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THE ROLE OF DIGITAL EDUCATIONAL PLATFORMS IN THE DEVELOPMENT OF INTERDISCIPLINARY TIES IN MATHEMATICS TEACHING

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РОЛЬ ЦИФРОВЫХ ОБРАЗОВАТЕЛЬНЫХ ПЛАТФОРМ В РАЗВИТИИ МЕЖПРЕДМЕТНЫХ СВЯЗЕЙ ПРИ ОБУЧЕНИИ МАТЕМАТИКЕ

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Abstract. In mathematical education programs, the importance of providing high-quality knowledge and its role in society are becoming increasingly significant each year. Preparing future generations to meet the demands of the modern era—to be knowledgeable, competent, and digitally literate professionals who have a comprehensive command of their field—is one of the primary responsibilities of today's educators. Without a solid foundation in mathematics, it is impossible to substantiate one's education in any discipline. The development of mathematical thinking shapes logical and analytical abilities and fosters certain intellectual skills. In addition, learning mathematics contributes to the aesthetic development of an individual. For students to achieve success in any field of knowledge, it is essential that they are able to apply the theoretical knowledge acquired at school to other scientific areas in a practical and effective way. The article discusses the role and significance of information technologies in teaching mathematics in connection with natural science disciplines. The effective use of digital tools by teachers in the classroom is one of the key factors in improving the quality of education. Today, the rapid advancement of new technologies is impacting all spheres of life, including education. Therefore, a modern teacher must employ innovative teaching methods by integrating information technologies into the educational process. The article also examines the importance of interdisciplinary connections and ways to enhance them in contemporary teaching practice.

Аннотация. В программах математического образования с каждым годом возрастает важность предоставления высококачественных знаний и их роль в обществе. Подготовка будущих поколений к требованиям современной эпохи — к тому, чтобы стать знающими, компетентными и цифровыми профессионалами, обладающими всесторонним знанием своей области, — является одной из главных обязанностей современных педагогов. Без прочной математической базы невозможно обосновать образование в любой дисциплине. Развитие математического мышления формирует логические и аналитические способности и способствует развитию определенных интеллектуальных навыков. Кроме того, изучение математики способствует эстетическому развитию личности. Для достижения успеха в любой области знаний крайне важно, чтобы студенты могли применять теоретические знания, полученные в школе, в других научных областях практическим и эффективным способом. В статье рассматривается роль и значение информационных технологий в преподавании математики в связи с естественнонаучными дисциплинами. Эффективное использование

цифровых инструментов учителями в классе является одним из ключевых факторов повышения качества образования. Сегодня стремительное развитие новых технологий влияет на все сферы жизни, включая образование. Таким образом, современный преподаватель должен использовать инновационные методы обучения, интегрируя информационные технологии в образовательный процесс. В статье также рассматривается важность междисциплинарных связей и способы их укрепления в современной педагогической практике.

Keywords: digital education, interdisciplinary connection, mathematics, natural and humanitarian sciences, interactive whiteboard, multimedia, information technologies.

Ключевые слова: цифровое образование, междисциплинарная связь, математика, естественные и гуманитарные науки, интерактивная доска, мультимедиа, информационные технологии.

It is well known among educators that providing a new type of education, based on global standards and closely linked to modern information technologies, is essential for the younger generation. In this regard, the ability to effectively use information technologies in every lesson has great importance. In the educational process, information technology and teachers' digital literacy — particularly the use of digital education through interdisciplinary connections — play a crucial role. Modern society demands that teachers be highly educated, culturally aware, capable of creative and critical thinking, and proficient in new technologies in accordance with current trends. Information technologies represent an environment that fosters innovation and creativity. The subject of mathematics develops a person's intellectual capacity, logical and analytical thinking, and contributes to mastering the treasure of knowledge. Learning and teaching mathematics requires consistency, perseverance, and diligent effort. Therefore, it is impossible for students to achieve high results without systematic preparation. In the era of rapid development of information technologies, the effectiveness of the educational process in secondary schools is directly related to the professional competence of future teachers. Consequently, the ability to effectively use information and communication technologies (ICT) in pedagogical activities is among the key professional requirements for school teachers [1].

In this context, the optimal use of information technologies and software tools in the pedagogical process is a relevant issue in training future teachers in higher education institutions.

Thus, it becomes clear that integrating information technologies into mathematics lessons is essential for interdisciplinary teaching. Teachers must possess the necessary knowledge and skills to solve emerging problems at a professional level. However, within the current system of preparing mathematics teachers at pedagogical universities, it is particularly important to train future educators based on interdisciplinary approaches. All of the above indicate the necessity of teaching specialists how to design and use multimedia-based learning programs effectively. Interdisciplinary Teaching through Computer and Information Technologies. The learning process aimed at establishing interdisciplinary connections through computers and information technologies helps students develop new learning abilities, enabling them to identify systemic relationships and patterns, and ultimately contributes to the formation of their professional potential [2].

In mathematics lessons, the practical implementation of interdisciplinary integration through the comprehensive use of information technology tools involves employing new resources that align with previously known software tools. However, by taking advantage of the capabilities of interactive whiteboards, it becomes possible to demonstrate, explain, practice, correct, and assess mathematical

topics in connection with subjects from other disciplines, thereby clarifying their role and significance in integrated teaching. It is evident that mathematics teachers, aiming to achieve specific pedagogical outcomes, can enhance the quality of education by effectively using interactive whiteboards during lessons [3].

The main objective of effectively applying information technologies in teaching mathematics in correlation with natural science subjects is to educate a generation that meets the demands of modern society — students capable of finding creative solutions in non-standard situations, mastering distance learning, processing large amounts of information in a short time, and acquiring comprehensive knowledge. To achieve these goals, every teacher must be able to incorporate new technologies and interactive tools effectively into the learning process. Organizing education based on such teaching technologies is particularly significant, as it enables learners to consider their individual abilities, engage actively in the learning process, and continually develop as individuals. It also fosters self-education and self-development while accommodating individual differences among students. It is also essential for mathematics teachers to be able to explain and convey their perspective on the subject, helping students understand that mathematics should not be viewed merely as a system of calculations or a set of measuring tools. First and foremost, teachers must emphasize that mathematics is a science, and secondly, that it forms the foundation of every other scientific discipline. Through mathematics, teachers can present their daily professional activities in a scientific manner, fostering students' moral values, encouraging self-reflection, and developing a sense of responsibility and integrity. Students who internalize these qualities become more resilient to difficulties and temporary psychological discomforts in the future.

The informatization of the education system aims to enhance the effectiveness and quality of all levels of the teaching and learning process by implementing developmental and learner-centered education through the use of new information technologies.

Materials and Methods

The interactive whiteboard is one of the most effective tools used in the educational process. It does not define the content or methods of teaching, but rather enhances the learning process. Digital educational technology refers to the process of preparing and delivering information to learners through computers. Information technology encompasses various teaching methods, including programmed instruction, cognitive learning, and others. At present, every modern individual is familiar with computers and uses them both at work and at home. Moreover, the modern world of computer technology allows us to solve large-scale problems and process vast amounts of information within a short period of time. Today, processing video and audio data or creating video clips no longer poses significant difficulty [4].

Digital education represents one of the technical means of teaching through the use of computer capabilities. It is now commonly referred to as e-learning. The e-learning system can be divided into two types: receptive and interactive. The interactive system is based on the use of personal computers, video recorders, video disks, and television complexes, creating two-way communication between the learner and technical tools while ensuring visualization and feedback. Thus, new information technologies in education can be considered a systematic approach to creating and implementing receptive or interactive e-learning, taking into account technical and human resources as well as their interaction, in order to optimize educational forms. Currently, the level of computer technology development provides solid prerequisites for a new era of multimedia and telecommunication capabilities and advantages. Therefore, using supplementary materials beyond standard textbooks in mathematics lessons—particularly in alignment with topics from natural science subjects—broadens learners' intellectual horizons and helps them understand recurring interdisciplinary concepts more

deeply through comprehensive learning. Improving the Quality of Education through Information Technologies. In the field of education, active efforts are being made to enhance the quality of learning and to optimize effective methods for intensifying and modernizing the educational process through the use of information technologies. The effectiveness and efficiency of these efforts can be scientifically substantiated and classified into several methodological, psychological, and pedagogical directions: defining a systematic scientific and methodological approach for implementing information technologies in teaching mathematics in correlation with natural science disciplines; developing methodological frameworks for using information technologies in students' practical activities; improving the professional competencies of future specialists in mastering and applying information technologies in the educational process; and training future subject teachers to use information technologies effectively in acquiring knowledge, skills, and competencies [5].

At present, the computer has become one of the main tools for enhancing the professional level and academic motivation of young specialists. In the educational process, the computer functions both as an object of study and as a tool for teaching, upbringing, development, and diagnosing the mastery of educational content. This dual role highlights two main directions in the use of information technologies. From the first perspective, information technologies serve as a necessary resource for acquiring knowledge, skills, and competencies, contributing to the formation of well-educated, comprehensively developed, and morally conscious individuals. From the second perspective, information technologies are a powerful tool for increasing the efficiency of organizing the teaching and learning process. Moreover, the use of digital educational technologies leads to several positive outcomes: it increases students' creative activity, fosters teamwork skills, and contributes to the formation of an independent, digitally literate, and knowledgeable personality capable of self-directed learning. Future mathematics teachers must understand the requirements, principles, and content frameworks for the effective use of information technologies in the learning process, as well as the methods of their application. Among such technologies are interactive whiteboards, multimedia resources, and online learning platforms. In general, integrating interactive whiteboard technology is particularly effective in computerizing the process of teaching mathematics in correlation with natural science disciplines. Currently, almost all secondary schools in Kazakhstan are equipped with interactive whiteboards. In many schools, the use of new information technologies has become widespread. Similarly, all classrooms at our university are equipped with interactive whiteboards. For example, when teaching mathematics, the use of an interactive whiteboard not only increases students' interest and engagement but also develops their creativity, broadens their knowledge, and enhances their ability to master and utilize modern information technologies [6].

The Use of Interactive and Digital Tools in Mathematics Lessons. Using elements of the interactive whiteboard during lessons allows students to visually perceive specially prepared tasks, understand them more thoroughly, and develop practical skills. When teaching mathematics in connection with other disciplines, it is possible to reveal the content of a topic more effectively by using visual aids such as ready-made images and comparative diagrams to demonstrate concepts clearly. With the rapid changes of the modern era, the field of education is also evolving and advancing at an accelerated pace. In this context, many new programs and educational resources have emerged. There are now numerous types of educational resources available on the Internet. To use digital educational resources effectively in the learning process, it is essential first to familiarize oneself with their classification and then select the most appropriate resources for a given lesson.

Among the digital tools mentioned above, programs such as Classtime, Kahoot, and LearningApps can be effectively used in mathematics lessons. One example is the Classtime platform, a solution designed for teachers that can be used to provide feedback and assess students' understanding during in-class learning. From an interdisciplinary perspective, this platform allows

teachers to pose questions that clarify the meaning of shared terms across different subjects. Students' responses, results, and grades can then be exported in PDF or Excel format.

For teachers, the use of electronic educational resources offers great potential and limitless opportunities to enhance students' creativity, critical thinking, and research activities during the learning process. Overall, digital tools help teachers prepare high-quality lessons, use instructional time more efficiently, and engage students' interest through colorful presentations that foster both subject-specific and universal learning skills. More specifically, when teaching topics related to the concept of functions and their graphs to students in grades 7–11, the use of digital tools proves to be particularly effective. Additionally, incorporating animations and interactive models into lessons helps demonstrate the significance of interdisciplinary connections and strengthens students' understanding of the relationships between mathematical concepts and other scientific disciplines.

The Impact of Integrating Traditional and Modern Technologies in Teaching Mathematics. This approach, which combines traditional teaching methods with modern information tools, has a particularly positive effect on teaching mathematics in connection with natural science disciplines. As a result, educators are able to organize the learning process in accordance with contemporary educational standards and improve the overall quality of education.

Information technologies play a significant role in creating such tasks, as they enable learners to visualize concepts, conduct interactive experiments, and solve complex problems. For example, teachers can present video content illustrating how mathematics is applied in everyday life or showing the mathematical research of historical figures. Such materials help students understand the practical relevance and importance of the subject. The use of interactive whiteboards and multimedia tools in interdisciplinary teaching offers several advantages:

Enhanced visualization: Students can not only hear mathematical concepts and problems but also see them through videos, images, and graphs. This increases their interest in the subject and facilitates better understanding.

Active participation: By interacting directly with the interactive whiteboard and completing tasks themselves, students become active participants in the learning process. This approach increases motivation and promotes more effective learning outcomes.

Immediate feedback: Multimedia and interactive tools allow students to complete tasks interactively and view results instantly. This enables them to correct mistakes in real time and strengthen their knowledge.

Time efficiency: Mathematical problems and graphs can be displayed quickly on the board or multimedia screen, saving valuable lesson time.

Thus, the use of interactive whiteboards and multimedia technologies in enhancing interdisciplinary connections during mathematics lessons significantly deepens students' knowledge, increases engagement, and diversifies the teaching process. These tools help students perceive concepts visually, participate actively, and develop both theoretical understanding and practical skills.

Results and Discussion

Today, it is well known that the use of modern information and communication technologies (ICT) in the field of education has become a common practice. Therefore, one of the main objectives of teachers is to effectively integrate digital technologies into lessons while preserving spiritual and cultural heritage and instilling national values in younger generations. In mathematics lessons, the teacher's key goal is to effectively use digital resources and teaching methods aimed at developing students' information competence and increasing their interest in the subject in order to achieve the learning objectives of each topic. During the lesson, students can be given tasks using educational platforms such as Wordwall, LearningApps, and others — for example, finding proverbs or sayings

related to numbers. For instance, in grade 8, within the topics "Quadratic Equations" and "Vieta's Theorem," a culturally oriented task may be formulated as follows:

Task 1. Construct a quadratic equation using the converse of Vieta's theorem and match each root of the equation with an appropriate proverb or saying. a) "If you cut down one tree, plant ten in its place." b) "Measure seven times, cut once." g) "A man with eight facets but one secret." d) "If six are uneven, what's in the mouth is lost; if four are complete, what's on the top is preserved." e) "The knowledgeable can defeat a thousand; the strong can defeat one."

These tasks can be offered to students in various ways and on different platforms, which will directly depend on the professional skills of each teacher. Of course, when selecting tasks, educational platforms, and teaching methods, it is necessary to consider the students' age characteristics as well as any individual or special educational needs. Tasks can be completed in pairs, in groups, or individually. In addition, to instill national values in students, digital resources can be used to present tasks from textbooks or additional materials. For example, the following Grade 5 tasks can be implemented via digital resources or educational platforms:

Task 2. The height of the Bayterek monument, including the sphere, is 105 meters, and excluding the sphere is 97 meters. Using these numbers, write the correct fractions, improper fractions, and mixed numbers.

Task 3. The head (peg) of a dombra is m , its neck is m , and its body is m . Find the total length of the dombra. When placing it on a number line, which fractions correspond to the peg (point A), neck (point B), and head (point C)?

Thus, using digital resources to teach mathematics in connection with other subjects plays an important role in improving the quality of education. It also contributes to developing students' competencies and creativity in line with the demands of the modern era.

Conclusion

The use of information technologies, including interactive whiteboards, in the educational process is an effective approach that meets the requirements of the modern era. Incorporating information technologies in mathematics lessons increases students' interest and enhances the interactivity of the lessons. By utilizing various tools, platforms, and resources, teachers can differentiate instruction while taking into account the individual learning levels of students. Through tasks and exercises designed for students of different levels, the learning process becomes maximally effective, addressing each learner's individual needs and capabilities. This contributes to increasing their interest in the subject and improving learning outcomes. For effective use of information technologies, methodological guidelines and recommendations for teachers provide opportunities to organize lessons more engagingly and efficiently. Video materials, interactive whiteboards, online platforms, and mobile applications help students better understand the lesson content and develop skills for independent work. Furthermore, applying new methods and tools in education prepares students to live and thrive in a modern information society and supports the development of their life skills. By correctly using information technologies and their capabilities, teachers can effectively organize their work, comprehensively develop students' knowledge, and enable them to apply theoretical knowledge in practical contexts.

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