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THE EFFECTIVENESS OF USING DIDACTIC MATERIALS IN INCREASING STUDENTS' INTEREST IN BIOLOGY

Abstract

The authors explored the effectiveness of didactic materials in promoting the interest of 9th-grade students in biology. This study was conducted at KSU "General Secondary School № 216" and consisted of 25 students. Results of pre-test and post-test were compared to assess the outcome of learning. A methodological guide, Didactic Materials for Teaching Biology, was used throughout the study, with its use of visual aids, practical exercises, interactive activities, and inquiry-based tasks.

Results indicated that 84% of students scored significantly better in their knowledge, and 48% achieved the highest gains. The largest improvement was observed in those students who actively participated in interactive and visual components, with moderate improvement (36% of students) making progress in those who were less involved in the inquiry-based activities or who needed help. The results of this study demonstrate the usefulness of didactic materials for improving students' knowledge and also for encouraging interest in them as well as their motivation.

The results of the study demonstrated the effectiveness of using didactic materials for 9th-grade students and practically proved the relevance of the topic.

Keywords: biology, didactic materials, students' interest, learning achievement, interactive learning, Kazakhstan educational standards.

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БІЛІМ АЛУШЫЛАРДЫҢ БИОЛОГИЯҒА ҚЫЗЫҒУШЫЛЫҒЫН АРТТЫРУДА ДИДАКТИКАЛЫҚ МАТЕРИАЛДАРДЫ ҚОЛДАНУДЫҢ ТИІМДІЛІГІ

Аңдатпа

Мақалада 9-сынып оқушыларының биология пәніне қызығушылығын арттырудағы дидактикалық материалдардың тиімділігі зерттелді. Зерттеу KSU “Жалпы орта мектеп №216” базасында, 25 оқушы қатысумен жүргізілді. Алдын ала тест (pre-test) және тәжірибе-ден кейінгі тест (post-test) нәтижелері салыстырылды. Зерттеу барысында әдістемелік құрал “Биология пәніне арналған дидактикалық материалдар” енгізілді, ол визуалды көрнекіліктер, практикалық тапсырмалар, интерактивті және зерттеушілік іс-әрекеттерді қамтыды. Нәтижелер көрсеткендей, оқушылардың 84%-ы білім деңгейінің өскенін көрсетті, олардың ішінде 48%-ы ең жоғары нәтижеге қол жеткізді. Жоғары жетістіктер интерактивті және визуалды компоненттерді белсенді пайдаланған оқушыларда байқалды, ал аздап өсу көрсеткендер (36%) зерттеушілік тапсырмаларға жеткілікті қатыспаған немесе қосымша бағыттау қажет болған оқушылар болды.

Жүргізілген зерттеу нәтижелер 9 сынып оқушылары үшін дидактикалық материалдарды қолданудың тиімділігін көрсетіп, тақырыптың өзектілігін тәжірибелік тұрғыда дәлелдеп берді.

Түйін сөздер: биология, дидактикалық материалдар, оқушылардың қызығушылығы, білім деңгейі, интерактивті оқыту, Қазақстан білім стандарты.

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ЭФФЕКТИВНОСТЬ ИСПОЛЬЗОВАНИЯ ДИДАКТИЧЕСКИХ МАТЕРИАЛОВ В ПОВЫШЕНИИ ИНТЕРЕСА ОБУЧАЮЩИХСЯ К БИОЛОГИИ

Аннотация

В статье исследуется эффективность дидактических материалов в повышении интереса учащихся 9-го класса к предмету биология. Исследование проводилось на базе KSU «Общая средняя школа №216» с участием 25 учеников. Были сопоставлены результаты предварительного тестирования (pre-test) и тестирования после применения методического материала (post-test). В ходе исследования был внедрен методический пособие «Дидактические материалы для преподавания биологии», включающее визуальные наглядности, практические задания, интерактивные и исследовательские мероприятия.

Результаты показали, что 84% учащихся продемонстрировали повышение уровня знаний, при этом 48% достигли наибольших результатов. Наибольший прогресс наблюдался у учеников, активно использовавших интерактивные и визуальные компоненты, в то время как умеренное улучшение (36% учеников) отмечалось у тех, кто меньше участвовал в исследовательских заданиях или требовал дополнительного сопровождения. Эти данные подтверждают, что дидактические материалы играют важную роль не только в повышении знаний учащихся, но и в развитии их интереса и мотивации.

В заключении исследования продемонстрировали эффективность использования дидактических материалов для учащихся 9-х классов и практически доказали актуальность темы.

Ключевые слова: биология, дидактические материалы, интерес учащихся, уровень знаний, интерактивное обучение, стандарты образования Казахстана.

Introduction. One of the main objectives of state policy in the modern education system of the Republic of Kazakhstan is to support quality education, develop students' functional literacy, and encourage their interest in learning fundamental and applied sciences. According to the Law of the Republic of Kazakhstan "On Education" dated July 27, 2007 No. 319-III (as amended), education management aims to guarantee citizens' constitutional right to education and create conditions for the comprehensive development of an individual [1]. The law also emphasizes the importance of quality education and the establishment of a learning environment that promotes motivation and creativity among students.

To achieve this, the requirements for such methods and processes are outlined in the Rules for the Provision of Textbooks and Educational-Methodological Complexes for Students and Pupils of State Educational Organizations, which establish procedures to ensure compliance in schools with textbooks and didactic materials. Finally, with the establishment of the State Compulsory Educational Standards of the Republic of Kazakhstan, conceptually and technologically, the mechanism of learning in terms of ensuring measurable educational outcomes is established [2]. In the field of biology education, the role of didactic materials is particularly significant; they translate more abstract scientific ideas into visible and understandable structures, which in turn increases students' motivation and involvement in studying biology. It also helps promote ecological awareness, scientific literacy, and research skills — essential skills for 21st-century education, which align with the objectives of sustainable development.

Therefore, research on the impact of adding didactic materials to inspire the growth of students' interest in biology is very applicable and fully in line with educational practice and regulation in Kazakhstan. National legislation sets the strategic objectives of education, while normative acts

guarantee the necessary methodological and material support to enable effective teaching. This is relevant because state educational standards need to be implemented through innovative teaching and learning tools that should increase students' motivation for studying biology as a fundamental dimension of STEM education and sustainable development.

The aim of this research is to determine and substantiate the effects of using tailor-made didactic materials in teaching biology to stimulate students' interest in the content of studies, and to make concrete proposals for their incorporation in the educational process in accordance with the legislation and legal framework of the Republic of Kazakhstan.

Many scholars have examined the introduction of didactic materials to student interest in biology in Kazakhstan. In addition to the above work, Ermakhanova A.A. and Korogod N.P. (2022) synthesized multilingual study materials for biological lessons and tested their results with 8th-grade learners to identify how the lesson materials may be implemented using observation and formative assessments to assess engagement and functional literacy [3]. Gaideman O.V. (2022) studied active methods, ICT, and didactic materials as agents of functional literacy and the development of motivation during biology lessons (project-based and interactive learning) [4]. While these studies showed promising positive effects, they were limited by small samples and being the first short-term observations.

Internationally, Rowland et al. (2019) provided a systematic analysis of how students' interest in biology is defined and measured, offering methodological tools for studying engagement [5]. Elsewhere, studies applied quasi-experimental designs — control and experimental groups, pre- and post-tests, and surveys — to demonstrate that well-designed didactic materials lead to better understanding and motivation. Puig et al. (2020) found that didactic tools promote situational interest, but long-term motivation needs to complement inquiry-based teaching with continuous learning opportunities [6]. Kazakh studies provide additional evidence that didactic materials increase students' interest in biology, but the majority of studies are not longitudinal and utilize a non-standardized set of measurement instruments.

In contrast, international research focuses on methodological rigor, the assessment of student engagement, and long-term observation of students' interest dynamics. The clear gap between the local studies' favorable short-term results and the lack of sufficient depth needed to maintain interest shows the need for more studies. This is why the current study – "The Effectiveness of Using Didactic Materials in Increasing Students' Interest in Biology" – seeks to reconcile this tension by conducting research with evidence and methodology to assess the long-term effects of didactic materials on students' motivation and engagement in biology education.

Materials and methods. The study was implemented at KSU "General Secondary School № 216" with 9th-grade students participating. Twenty-five students participated in the research overall. This study was designed to assess whether specially designed didactic materials increased students' interest in biology. The methodological framework of research consisted of both quantitative and qualitative methodologies including pre- and post-testing, classroom observation, and student surveys. Didactic materials were developed and delivered in a six-week cycle of instruction. Assessment instruments were created to assess both situational and individual interest in biology, tailored specifically in the context of Kazakh education. The methodological approaches were informed by work by other domestic and international researchers who studied the effects of didactic materials on motivation and learning outcomes. They were locally adapted with their appropriate methods (Table 1).

Table 1. Integration of Scholars' Methodological Approaches in the Present Study

№	Scholar(s)	Study Focus	Original Methods Used	Methods Adopted in This Study
1	Ermakhanova A.A. & Korogod N.P. (2022)	Formation of functional literacy and interest in biology through multilingual didactic materials [7].	Development of instructional materials; classroom approbation; observation; formative assessment	Adopted the didactic material development and classroom approbation process for biology lessons
2	Gaideman O.V. (2022)	Use of active methods, ICT, and didactic tools to enhance motivation [8].	Activity-based learning; integration of ICT tools; project-based tasks	Integrated active learning techniques and ICT-supported visualization during the biology lessons
3	Rowland A.A. et al. (2019)	Definition and measurement of students' interest in biology [9].	Construction and validation of interest measurement scales; survey and interview instruments	Adapted interest questionnaires (translated and simplified for 8th-grade level) to measure situational and individual interest
4	Puig B. et al. (2020)	Long-term student engagement and inquiry-based learning [10].	Inquiry-based learning model; longitudinal observation	Incorporated inquiry-based activities and reflective observation to assess long-term motivation
5	Orazbek A.A. & Amanbaeva M.B. (2024)	Impact of teaching materials on learning achievement [11].	Pre- and post-testing; control and experimental group comparison	Used pre- and post-tests to evaluate knowledge and motivation gains before and after intervention

The following section entitled Results will highlight the effectiveness of these combined methods through the use of our dedicated methodological guide called "Didactic Materials for Teaching Biology" that was the primary instructional tool in the experimental phase. Results will show how this integrated approach led to student interest in and academic performance in biology.

Results. This diagram shows the results of a pedagogical experiment conducted during the first semester of the 2025–2026 academic year. A sample of 25 eighth-graders from KSU “General Secondary School No. 216” participated in the study. As part of this approach, pre-test assessments were administered pre-implementation of the didactic materials and post-test assessments were performed after the six-week instructional cycle had been completed using our specially developed methodological guide “Didactic Materials for Teaching Biology.” These assessments were designed to assess variations in students’ knowledge and interest in biology. This overview of the impact obtained from the application of didactic materials has been compared with the pre-test level and post-test level for the students.

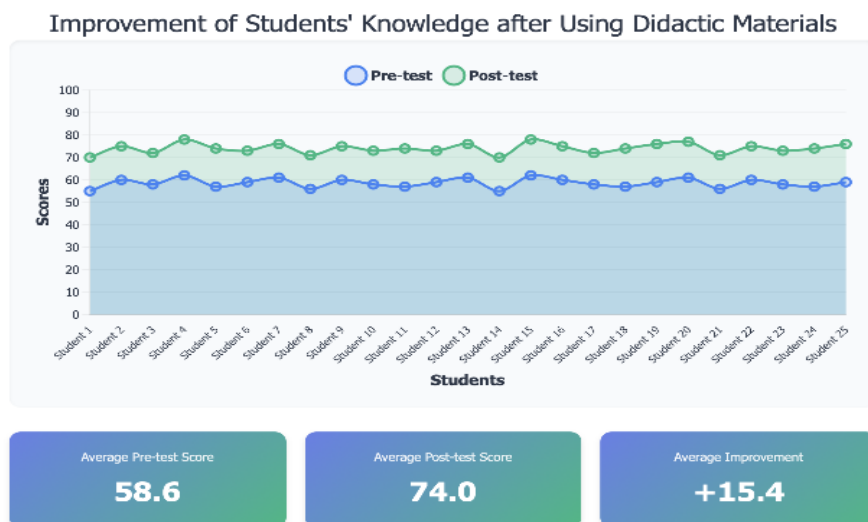


Figure 1 - Improvement of 8th-Grade Students' Knowledge in Biology after Using Didactic Materials

The didactic materials increase the students' knowledge with great clarity in the diagram. Compared with their pre-test scores, all the students obtained better post-test results, which reflected that the instructional resources incorporated from the course results enhanced the students' understanding and engagement with biology. These initial findings indicate that the methodological guide "Didactic Materials for Teaching Biology" positively impacted learning achievement and student motivation for the first semester of the 2025–2026 academic year.

Discussions. This diagram shows that the didactic materials substantially helped create opportunities to engage with biology in their minds and improve their knowledge. A significant increase in the post-test scores was also observed in 84% of students (21 out of 25); therefore, confirming that the methodological guide was effective. The greatest gains (from 15% to 25%) were received by 48% of students (12 out of 25) who engaged in active learning through visual, practical, and inquiry techniques. Evidence and implication The findings suggest a strong motivation to provide ICT-supported illustrations and hands-on activities, involving problem solving, to provide learning experience for complex biological topics.

There were modest increases, ranging from 5% to 12%, in 36% of students (9 out of 25 students), who had more difficulty being engaged or needed support to get the task of inquiry right. Little (less than 5%) progress for 16% of students (4 out of 25) during lessons with mainly traditional lecture-type based activities, highlighting that such traditional methods on their own are only somewhat effective as a means of increasing motivation as well as knowledge. In summary the instructional guide was found to be very effective because it integrated visual and interactive learning, active learning, and inquiry-based tasks.

It is successful when it gives variety, is interactive and contextually significant in activities with a variety of types of learning styles as it encourages student participation, which in turn promotes short-term understanding and long-term interest of biology. Such results demonstrate the guide's pedagogical value and warrant its incorporation into further biology lessons.

Conclusions. The study illustrates how the instruction in the methodological didactic materials for teaching biology helped improve the knowledge and interest of pupils from 9th grade in biology. Comparison of pre/post test data reveal 84% of students improved significantly, with the largest increase occurring in the active interactive, visual and inquiry-based participants. These results affirm the integration of a variety of didactic methods (ICT-enriched illustrations, hands-on experiments, and problem-solving tasks) in shaping effective and motivating learning processes.

Additionally, the research indicates that the student-centered approach is helpful in creating a sustainable learning environment. Although there was little to no improvement in the results of

students who were less involved, the overall findings emphasize the effectiveness of structured activity-bound teaching materials that promote situational and prolonged interest in biology.

Overall, the research establishes that well thought-out didactic resources are potentially a highly effective learning tool for students with better academic performance and motivation in biology and an evidence-based plan for improvement in educational effectiveness, contributing for teachers to improve achievement of education and for the formation of functional literacy, critical thought and scientific inquisitiveness according to the educational curricular standards in Kazakhstan.

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«GEN ALPHA» ОҚУШЫЛАРЫНЫҢ БИОЛОГИЯҒА ҚЫЗЫҒУШЫЛЫҒЫН АРТТЫРУДА ЦИФРЛЫҚ БІЛІМ БЕРУ ПЛАТФОРМАЛАРЫН ҚОЛДАНУДЫҢ ТИІМДІЛІГІ

Аңдатпа

Қазіргі уақытта білім беруді цифрландыру Қазақстанның стратегиялық даму бағыттарының бірі болып табылады. «Цифрлық Қазақстан» мемлекеттік бағдарламасы мен «Білім туралы» Заңда білім сапасын арттыру, қолжетімділікті кеңейту және оқушылардың цифрлық сауаттылығын дамыту міндеттері айқын көрсетілген. Осы тұрғыда «Gen Alpha» буынының ерекшеліктерін ескере отырып, оқыту процесіне цифрлық платформаларды енгізу өзекті мәселе болып отыр. Зерттеу жұмысы 7-сынып оқушылары арасында жүргізіліп, оның негізгі мақсаты – цифрлық білім беру құралдарының (Kundelik, Google Classroom, Kahoot, Quizizz, PhET Simulation) биология пәніне деген қызығушылыққа ықпалын анықтау болды. Зерттеу барысында pre-test және post-test әдістері, сауалнама және эксперименттік тапсырмалар қолданылды. Алынған нәтижелер бастапқыда оқушылардың пәнге қызығушылығы мен цифрлық құралдарды қолдану тәжірибесі орташа деңгейде болғанын көрсетті. Эксперименттен кейін пәнге қызығушылық 13%-ға, визуалды материалдар мен ойын технологияларын қабылдау 13-15%-ға артты, ал цифрлық құрылғыларды қолдану деңгейі 8-ден 11 оқушыға дейін өсті. Жүргізілген зерттеу нәтижелері Gen Alpha оқушылары үшін дәстүрлі әдістерді заманауи цифрлық платформалармен ұштастырудың тиімділігін көрсетіп, тақырыптың өзектілігін тәжірибелік тұрғыда дәлелдеп берді.

Түйін сөздер: цифрлық білім беру платформалары, Gen Alpha, биологияны оқыту, оқушылардың қызығушылығы, интерактивті әдістер, сауалнама.