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Khumar Novruzova,
PhD in pedagogy,
lecturer at Baku Slavic University.
Baku, Azerbaijan.
https://orcid.org/0009-0007-1415-8457
novruzovaxumar@gmail.com

SYSTEM FOR TEACHING ALGEBRA USING ICT IN HIGHER PEDAGOGICAL EDUCATION

Abstract. In the current stage of development of the education system of the Republic of Azerbaijan, the application of ICT and innovative methods plays a priority role. It is well known that, in order to compete in today's global market, one must not only know a foreign language but also be able to use modern technologies in professional activities. Information technologies are increasingly becoming a decisive factor in the socio-economic progress of both nations and individuals. At the same time their implementation in education depends on the preparation of qualified personnel in this field, the trends in the development of the country's ICT infrastructure and the resolution of general issues. In the process of informatization of the education system, the teacher occupies a central position. The success of educational informatization largely depends on the level of the teacher's knowledge in the field of ICT and the extent to which they can apply these skills in teaching. Addressing issues such as the study of e-learning and educational management technologies, the development of electronic textbooks, research into international standards in this area, the use, evaluation and review of e-textbooks, the integration of ICT into educational institutions, and the conduct of scientifically grounded research in this direction is of great importance. As academician R. Aliguliyev noted, in modern education, chalk, blackboard, paper, and pencil should be replaced with modern computer tools; instructors should present their knowledge not in the form of traditional lectures but as multimedia content. Global experience shows that one of the main factors introducing new demands and responsibilities to school teaching staff is the modern educational model built upon the use of ICT. Consequently, enriching educators' knowledge in the field of modern technologies becomes increasingly urgent. Their fundamental knowledge in their chosen specialty, along with training in

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pedagogy and psychology, is no longer sufficient. Today's teachers are expected to select and apply modern technologies that align with the structure and goals of the subject they teach, consider the individual characteristics of learners and foster their harmonious development. ICT tools are among the means that can significantly simplify the teaching process while making it more dynamic and flexible. Incorporating modern technologies into the teaching model enables the organization of the educational process on an individual basis, stimulating learners' interest and motivation. Lessons conducted with ICT are engaging and memorable, enhancing learners' cognitive activity. Using multimedia tools, automated learning systems, modern application software and computer-based teaching programs in subject instruction fosters learners' intellectual engagement. Children living in the rapidly changing information society must learn to use modern technologies if they are to become highly qualified specialists in the future. Modern technologies should therefore be an integral part of the learning process, and their effective use in education is one of the pressing issues of contemporary education. Changes in the modern education system require pupils not to rely solely on past experience but to draw conclusions from practical knowledge gained through their own activities, and to build their learning process with an independent and creative approach to each subject. Innovation, in the context of education and science, implies the use of new forms, methods, and skills. The main requirement of our time is to build the teaching process in educational institutions using completely new, more dynamic, and innovative methods. The scientific novelty of this article lies in the justification and validation of a new methodological system for teaching algebra in higher pedagogical education through the use of ICT tools. Its theoretical significance is in strengthening students' overall scientific potential and intellectual development through algebra instruction, while taking into account the development path of algebra as a science, and providing education in line with the information society. The practical significance lies in identifying opportunities for using ICT tools in the teaching of algebra, ensuring the effective organization of the teaching process, eliminating inconsistencies between secondary and higher mathematics curricula, and thereby forming a systematic and consistent mathematical education. The proposed methodology can be used by university students and teachers, as well as young researchers, in their work.

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Keywords: teaching process; use of ICT tools; algebra; development; modern education system; systematic and consistent.

INTRODUCTION / ВСТУП

Statement of the problem / Постановка проблеми. The implementation of a student-centered curriculum in educational institutions, the provision of knowledge aimed at acquiring practical skills in mathematics lessons, as well as the use of ICT, require corresponding changes in the content of mathematical subjects in higher education institutions. However, the current situation is different: a high school student, educated under the aforementioned conditions, receives instruction through traditional lectures and seminars at universities, often without any use of ICT, which remains largely formal and does not provide an understanding of where the given topic or subject can be applied. However, higher education should equip students with knowledge, skills, and competencies that are essential in human life, and prepare individuals for practical activities and professional work. To organize the activities of higher education institutions more effectively, attention should be given to the quality of teaching, the professional development of faculty, and the use of new technologies in the educational process.

The traditional education system, which has existed since the 19th century, despite continuous development, has largely remained unchanged due to its socio-cultural orientation, and its potential has been exhausted to date. Graduates of higher education institutions face difficulties in making life choices. Education lags behind the realities of life and innovation. The absence of a structured model for innovative and creative activity in the training of future teachers is considered one of the shortcomings of higher education pedagogy.

The teacher factor, their role in society, and their activities have always been at the center of attention, and various studies have been conducted in this area. However, the modern era, as in many other fields, requires a new approach to the issues of teacher activity and training. “What should this approach be, and how should today’s teacher differ from teachers of the past?” is one of the questions that prompts reflection. New pedagogical technologies, innovative teaching methods, and interactive learning have already become an integral part of the educational process. Nevertheless, the primary factor must always remain the teacher’s ability to teach, impart knowledge, provide guidance, and demonstrate professionalism.

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The need for a radical transformation of the pedagogical education system is considerable. This is also evidenced by socio-psychological studies aimed at examining the training and adaptation of graduates and young teachers to the educational process. As a result of surveys conducted in 2013, it was revealed that 69 % of graduates and about 72 % of young teachers were dissatisfied with the education they received. Only 11 % of teachers with 2–3 years of experience successfully integrated into teaching activities without difficulties [4]. If we view the primary goals and objectives of future teachers not only as the transmission of knowledge but also as the development of students, and therefore as the mastery of developmental teaching technologies, we must remember that the knowledge and skills of these teachers should already be formed in the pedagogical universities currently in operation.

In research studies dedicated to the use of ICT in higher pedagogical education and the improvement of mathematics teaching, these issues have been examined from various perspectives. These studies have considered the application of ICT in teaching mathematical disciplines in secondary and higher education institutions, innovative teaching methods in lessons, as well as the methodology of teaching different sections of the mathematics curriculum in higher education – such as mathematical analysis, algebra, functional analysis, analytical geometry, and others. However, at present, due to the factors mentioned above, research on the use of ICT in teaching algebra is practically absent. The teaching of algebra courses in higher education institutions still largely reflects the level of the 1960s – 1970s. It should be noted that modern students and youth think differently and hold perspectives unlike those of previous generations.

Therefore, there is a pressing need for a new vision and a new methodological approach to teaching this subject. The demand for the use of computer programs in solving practical algebraic problems is growing. The use of such programs in the process of teaching algebra has long been known in many countries around the world. However, this problem remains unresolved in many universities of our republic. Contradictions have arisen between the high demands for training mathematics teachers and the traditional teaching of algebra in higher education institutions. These contradictions include the following:

- contradictions between the high demands of the information society and the low level of ICT infrastructure in universities;
- contradictions between the lack of connection and compatibility between the school mathematics curriculum and the university algebra curriculum, the

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dominance of practical problem-solving aligned with the school program in schools, and the shortage of such problems in university algebra classes;

- the inconsistency of modern pedagogical technologies used in the global education system for teaching algebra with the traditional methods of teaching algebra in universities of our republic;
- the absence of software materials reflecting current trends in the development of algebra, insufficient instructional hours for algebra, and problems arising in the assimilation of the material.

To resolve these contradictions, it is necessary to organize the effective use of ICT capabilities in teaching algebra and to create a student-centered learning process based on modern educational technologies.

Analysis of (major) recent research and publications / Аналіз (основних) останніх досліджень і публікацій. A review of the scientific and methodological literature on the use of ICT in teaching algebra makes it clear that, despite extensive research in this field worldwide, this topic has recently received little attention in Azerbaijan. There are a considerable number of research studies and methodological resources related to the use of ICT in algebra and its teaching at universities within the mathematics curriculum. However, the extent to which computer technologies should be employed in teaching algebra in higher pedagogical education, and which computer programs are most targeted and effective in Azerbaijan, remain insufficiently studied.

One such study is the dissertation by I. Bayramov, “System of Work on the Application of Information Technologies in the Teaching of Mathematics Courses in Higher Technical Education Institutions” [3]. The study addresses the teaching of topics in higher mathematics courses using the computer program Mathematica. It substantiates the use of Mathematica as a new information technology tool and examines its potential impact on the content and methodology of teaching mathematics in technical universities.

A study conducted by Evrim Erbilgin and Burçak Boz focused on the preparation of mathematics teachers in three countries – Finland, Singapore, and Japan. The researchers note that the aim of the study was to compare the teacher training policies of these countries with the corresponding policy in Turkey and to evaluate positive factors [8]. Another Turkish researcher, Eraslan, considers it impractical to apply these factors directly to Turkey and, as an alternative, suggests that school and university administrations pay closer attention to teacher activities [9]. Turkish researchers Ersoy and Erbaş, Dede, Yalın, and Argun have also identified numerous problems in the study of algebra, which is regarded as one of the most difficult branches of mathematics [10]. Assessment

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systems developed by researchers from the USA, Turkey, Singapore, Finland, Japan, and South Korea are presented in a comparative format. In 1995, Brian M. and Thomas attempted to clarify these issues by analyzing numerous studies from that period. Turkish scholars, Professor Gulsun Atanur Başkan and Ali Erkan Barış, analyzed these studies and expressed their viewpoints [10]. Among Azerbaijani scholars who have authored textbooks and methodological manuals and conducted research on the teaching of algebra, notable figures include R. Aliyev [1], Y. Bakhshalieva [2], I. Jabbbarov [4], and others.

The scientific and methodological literature addresses various issues related to the use of ICT in the educational process, the formation of new teacher-student relationships, the teaching of algebra in universities, and the application of mathematical software packages. Although recent peer-reviewed studies do not specifically examine the use of ICT in teaching algebra, they note the effectiveness of mathematical software packages and the positive impact of ICT on the learning process in general.

AIM AND TASKS / МЕТА ТА ЗАВДАННЯ

The ***aim*** of this article is to study the features, possibilities, and methods of using ICT in the process of teaching algebra to students of pedagogical specialties in higher education institutions.

Based on the research objectives, the following ***tasks*** can be identified:

- Organize the teaching of algebra in higher pedagogical education in a student-oriented manner and based on modern technologies.
- Strengthen the scientific potential and intellectual development of students, providing them with education in line with the requirements of the information society.
- Determine the possibilities of using ICT tools in teaching algebra, effectively organize the educational process, eliminate the gap between mathematics courses in secondary and higher education, and ensure the systematic and consistent formation of mathematical education.
- Ensure compatibility between the teaching of algebra at the secondary school and university levels.
- Differentiate the teaching of algebra from traditional methods and make it student-oriented through the use of modern pedagogical technologies.

THEORETICAL FRAMEWORK / ТЕОРЕТИЧНІ ОСНОВИ

The process of informatization of the algebra course in higher pedagogical education emerges as a necessary and natural requirement for the development

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of society. The criteria for educational technologies include conceptual integrity, systematization, manageability, effectiveness, and reproducibility. The connection between these criteria and the teaching of algebra must be substantiated in the pedagogical context, in the specific educational process, and adapted to the components of the content.

As for the role of ICT in the educational process, and particularly in teaching algebra, it can be noted that it provides visual representation, fosters independent student activity, develops logical and creative thinking, supports learning motivation, and creates an interactive learning environment. Thus, when a student works on a computer, they search according to their interests and inclinations, solve problems, take part in discussions, and in some cases even make discoveries. This is an important condition for student-centered education.

It is important to take into account both the positive and negative psychological factors of using ICT in the educational process. Student-centered education requires making education a sphere of self-affirmation. In this regard, the use of ICT provides students with freedom of action and the conditions for applying their knowledge. In the learning process, the teacher should provide students with interesting, practically significant, and useful knowledge, and strive to evoke positive emotions and interest through computer effects and created mathematical models [2].

The integration of algebra and computer science is implemented through the teaching of algebraic topics using computer programs. This makes it possible to teach students how to work with software in computer science, reinforce algebra topics, and accurately solve problems of various types. Organizing the teaching of algebra with the use of ICT requires addressing strategic, tactical, and situational tasks within the teacher's competencies as a member of society, as an individual, and as a professional.

It is considered appropriate to describe the methodological system of teaching algebra, taking into account its content and ICT support in higher pedagogical institutions, as follows *(Figure).*

The ICT component introduced into the methodological system should be considered in connection with all other components. Thus, when using ICT, it is necessary to organize lessons that are effective, useful, and engaging for the audience, taking into account the objectives, teaching methods, content, and so on. In this system, which is common to all studied subjects, the unique characteristics of each subject cannot be ignored. The development of algebra as a science, consideration of trends in teaching methodology, the evolution of modern algebra and the challenges arising within it, ways to overcome these

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challenges, and, finally, the integration of algebra with all mathematical and non-mathematical sciences – these factors must be specifically taken into account in the methodological system.

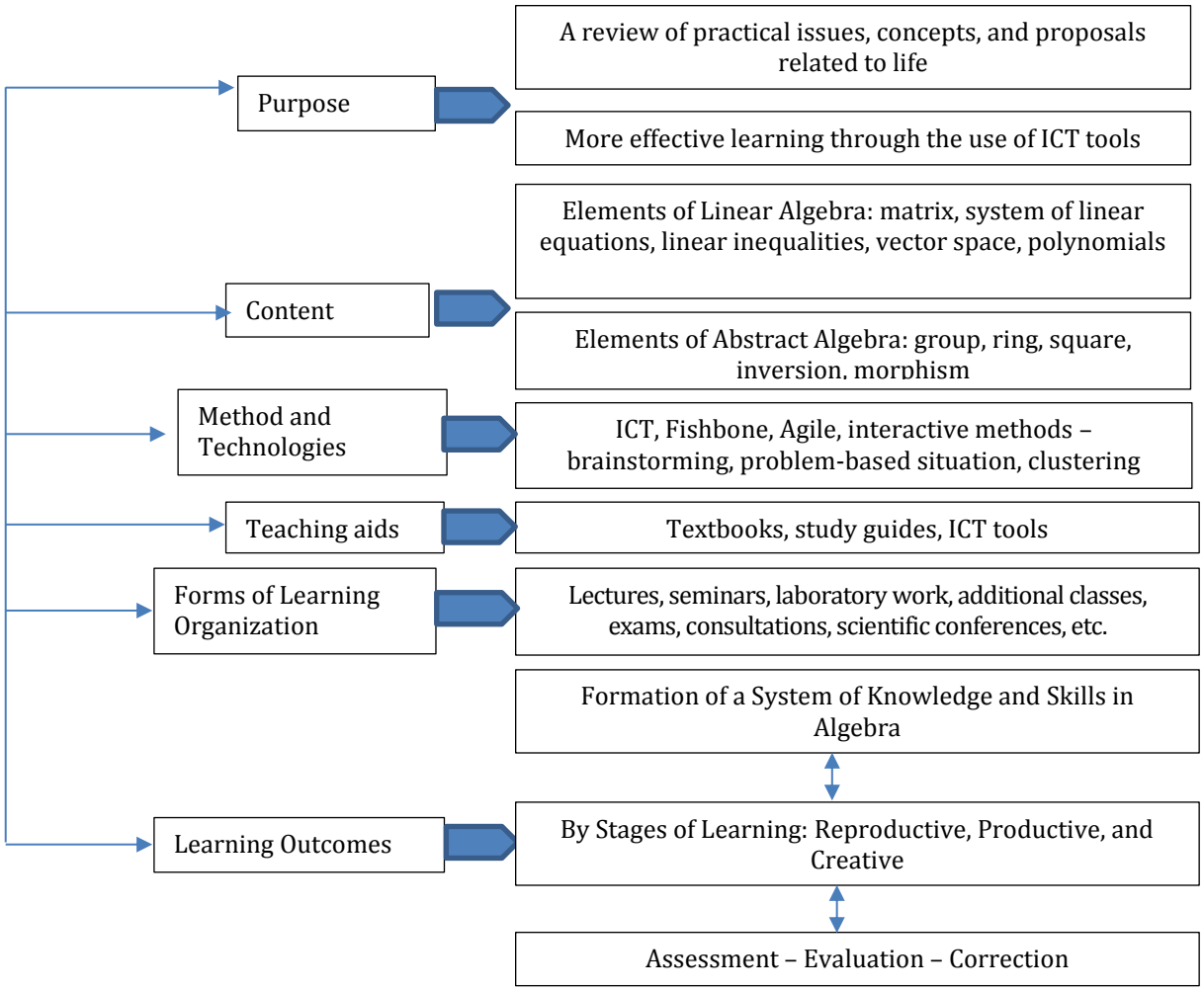

Fig. Methodological System for Teaching Algebra

In this system, which is common to all studied subjects, the unique characteristics of each subject cannot be ignored. The development of algebra as a science, consideration of trends in teaching methodology, the evolution of modern algebra and the challenges arising within it, ways to overcome these challenges, and, finally, the integration of algebra with all mathematical and non-mathematical sciences – these factors must be specifically taken into account in the methodological system.

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The main and foundational structural element in teaching algebra must be clearly defined so that the other elements of the system can be appropriately aligned with it. Based on research findings and the characteristics of modern algebra's development, it can be stated that the goal of algebra is to teach the effective solution of practical problems closely related to real-life contexts and activities, using ICT.

To achieve this goal, it is essential to cultivate the following factors, which positively influence students' intellectual development:

- The ability to reason freely, analyze, abstract, compare, generalize, conduct mathematical experiments, and identify patterns;
- Mastery of precise and concrete understanding of concepts, theorems, and proofs;
- Interest in algebra, fostered through historical examples and engaging problem-solving;
- Independent and creative engagement in solving non-standard problems, among other skills.

The proper choice of teaching methods plays a crucial role in the instruction of algebra. In the previous chapter, various types of new teaching technologies and their characteristics were reviewed and analyzed. It should be noted that the use of ICT is appropriate across all modern teaching technologies.

The third important element of the methodological system is the content of algebra instruction. Since this content should be aimed, on the one hand, at the logical continuation of mathematics education from secondary school and, on the other hand, at enhancing the professional training of future mathematics teachers, it should be understood as a system in which knowledge, skills, and abilities form a pedagogical unity [9].

Knowledge is an important component that integrates algebraic, logical, methodological, historical, general scientific, interdisciplinary, and intradisciplinary connections. In the process of studying algebra, knowledge is characterized by depth and completeness, meaningfulness, systematization, concreteness, and generality. This, in turn, depends, first, on the methodological approach and its reflection in curricula, textbooks, and study guides; second, on the pedagogical skill of the teacher and the ability to use educational technologies; and third, on the personal qualities of the students – their abilities, interest in the subject, and goals [5].

In pedagogical literature, the main components of higher education instruction are most often identified as the system of knowledge, the system of skills and abilities, and the system of attitudes (interests, needs, motives, etc.). The

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acquisition of knowledge can be carried out through reproductive, productive, and creative methods [3].

The organization of the educational process in higher education institutions is a complex task that should include the development of students' cognitive activity and the integration of all factors necessary for training highly qualified specialists. The educational process must be structured in such a way that, in addition to meeting the moral and intellectual needs of students engaged in learning activities, it also provides them with a comfortable and optimal working environment. This process can be organized in various forms. The main forms of learning organization currently used in higher education institutions are:

1. Lecture;
2. Laboratory, seminar, and practical classes;
3. Teaching practice;
4. Internship;
5. Completion of coursework (independent) assignments;
6. Completion of final or diploma projects;
7. Consultation hours;
8. Colloquia;
9. Organization of students' independent work.

The methodological training of a future teacher depends on three closely interconnected components: the content of instruction, the teaching process itself, and the students' learning activities. The content of instruction is determined at three levels: the assimilation of general theoretical material, the specific subject matter (algebra), and the instructional material [5]. The instructional material is primarily reflected in study guides and textbooks. The teacher's task is to guide students toward scientifically grounded theoretical knowledge, rich in scientific content, which enables them to expand their information base based on the instructional material.

Considering the specifics of teaching algebra in pedagogical universities, the following tasks can be highlighted:

1. Scientific and Philosophical Tasks:

- Investigate changes in the paradigms of subject activity in the context of the transition to an information society;
- Explore directions for reforming the education system in the context of a competency-based approach and the application of information and communication technologies (ICT).

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2. Theoretical Tasks:

- Conduct a pedagogical analysis of the role and place of computer technologies in accordance with the current level of educational development;
- Identify directions for developing the content of a mathematics teacher's activities in the context of rational digital use of ICT;
- Clarify the content of professional competence for mathematics teachers in the context of educational informatization;
- Formulate a model of the methodological activity system, including subject-specific and methodological training for future mathematics teachers.

3. Methodological Tasks:

- Develop educational content, a system of assignments, and teaching methods based on the tools of an interactive educational portal, applied within the methodological system for developing mathematical activities using a digital ICT approach and the block-modular technology methodology;
- Organize the use of, and publish, instructional-methodological complexes on computer science and mathematics, as well as methodological and technological training for mathematics teachers, for implementation in pedagogical universities.

Seminar classes primarily address three objectives: educational, developmental, and assessment-related. The conduct of seminar sessions is of great importance. First and foremost, these sessions help students develop self-confidence, cultivate a sense of responsibility, and enhance their independent activity, thinking, as well as research and creative skills. The role of seminar classes in the educational process is significant. In addition to acquiring specialized skills and abilities, students' knowledge is assessed during these sessions, which serves as a motivating factor in their learning activities. Thus, creating motivation is crucial for achieving high results; without it, it is very difficult to spark interest in the lesson or subject and to guide students toward scientific inquiry. For this reason, the proper organization and conduct of seminar classes is an important aspect of the professional training of future mathematics teachers, fostering their scientific activity and shaping their way of thinking.

A seminar is a form of instruction in higher education where theory is applied in practice. These are educational sessions that should be organized in such a way that students can maximally assimilate and retain the knowledge acquired. The term "seminar" comes from the Latin word *seminarium*, meaning a source from which something is developed or prepared. The purpose of seminars is to systematize, deepen, and consolidate the theoretical knowledge acquired by students, as well as to cultivate their skills in independent research and

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methodological inquiry [7].

In the modern period, the methodology for conducting practical classes occupies an important place in the training of future mathematics teachers. It is during these sessions that the level of students' knowledge and the extent of their mastery of the instructional material can be assessed. The primary goal of such classes is not limited to systematizing, deepening, and consolidating theoretical knowledge. At the same time, they involve the development of intellectual activity and research skills, which are essential for a mathematics teacher.

During seminar sessions, the following issues are addressed [7]:

1. The student, when presenting, demonstrates the degree of mastery of the topic and their attitude toward it. This creates two-way communication, where both the student's understanding of the topic and their own questions and ideas are discussed.

2. The student, as a listener, attentively follows the speaker and assimilates the material they need.

Various teaching methods can be used in seminar classes [7]:

- Oral methods – discussion, commentary, essay, report, presentation, etc.
- Visual methods – illustration, demonstration, slideshow, etc.
- Written methods – glossary, crossword, block diagrams, construction of tables and algorithms, adaptive testing methods, etc.

For example, when teaching group theory, one of the fundamental topics in algebra, seminar sessions can involve the use of tables, algorithm construction, as well as student-prepared reports, presentations, and test assignments on the topic. Typically, each of these tasks is created using ICT in the form of presentations. The teacher's task is to identify and apply the appropriate combination of these methods, thereby ensuring a more effective conduct of seminar sessions.

An important stage of seminar sessions is the assessment of knowledge. Evaluation criteria should be defined for each session (and possibly for each section). These criteria should include the following requirements:

1. Objectivity – ensuring an accurate assessment of knowledge;

2. Completeness – taking into account the student's level of understanding of the topic, as well as the development of their scientific worldview on the subject;

3. Systematicity – understanding the facts on which the topic is based;

4. Variety – employing different methods of assessment [6].

Automated computer-based assessment during seminar sessions conducted using testing methods creates conditions for ensuring objectivity. At

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present, the above-mentioned forms of learning organization are preferred in higher education institutions in Azerbaijan. However, it should be noted that, considering modern trends in the use of ICT in teaching algebra, there may be a need to combine these forms. In the case of teaching computer algebra, it is more appropriate to conduct both lectures and seminar sessions in modern laboratories equipped with ICT.

Throughout a person's life, three main types of thinking are formed: practical-visual, visual-imaginative, and visual-theoretical. However, this does not mean that the previous type of thinking disappears with the emergence of a new type [2].

During the learning process, abstract-theoretical, practical-visual, and visual-imaginative thinking are developed, all of which are closely interconnected and influence one another. These types of thinking cannot exist independently. However, it should be noted that the principle of visuality applied in education has since evolved and been adapted to the requirements of the modern era. While in the past visuality was associated with pictures, tables, diagrams, and figures that students drew by hand – that is, objects they could physically interact with – today it has been replaced by two- and three-dimensional forms displayed on computer screens or monitors. It is impossible to draw three mutually perpendicular lines in physical space, but demonstrating them on a computer screen, interactive whiteboards, or displaying spatial figures using 3D programs (e.g., 3D Studio Max, Python, 3D Illustrator) helps students form clearer concepts and develop visual-imaginative thinking.

Today, the combination of lectures and seminars reflects the integration of algebra instruction in higher education into the global education system. The fact that these sessions are conducted within the framework of a three-way dialogue-"teacher-student-computer" – with the addition of an ICT component can be regarded as a success of the modern education system. The use of ICT tools in teaching algebra is situational, aimed at achieving effective results in teaching specific topics, ensuring objective assessment, and organizing students' work efficiently. However, the rapid development of the information society, permeating the field of education, not only changes the content of academic subjects but also leads to their implementation in a new format as entirely new subjects. In recent years, computer algebra has been taught in many higher education institutions worldwide. Therefore, it is important to pay attention to the methodological aspects of teaching this subject in research. Based on a review of the literature on computer algebra, it can be concluded that basic algebraic concepts are introduced from the very first lessons. Only after these concepts are

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mastered can they be effectively taught using mathematical software packages.

RESEARCH METHODS / МЕТОДИ ДОСЛІДЖЕННЯ

The following research methods were used in the study: theoretical analysis and composition; pedagogical observation; pedagogical interviews; document analysis; mathematical and statistical methods; and pedagogical experimentation.

RESEARCH RESULTS / РЕЗУЛЬТАТИ ДОСЛІДЖЕННЯ

As a result of the study, we concluded that in higher pedagogical education, the approach to teaching algebra should focus on depth rather than breadth. In other words, concepts should be mastered more thoroughly and in greater detail, proper motivation should be created for clearer understanding, and interactive teaching methods should be used. The methodological system for algebra should include objectives, methods, content, organizational forms, and teaching aids, as well as an ICT component. This approach allows algebra instruction to be organized more effectively, in accordance with students' interests and inclinations. The study presented a structural model of the methodological system for teaching algebra, including the ICT component.

The principles for using ICT in teaching algebra in higher pedagogical education should be clarified. Taking into account the content of algebra, the author has added the principles of generalization, integrativity, humanization, continuity, and practicality.

The teaching of algebra in universities still relies primarily on theoretical material. However, since its inception, algebra has developed as a science closely connected with real life and practical applications. This has led to a discrepancy between the level of development of the science itself and its teaching in higher education. This issue calls for a new approach to teaching algebra at the university level, a revised methodological framework, and updates to curricula and textbooks.

The effective use of ICT and mathematical software packages in teaching algebra in higher pedagogical institutions will lead to positive outcomes in course instruction. Such packages include GeoGebra, Mathcad, MatLab, Mathematica, and others. The use of these mathematical packages allows students to master only the essential algebraic knowledge while solving other problems with the help of the software. The research article highlighted that using mathematical software packages on computers facilitates the work of both teachers and students, enabling faster and more efficient mastery of the instructional material.

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CONCLUSIONS / ВИСНОВКИ

- The study also led to the following conclusion: in teaching algebra at higher pedagogical institutions, the focus should be on depth rather than breadth. In other words, to master concepts in greater detail and achieve a clearer understanding, it is necessary to create proper motivation and employ interactive teaching methods.
- In algebra lectures and seminars, the theoretical part – definitions of concepts, theorems, propositions – is usually taught, supported by practical exercises. However, students may not yet understand the significance of this knowledge for their future activities or where it will be applied. The study proposes using a new methodology in this area. Thus, by working through practical problems on the topics covered, considering real-life situations, and intuitively grasping the concepts, students can independently master the theoretical material.

Prospects for further research in this direction / Перспективи подальших досліджень у цьому напрямі. Due to the limited number of class hours allocated to algebra, it is necessary to organize additional consultations and various forms of activities on this subject, as well as to involve students in scientific conferences. This will help future mathematics teachers acquire not only mathematical knowledge but also a broader and more objective understanding of other subjects, thereby enhancing their professional skills. It would be advisable for algebra to be taught not over two semesters, but over three to four semesters, as Linear Algebra and Abstract Algebra. We also consider it necessary to conduct joint lectures and seminars on subjects such as “Algebra + Geometry,” “Algebra + Physics,” and “Algebra + Computer Technologies,” which are successfully applied in modern educational practices.

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СИСТЕМА ВИКЛАДАННЯ АЛГЕБРИ З ВИКОРИСТАННЯМ ІКТ У ВИЩІЙ ПЕДАГОГІЧНІЙ ОСВІТІ

Новрузова Хумар Тофіг гизи,
PhD з педагогічних наук,
викладач Бакинського славістичного університету.
Баку, Азербайджан.
https://orcid.org/0009-0007-1415-8457
novruzovaxumar@gmail.com

Анотація. На сучасному етапі розвитку системи освіти Азербайджанської Республіки застосування ІКТ та інноваційних методів відіграє пріоритетну роль. Загальновідомо, що для того, щоб конкурувати на сучасному світовому ринку, необхідно не лише знати іноземну мову, а й вміти використовувати сучасні технології у професійній діяльності. Інформаційні технології дедалі більше стають вирішальним фактором соціально-економічного прогресу як народів, так і окремих осіб. Водночас їх впровадження в освіту залежить від підготовки кваліфікованих кадрів у цій галузі, тенденцій розвитку

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ІКТ-інфраструктури країни та вирішення загальних питань. У процесі інформатизації системи освіти вчитель займає центральне місце. Успіх освітньої інформатизації значною мірою залежить від рівня знань вчителя в галузі ІКТ та того, якою мірою він може застосовувати ці навички у навчанні. Вирішення таких питань, як вивчення технологій електронного навчання та управління освітою, розробка електронних підручників, дослідження міжнародних стандартів у цій галузі, використання, оцінка та рецензування електронних підручників, інтеграція ІКТ в освітні заклади, проведення науково обґрунтованих досліджень у цьому напряму має велике значення. Як зазначав академік Р. Алігулієв, у сучасній освіті крейда, дошка, папір та олівець повинні бути замінені сучасними комп'ютерними засобами; викладачі повинні представляти свої знання не у формі традиційних лекцій, а як мультимедійний контент. Світовий досвід показує, що одним із головних факторів, що висувають нові вимоги та відповідальність до шкільних педагогічних колективів, є сучасна освітня модель, побудована на використанні інформаційно-комунікаційних технологій. Відповідно, збагачення знань педагогів у галузі сучасних технологій стає дедалі актуальнішим. Їхніх фундаментальних знань з обраної спеціальності, а також підготовки в галузі педагогіки та психології, вже недостатньо. Від сучасних вчителів очікується вибір та застосування сучасних технологій, які відповідають структурі та цілям предмета, який вони викладають, враховують індивідуальні особливості учнів та сприяють їхньому гармонійному розвитку. ІКТ-інструменти є одними з засобів, які можуть значно спростити навчальний процес, зробивши його більш динамічним та гнучким. Впровадження сучасних технологій у модель навчання дозволяє організувати навчальний процес на індивідуальній основі, стимулюючи інтерес та мотивацію учнів. Уроки, що проводяться з використанням ІКТ, є захопливими та такими, що запам'ятовуються, покращуючи пізнавальну активність учнів. Використання мультимедійних інструментів, автоматизованих навчальних систем, сучасного прикладного програмного забезпечення та комп'ютерних навчальних програм у предметному навчанні сприяє інтелектуальній залученості учнів. Діти, які живуть у швидкозмінному інформаційному суспільстві, повинні навчитися використовувати сучасні технології, якщо вони хочуть стати висококваліфікованими спеціалістами в майбутньому. Тому сучасні

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технології повинні бути невід'ємною частиною навчального процесу, а їх ефективне використання в освіті є одним із актуальних питань сучасної освіти. Зміни в сучасній системі освіти вимагають від учнів не покладатися виключно на минулий досвід, а робити висновки з практичних знань, отриманих завдяки власній діяльності, та будувати свій навчальний процес із самостійним та творчим підходом до кожного предмета. Інновації в контексті освіти та науки передбачають використання нових форм, методів та навичок. Головною вимогою нашого часу є побудова навчального процесу в навчальних закладах з використанням абсолютно нових, більш динамічних та інноваційних методів. Наукова новизна цієї статті полягає в обґрунтуванні та валідації нової методологічної системи викладання алгебри у вищій педагогічній освіті шляхом використання засобів ІКТ. Її теоретичне значення полягає у зміцненні загального наукового потенціалу та інтелектуального розвитку студентів через навчання алгебрі, враховуючи шлях розвитку алгебри як науки та забезпечуючи освіту відповідно до вимог інформаційного суспільства. Практичне значення полягає у визначенні можливостей використання засобів ІКТ у викладанні алгебри, забезпеченні ефективної організації навчального процесу, усуненні невідповідностей між навчальними програмами середньої та вищої математики, і тим самим формуванні системної та послідовної математичної освіти. Запропонована методологія може бути використана студентами та викладачами університетів, а також молодими дослідниками у своїй роботі.

Ключові слова: освітній процес; використання ІКТ-засобів; алгебра; розвиток; сучасна система освіти; систематичність та послідовність.

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