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ORGANIZATION OF NATURAL SCIENCE CLASSES IN A DIGITAL EDUCATIONAL ENVIRONMENT: MODERN METHODOLOGY AND ASSESSMENT SYSTEMS

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Abstract. This research is devoted to analyzing modern methodology and assessment systems for teaching science subjects in a digital learning environment in primary education. The article examines the role of digital technologies in science education, teaching approaches based on the 5E model, and modern assessment methods. The research results identified the importance of using digital platforms in improving educational effectiveness and proposed new ways to improve the pedagogical process.

Keywords: digital learning, science education, primary education, 5E model, assessment system, pedagogical methodology

Аннотация. Настоящее исследование посвящено анализу современных методик и систем оценки преподавания естественных наук в начальном образовании в цифровой образовательной среде. В статье рассматривается роль цифровых технологий в естественнонаучном образовании, подходы к обучению, основанные на модели 5e, и современные методы оценки. В результате исследования выявлено значение использования цифровых платформ в повышении эффективности обучения и предложены новые пути совершенствования педагогического процесса.

Ключевые слова: цифровое образование, естественные науки, начальное образование, модель 5E, система оценок, педагогическая методология

Annotatsiya. Ushbu tadqiqot boshlang'ich ta'limda tabiatshunoslik fanini raqamli ta'lim muhitida o'qitishning zamonaviy metodikasi va baholash tizimlarini tahlil qilishga bag'ishlangan. Maqolada raqamli texnologiyalarning tabiatshunoslik ta'limidagi roli, 5E modeli asosidagi o'qitish yondashuvlari va zamonaviy baholash usullari ko'rib chiqilgan. Tadqiqot

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natijasida raqamli platformalardan foydalanishning ta'lim samaradorligini oshirishdagi ahamiyati aniqlangan va pedagogik jarayonni takomillashtirishning yangi yo'llari taklif etilgan.

Kalit so'zlar: raqamli ta'lim, tabiatshunoslik, boshlang'ich ta'lim, 5E modeli, baholash tizimi, pedagogik metodika

INTRODUCTION

The digitalization of the education system in the 21st century is developing as a global process, and these changes are also widely applied in primary education. Science education plays a crucial role in shaping students' knowledge about the world around them and developing their scientific thinking skills [1]. The rapid development of digital technologies has brought new opportunities to the educational process and led to fundamental changes in traditional teaching methods. In the modern educational environment, students play not only the role of information receivers but also active participants and knowledge creators. In this situation, educators are required to master new methodologies and effectively use digital tools. The specific characteristics of science education - observation, experimentation, analysis, and drawing conclusions - can be implemented more effectively in a digital environment [2]. Modern assessment systems provide comprehensive evaluation of students' knowledge and skills while creating opportunities for individual educational pathways. The purpose of this research is to identify the most effective methods for organizing science lessons in a digital learning environment and demonstrate the importance of modern methodology and assessment systems [3].

METHODOLOGY AND LITERATURE REVIEW

This research was conducted based on literature analysis methodology. The analysis included works by Uzbek researchers such as Karimova N.A. who studied the effectiveness of digital technologies in primary science education, and Abdullayev S.M. who examined interactive teaching methods in science education [4]. International studies also contributed significantly to understanding digital learning environments. According to Johnson et al., digital platforms increase student engagement in science learning by 40% compared to traditional methods [5].

The 5E model (Engage, Explore, Explain, Elaborate, Evaluate) has proven particularly effective in digital environments, as demonstrated by research conducted at Tashkent State Pedagogical University by Rahimova L.K., which showed significant improvements in student

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understanding of natural phenomena [6]. Russian researcher Petrov A.V. emphasized that digital tools enable better visualization of complex scientific concepts, making them more accessible to primary school students [7]. The integration of assessment systems within digital platforms has been studied extensively by Uzbek scholar Yusupova M.T., who developed a comprehensive framework for continuous assessment in science education [8]. The literature reveals that successful implementation requires teacher training, appropriate technological infrastructure, and well-designed pedagogical approaches that combine traditional wisdom with modern capabilities.

RESULTS AND DISCUSSION

The analysis of current research and practical implementations reveals several key findings regarding digital learning environments in science education. First, the implementation of digital platforms has shown significant improvement in student comprehension and retention of scientific concepts. Uzbek research by Mirzayev A.B. (2023) demonstrated that students using digital science platforms showed 35% better performance in understanding natural processes compared to traditional classroom settings [9]. The 5E model implementation in digital environments has proven particularly effective because each phase can be enhanced through technology.

The Engagement phase benefits from multimedia content and virtual experiments that capture student interest. The Exploration phase is enriched through virtual laboratories and simulation software that allow students to conduct experiments safely and repeatedly. During the Explanation phase, digital tools provide multiple representations of concepts through animations, interactive diagrams, and augmented reality applications. The Elaboration phase enables students to apply their knowledge through digital projects and collaborative online activities.

Finally, the Evaluation phase is enhanced through immediate feedback systems and adaptive assessment tools that adjust to individual student needs. Assessment systems in digital environments offer unprecedented opportunities for comprehensive evaluation. Traditional paper-based tests are being replaced by interactive assessments that measure not only knowledge retention but also problem-solving skills, critical thinking, and practical application abilities. The research by Nazarova F.S. (2024) from the Uzbek Academy of Sciences showed that digital assessment tools provide more accurate insights into student learning patterns and help identify areas requiring additional support [10]. However, challenges remain in

implementation, including the need for teacher professional development, ensuring equitable access to technology, and maintaining the balance between digital and hands-on learning experiences. The integration of digital tools should complement rather than replace direct observation of natural phenomena and hands-on experimentation that are fundamental to science education.

CONCLUSION

The research demonstrates that digital learning environments offer substantial benefits for science education in primary schools when implemented with appropriate methodology and assessment systems. The combination of the 5E model with digital technologies creates engaging and effective learning experiences that enhance student understanding of scientific concepts. Modern assessment systems integrated within digital platforms provide comprehensive evaluation capabilities while supporting individualized learning pathways.

However, successful implementation requires careful planning, adequate teacher preparation, and maintaining balance between digital innovation and fundamental pedagogical principles. The evidence from both Uzbek and international research suggests that the future of science education lies in thoughtful integration of digital tools with proven educational methodologies, creating learning environments that prepare students for the challenges of the modern world while fostering deep understanding of scientific principles.

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