-methodical line, including algorithmic, are described in the works of L. N. Udovenko and I. G. Sheina:

- ✓ permeating the entire course of study;
- ✓ development of a system of concepts that reveal the content of the line;
- ✓ The presence of connections within the line.⁷

The algorithmic line in the course of mathematics is a content-methodological aspect of teaching, oriented in a special way, penetrating into all mathematics teaching and receiving the greatest development when mastering the methods of algorithmization.

⁶. Газейкина А.И. Стили мышления и обучение программированию студентов педагогического вуза / А.И. Газейкина. – [Электронный ресурс]. – URL: [www.http://ito/edu.ru/2006/Moscow/1/1/I-1-6371.html](http://ito/edu.ru/2006/Moscow/1/1/I-1-6371.html) (дата обращения: 06.10.2021)

⁷. Татур Ю.Г. Компетентность в структуре модели качества подготовки специалистов / Ю.Г. Татур // Высшее образование сегодня. – 2004. – №3. – С. 20-26.

In accordance with the stages of algorithmization, the movement in learning along the algorithmic line involves the implementation of a sequence of actions for the use of algorithms in educational activities:

- ✓ an algorithm in the sense of a prescription or a guide to action (algorithmic skills act as a subject of training, the development of algorithmic activity within the framework of an algorithmic line);
- ✓ an algorithm in the sense of performing mental actions (algorithmic skills act as a means of obtaining knowledge, the penetration of an algorithmic line into other content-methodological lines).

The most important components of mathematical learning activities are operational and algorithmic actions. Performing these actions, the student follows a certain sequence in accordance with the planned result, while the main goal of his activity is the solution of a mathematical problem. In the process of teaching mathematics, the content of the algorithmic line is determined by the concepts of "algorithm", "auxiliary algorithm", "algorithm properties", "algorithm implementation" and is carried out by studying the main algorithms of the course and performing actions according to the algorithm, as well as (higher level) compiling and combination of known algorithms. When studying mathematics in the process of vocational education, the algorithmic line is a content-methodological component of education, covering all teaching mathematics and developing in the study of practical methods of algorithmization using modern information technologies.

In the mathematical training of future specialists in the HPE system, it is advisable to form algorithmic competence as a component of the professional competence of these specialists, in which algorithmization is presented as a stage in solving a mathematical problem. The generalization of the above allows us to clarify the concept of algorithmic competence: the algorithmic competence of a future ICT specialist is an integrative, dynamic quality of a person, which is revealed in the ability to use ready-made algorithms to solve a certain range of problems, combine them, compose new ones and choose the optimal algorithm, as well as the willingness to implement algorithmization in solving various problems of the professional sphere.

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2. Зеер Э. Компетентностный подход к модернизации профессионального образования / Э. Зеер, Э. Сыманюк // Высшее образование в России. – 2010. – №5. – С. 23-30.
3. Зеер Э. Компетентностный подход к модернизации профессионального образования / Э. Зеер, Э. Сыманюк // Высшее образование в России. – 2010. – №5. – С. 23-30.