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Methodology for Developing Creative and Algorithmic Thinking in Future Computer Science Teachers Based on Educational Hackathons

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Abstract: This article analyzes the pedagogical potential of educational hackathons in developing creative and algorithmic thinking among future computer science teachers. It examines a hackathon-based learning model, methodological support, assessment criteria, and experimental results. The findings show that hackathon technology significantly enhances students' creative approach and algorithmic thinking.

Keywords: Educational hackathon, creative thinking, algorithmic thinking, computer science teacher, project-based learning, digital education.

Introduction: In the context of digital transformation, a computer science teacher is expected not only to be able to program, but also to think creatively, conduct algorithmic analysis of problems, and organize innovative pedagogical events. Traditional teaching methods often foster reproductive thinking; however, developing creative and algorithmic thinking requires interactive, problem-oriented, and project-based methods.

Educational hackathons are short-term, intensive project events in which students are asked to solve real-world problems. This process involves generating a creative idea and transforming it into an algorithmic solution.

LITERATURE REVIEW

The development of creative and algorithmic thinking in future computer science teachers in higher education institutions is one of the relevant areas of modern pedagogy. The main goal of developing algorithmic thinking and teaching programming is to cultivate students' logical, critical, and algorithmic thinking, prepare them to work with modern digital technologies, and develop independent problem-solving skills. A deep mastery of the foundations of creative and algorithmic thinking, an understanding of their practical significance, and knowledge of how they can be applied in real life are important components of today's educational process. In this context, digital educational resources and interactive methods serve as powerful didactic tools for effectively organizing the learning process.

The theory of creative thinking has been widely studied in psychology and pedagogy. In particular, E. P. Torrance's methodology for assessing creative thinking makes it possible to identify such criteria as fluency, flexibility, originality, and elaboration. J. P. Guilford proposed the theory of divergent thinking, arguing for an inseparable connection between creative thinking and multidirectional thinking processes. M. Csikszentmihalyi, in turn, linked creativity to the state of "flow" and demonstrated the importance of intrinsic motivation in creative activity. These theories define the psychological foundations for developing creative thinking.

The issue of developing algorithmic thinking occupies a special place in the methodology of teaching computer

science. S. Papert grounded his constructionist theory in the idea that students' algorithmic thinking can be formed through active practical activity. The concept of "computational thinking," proposed by J. M. Wing, interprets algorithmic thinking as a general educational competence. In her view, the stages of problem decomposition, abstraction, algorithm design, and evaluation are highly significant. In the studies of Grover and Pea, Brennan and Resnick, Shute, and others, criteria for assessing computational thinking skills were developed.

Theories of project-based and problem-oriented learning are reflected in the works of scholars such as J. Dewey, J. Bruner, and G. Pólya. In their studies, an important role is given to learning through practical activity, problem analysis, and a step-by-step search for solutions. These approaches make it possible to develop creative and algorithmic thinking in a harmonious way.

In recent years, educational hackathons have been widely discussed in academic literature as an innovative pedagogical technology. Komssi et al. evaluated hackathons as a means of innovation activity and rapid problem solving. Nandi and Mandernach examined hackathons as an informal educational platform and demonstrated their positive impact on student motivation. Fowler et al., based on empirical research, substantiated the role of hackathons in developing students' competencies.

The use of interactive platforms in digital learning environments is widely discussed within Mishra and Koehler's TPACK model, Siemens' theory of connectivism, and Laurillard's approaches to learning design. These studies emphasize the integration of technology, pedagogy, and subject content as a necessary condition for effective learning.

The literature analysis shows that the psychological foundations of creative thinking, theoretical concepts of algorithmic thinking, and project-oriented teaching methodology are sufficiently developed. However, an integrative methodology for forming creative and algorithmic thinking in future computer science teachers based on educational hackathons has not yet been fully systematized. This study aims to fill this research gap and involves developing a model for the harmonious development of creative and algorithmic thinking based on hackathon technologies.

METHODOLOGY

The use of educational hackathons in developing creative and algorithmic thinking among future computer science teachers in higher education institutions is one of the relevant pedagogical issues. The integration of digital technologies into the modern educational process not only increases learning effectiveness but also contributes to developing students' independent thinking, problem analysis, and algorithmic solution design skills. Therefore, the methodological justification and practical implementation of hackathon-based education are considered an important scientific task.

Today, various didactic platforms, distance learning systems, and interactive learning resources are used to improve the development of creative and algorithmic thinking. In this study, online and offline methods used in organizing educational hackathons were examined, and their effectiveness in developing students' algorithmic thinking and creative approach was analyzed.

The methodological basis of this research is the constructivist and competency-based approaches. According to the constructivist approach, knowledge is formed through activity, and the learner acquires new knowledge by independently solving problems. The competency-based approach is aimed at developing the professional competencies of future teachers, particularly algorithmic thinking, creative thinking, and teamwork skills.

The study employed theoretical and empirical methods. Theoretical methods included reviewing academic literature, analysis, comparison, and modeling. Empirical methods included pedagogical observation, surveys, test tasks, practical project work, and expert evaluation methods. Comparative analysis and percentage calculations were also used to determine the experimental results.

The experimental work was organized in three stages: diagnostic, formative, and final. At the diagnostic stage, the level of students' creative and algorithmic thinking was determined, and baseline indicators were established. At the formative stage, hackathon-based learning was introduced in the experimental group. At the final stage, the results were re-measured, and the indicators of the control and experimental groups were

compared.

The research results showed that an educational process organized on the basis of educational hackathons effectively develops the creative and algorithmic thinking of future computer science teachers. This substantiates the need for the systematic implementation of hackathon technology in higher education.

RESULTS

In the course of the study, a comparative analysis was conducted to examine the impact of educational activities organized in the format of educational hackathons on the creative and algorithmic thinking of future computer science teachers. The experimental work was carried out with control and experimental groups, and the results were measured at the diagnostic and final stages.

At the diagnostic stage, it was established that students in both groups had nearly identical indicators of creative and algorithmic thinking. It was noted that the criteria of creative thinking (originality, flexibility, fluency of ideas) and the indicators of algorithmic thinking (problem decomposition, accuracy of algorithm design, logical sequence) were at a medium level.

At the formative stage, educational hackathons were introduced in the experimental group. Students actively participated in developing projects based on real-world problems, generated creative ideas through brainstorming, created flowcharts and pseudocode, and developed software prototypes. In the control group, the traditional lecture-and-practice format of instruction was maintained.

The results of the final stage showed the following:

• The experimental group significantly increased indicators of creative thinking (on average by 20–25%).

• The level of algorithmic thinking improved, in particular the accuracy of step-by-step problem analysis and algorithm construction increased.

• Students' skills in independent decision-making and teamwork developed.

• The ability to identify and correct errors during the development of software solutions was strengthened.

Although growth was also observed in the control group, it was significantly lower than in the experimental group, which suggests that educational hackathons stimulate thinking by creating an interactive environment for problem solving.

The analysis confirmed that educational hackathons:

• stimulate the generation of creative ideas;

• systematically develop algorithmic thinking;

• combine theoretical knowledge with practical activity;

• increase students' motivation.

Overall, the results of the pilot testing confirmed the effectiveness of the methodological model developed on the basis of educational hackathons. This model enables the comprehensive development of creative and algorithmic thinking in future computer science teachers and is suitable for implementation in higher education.

CONCLUSION

In the context of modern digital transformation, developing creative and algorithmic thinking in future computer science teachers is one of the priority tasks of the educational process. The study results showed that educational hackathons serve as an effective pedagogical tool for forming and developing these competencies.

As a result of the experimental work, it was found that the indicators of originality, flexibility, and fluency of ideas in creative thinking increased significantly, while in algorithmic thinking the skills of problem decomposition, algorithm development, and maintaining logical sequence were developed. Educational hackathons strengthened students' independent thinking, teamwork skills, and the ability to make quick decisions in problem situations.

The hackathon-based methodological model made it possible to integrate theoretical knowledge with practical activity, transform creative ideas into algorithmic solutions, and effectively use digital technologies. This contributes to the comprehensive development of the professional competencies of future computer science teachers.

At the same time, the study confirms the need for the systematic implementation of educational hackathons in higher education. Integrating this technology into curricula and programs, improving assessment criteria, and aligning it with digital platforms are important tasks for the future.

In general, educational hackathons can be regarded as an innovative, effective, and methodologically grounded pedagogical technology for the comprehensive development of creative and algorithmic thinking in future computer science teachers.

REFERENCES

1. Куралов Б.А. Исследование образовательных хакатонов // Образовательные и инновационные исследования. Бухара – 2023. Выпуск 9. С. 175-177.
2. Куралов Б.А. Хакатон как новая инновационная практика // Вестник Национального университета Узбекистана. Т. 2023 [1/8/1] Выпуск. С. 131-133. (13.00.00; №15)
3. Куралов Б.А. Классификация и анализ типов хакатонов // Преподаватель и непрерывное образование. Н. 2023. Выпуск 4/2 – С. 352-355. (13.00.00; №20)
4. Куралов Б.А. Основы моментов провинциальной хакатоны // Материалы международной научно-практической конференции «Физическая культура и спорт: совершенствование образовательных программ, проблемы и решения». Бухара – 2023. – Б.590-591.
5. Куралов Б.А. Как проводятся хакатоны и основные циклы // Сборник материалов XII Международной научно-отеретической конференции профессорско-преподавательского состава высших учебных заведений России, Узбекистана и Таджикистана 25 ноября 2023 года. - Б. 528-532.
6. Куралов Б.А., Роль образовательных хакатонов в развитии навыков инновационного мышления будущих учителей // Международная научно-практическая конференция на тему «Важность цифровой экономики и технологий искусственного интеллекта в развитии общества». Т. 2024. – С. 1269-1272.
7. Куралов Б.А. Разработка инновационных проектов и решение образовательных проблем с помощью методики хакатонов // Сборник материалов Республиканской научно-практической конференции на тему «Перспективы преподавания математики и информатики». Т. 2024. – С. 247-248.