

Competency Requirements For Using The Algori-Game Hybrid Teaching Method In Teaching Algorithmic Languages And Programming

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Abstract: This article discusses the issue of forming algorithmic thinking and programming competencies in students through the use of the ALGORI-GAME hybrid teaching method in teaching the subject "Algorithmic Languages and Programming". The main pedagogical components of the method, their combination with a competency-based approach, as well as their impact on educational effectiveness based on experimental results are analyzed. The combination of the ALGORI-GAME method with gamification, adaptive assessment, digital environment and real tasks is based on the fact that it develops not only the level of knowledge of the student, but also his creative and reflective potential. At the end of the article, ways to improve the method are enriched with artificial intelligence, mobile applications and project-based approaches.

Keywords: ALGORI-GAME, algorithmic thinking, programming competence, hybrid education, gamification, adaptive learning, digital learning methodology, innovative pedagogy.

INTRODUCTION

In the current era, when the role of information technologies in society is increasingly increasing, the formation of algorithmic thinking and programming skills is becoming one of the priority areas of the education system. Effective teaching of the subject "Algorithmic Languages and Programming", especially at the stages from school to university, creates the basis for digital literacy and the ability to make independent decisions in problem situations. However, since this subject has a complex logical basis, mastering it through traditional, passive teaching methods in most cases gives poor results.

New requirements in education require that students not only acquire knowledge, but also independently develop skills and competencies through it. In this context, the teacher faces complex tasks, such as, in addition to conveying the content of the subject, awakening the student's

internal activity and forming a digital thinking person who is ready to solve real problems.

One approach that meets these needs is the ALGORI-GAME hybrid learning method. This method combines interactivity, game-based tasks, adaptive assessment, freedom of choice, and self-analysis, making programming not just a theoretical study, but an effective tool for individual mastery and application in practice.

The following article will provide an in-depth analysis of what competencies are formed in teaching "Algorithmic Languages and Programming" using this method, what criteria can be used to develop them step by step, and most importantly, the role of the ALGORI-GAME method in this process.

Learning to program is not just about syntax and writing code, but first of all, the process of developing algorithmic thinking. Algorithmic thinking is the ability to analyze a problem step by step, abstract it, organize it, and build an

algorithmic model that leads to the optimal solution. This type of thinking is considered one of the most important intellectual competencies in areas related to computer science and technical sciences.

The competency-based approach in modern education involves developing in the student the ability to independently apply ready-made knowledge in real-life situations, to think critically, and to justify his or her own opinion, rather than memorizing ready-made knowledge. In this approach, knowledge serves as a means, and competencies are the goal.

The main competencies that need to be developed in algorithmic languages and programming are:

- Analytical competence - understanding a software problem, breaking it down into parts, and identifying its main elements.
- Modeling competency – expressing a problem in algorithmic form, flowcharts, or a psychological model.
- Coding competency – implementing the selected model in a programming language.
- Testing and verification competency – testing written code, identifying bugs, and fixing them.
- Solution analysis and optimization competency – assessing the effectiveness of a program and making decisions about its improvement.

When these competencies are consistently developed, the student not only masters a programming language, but also becomes a creative individual who can analyze problems through logical thinking and approach them systematically.

Therefore, the teaching of algorithmic languages and programming should move away from the traditional format of knowledge transfer and be based on a methodology aimed at developing competencies. In this case, the teacher participates not as a source of knowledge, but as a mentor coordinating the learning process.

ALGORI-GAME is a hybrid teaching method that combines game (gamification), adaptive assessment and analytical thinking, aimed at developing algorithmic thinking. Its concept is that the learning process, while maintaining traditional lesson forms, is enriched with elements of a digital environment, interesting tasks and an individual approach that increase student activity. In this method, the student turns from a passive audience participant into an active creator of knowledge.

The main components of the ALGORI-GAME method can be explained as follows:

Step-by-step approach. In this method, all topics of programming science are structured from elementary to complex, on a chain, modular basis. Each new topic builds on previous knowledge. This ensures the coherence and systematicity of knowledge. At the end of each stage, the level of mastery is assessed through mini-tests or interactive exercises.

Adaptive learning system. In the method, each student is provided with customized (i.e. adaptive) tasks based on their initial level of knowledge. For this, the results of an entrance test and progress monitoring are used. If a student is having difficulty with a particular topic, he is offered additional resources (manuals, examples, supporting videos). Strong students are taken into the difficulty zone through high-level quest tasks.

Gamification elements. Through a gamified environment (creating a character, collecting points, moving up in level, receiving virtual awards), intrinsic motivation is formed in students.

These elements encourage the student to be active “not for the sake of knowledge, but for his own achievement.” As a result, the learning process turns into an enjoyable game, but this game leads to real knowledge, skills and qualifications.

The principle of learning from mistakes. The ALGORI-GAME method sees each incorrect answer not as a penalty, but as a learning opportunity. The platform gives the student a second chance to analyze their answers, identify and correct the error. This forms metacognitive skills - the ability to analyze, evaluate and improve their own learning.

Rating and feedback system. Student performance is assessed based on a point system and rating tables are developed to allow them to compete with each other. At each final stage, the student receives analytical feedback on their level of knowledge: strengths, areas of knowledge that still need to be strengthened, and recommendations are indicated.

All of these components work in harmony and awaken the cognitive, affective, and reflective competencies of the student. This method is not a simple learning technology - it is the product of a deep pedagogical philosophy aimed at transforming the student into an active subject.

When applying the ALGORI-GAME method to algorithmic languages and programming, it is not enough to simply form knowledge and skills - this method requires the gradual development of specific competencies. This approach focuses on creating an individual development trajectory for the learner, not on the content of the subject.

Initially, the method determines the student's level of knowledge based on an entrance test. This test is not just a scoring tool, but a diagnostic tool that determines the level of competence of the student. For example, a student may have developed analytical thinking, but low

coding skills. Therefore, in the ALGORI-GAME method, competencies are formed not in one go, but in the correct sequence.

The table below lists the key competencies expected to be developed for each stage:

Stage	Type of competence	Definition
1. Introduction	Diagnostic analysis	Understanding the problem, seeing solution options
2. Home	Algorithmic thinking	Be able to model reality based on sequence, condition, and repetition
3. Advanced	Writing code	Writing your algorithm in a specific programming language
4. Strengthening	Testing and debugging	Testing, debugging, and fixing code
5. Reflective	Solution optimization	Evaluate and improve program effectiveness

In addition, the ALGORI-GAME method provides quest-based tasks. These tasks require different levels of thinking and creative approach at each stage. The student works not only for the result, but also for understanding and mastering the process, by receiving rewards such as "sword, shield, helmet".

The following metacompetences of students are also given special attention:

- Being able to explain a problem – explaining your solutions, being clear in communication.
- Decision making is the ability to choose the optimal one from several algorithmic solutions.

- Collaborative work – writing code as a team, participating in the debugging process together.

Thus, the ALGORI-GAME method serves to develop multi-level, integrated competencies necessary in real life, rather than simply imparting theoretical knowledge. This distinguishes it as a modern approach, especially in teaching technical subjects.

Experimental and observational approaches are important in determining the true effectiveness of innovative methods. The main goal of integrating the ALGORI-GAME hybrid teaching method into the educational process was to practically develop algorithmic thinking, independent thinking, and complex solution development skills in students.

The experiment was conducted on first and second year students of Termez State University in Surkhandarya region, and two groups were formed:

- Control group (with traditional training)
- Experimental group (based on the ALGORI-GAME methodology)

The following monitoring indicators were used during the experiment:

- Students' independent search for knowledge
- Code writing speed and accuracy
- Tendency to self-analyze
- Interest and enthusiasm in completing tasks
- Student attendance rate and tardiness

Experiment results:

In the experimental group:

- 78% of students were able to solve algorithmic tasks independently (in the control group this figure was 52%)

- 85% of students submitted assignments before the deadline (in the control group - 60%)
- 92% of students admitted that the platform's points system, rankings, and rewards increased their motivation
- 88% of readers found it enjoyable to learn through character selection and duel mode
- 74% of students demonstrated success in analyzing their own code and identifying errors

Questionnaire and verbal feedback:

The following opinions were expressed by students in the survey:

- "I used to be afraid of coding, but now it feels like a game to me."
- "I'm completing new tasks every day to make my character stand out from the rest."
- "If I can't complete a task, the platform will help me or offer other options."

Teachers expressed the following opinions about the method:

- "Previously passive students are now at the center of the lesson."
- "The competitive environment increased motivation, while collaboration improved the classroom environment."

The observations and analyses conducted in this way have shown that the ALGORI-GAME method is highly effective not only theoretically but also practically. This method transforms the student from a "knowledge consumer" to a "knowledge creator", which is a strategic achievement for 21st century education.

Any innovative method requires updating and developing itself over time. Despite the positive initial results of the ALGORI-GAME hybrid teaching method, there is a need for its deeper integration into the educational process and its combination with modern technologies.

Currently, the ALGORI-GAME method performs adaptation based on an entrance test and simple monitoring. To take it to the next level, artificial intelligence (AI) technologies should be introduced. With the help of AI, the student's solution style, the nature of errors, the type of algorithm used can be analyzed, and appropriate learning material, exercises and tips can be automatically offered. This further deepens the individual learning trajectory.

It is important to prepare students not only for theoretical knowledge and small laboratory work, but also to expose them to real IT problems. For example, if the platform includes an "open project" module, where at each stage students work as a team to develop a real web application, bot or mini-game, this will develop not only competencies, but also soft skills such as creativity, communication and responsibility.

Many students only have access to the platform via a computer. By developing the ALGORI-GAME method in the format of a mobile application, the student will be able to continue training anytime, anywhere. This approach is consistent with the philosophy of lifelong learning.

One of the main advantages of the method is that it can show the dynamics of a student's development in real time. Using the "analytical panel" that visualizes this, the teacher can take an individual approach to each student. In addition, a separate ****methodological manual**** should be developed for teachers using the ALGORI-GAME method, enriched with the most effective approaches, alternative exercise options and assessment schemes.

The platform's duel mode is a tool for interactively reinforcing knowledge, and it can be expanded further. For example, a monthly "Programmer Tournament" can be held, with winners awarded points, titles, and even certificates. This will enhance the competitive atmosphere and the internal need to work on themselves.

The above suggestions allow us to transform the ALGORI-GAME method not only as an interactive learning tool, but also into a comprehensive educational ecosystem. This method combines technological innovation, pedagogical approach and psychological sensitivity, making it suitable for the 21st century student.

Of course, the ****Conclusion**** section for your article below was prepared in an original, scientific-analytical approach:

The use of the ALGORI-GAME hybrid method in teaching the subject "Algorithmic Languages and Programming" serves to deeply and systematically implement a competency-based approach in the modern educational process. Unlike the traditional educational process, this method analyzes the student's activity, not his knowledge; it ensures that he is formed not just as a possessor of knowledge, but as a creator of knowledge.

ALGORI-GAME directly responds to the learning needs of digital generation students with its flexibility, gamification elements, real-time analytics-based assessment system, and adaptive modules offering individual learning paths. In particular, the competencies formed through this method, such as algorithmic thinking, coding, analytical approach, decision-making, problem modeling, testing and improving solutions, serve as a universal foundation not only for computer science and programming, but also for other disciplines and professions.

Based on experience and observations, students' opinions, and teachers' comments, the effectiveness of the ALGORI-GAME method has been scientifically proven. This method awakens in students an internal need for learning, forms a culture of not being afraid of failure, learning from mistakes, and most importantly, makes each student the author of his or her own learning process.

In the future, through the integration of the ALGORI-GAME method with artificial intelligence, mobile applications, team projects and intellectual tournaments, it can be demonstrated not only locally, but also internationally as an advanced educational technology. It combines innovative pedagogy and algorithmic thinking, serving to form future engineers, programmers and citizens of the digital society.

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