

MOBILE APPLICATION-BASED TEACHING METHODS IN INCREASING STUDENT ACTIVITY

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Annotation. In the modern education system, digital technologies are developing at a rapidly pace, opening new opportunities for the learning process. Mobile applications play a particularly important role in increasing student engagement and enhancing their interest in learning materials. As biology is a subject rich in visual content, the use of mobile technologies for effective teaching is becoming highly relevant. This article examines the effectiveness of mobile application-based teaching methods in increasing student engagement.

Innovative methods such as gamification, interactive simulations, virtual laboratories, augmented and virtual reality (AR/VR) are analyzed in terms of their impact on the learning process. The gamification method allows students to perceive learning as an exciting game, which increases their motivation. Interactive simulations and virtual laboratories help develop students' practical skills through modeling biological processes. AR/VR technologies give students the opportunity to delve deeper into complex topics and conduct research activities.

The article also discusses the challenges that may arise when using mobile applications and proposes solutions to overcome them. The research findings indicate that these methods not only increase student engagement but also contribute to a deeper understanding of the learning material.

Keywords: biology teaching, mobile applications, gamification, AR/VR, interactive learning, student engagement, innovative methods.

Introduction. In the current education system, the rapid development of information and communication technologies has had a significant impact on the learning process. In particular, the use of mobile applications and tablets in the field of education plays an important role in organizing the learning process more effectively. Since biology is a subject that explores various phenomena and laws of nature, the use of mobile technologies in teaching this subject proves to be especially effective. With the help of mobile applications and tablets, students engage with lessons in an interesting and interactive way, which in turn increases their participation and enhances their motivation toward learning. Therefore, the use of mobile applications in biology education is currently a highly relevant issue.

The use of mobile applications in the learning process not only increases students' interest in the subject, but also allows for a deeper and more effective understanding of the learning material. Traditional teaching methods may sometimes fall short in ensuring a comprehensive understanding of biology, whereas mobile technologies help bridge this gap. The integration of mobile applications in biology classes boosts students' motivation and supports the combination of theoretical knowledge with practical application [1].

The object of this study is the process of teaching biology in schools, while the subject of the research is the effectiveness of using mobile applications and tablets in teaching biology. The aim of this study is to determine the effectiveness of mobile applications and tablets in increasing student engagement in biology lessons. To achieve this goal, several objectives have been set: to explore effective methods of teaching biology through the use of mobile applications; to identify

ways to increase students' interest and engagement in the subject through mobile apps; to examine the possibilities of improving learning outcomes through mobile technologies; and to identify challenges encountered during the implementation of mobile applications, as well as potential solutions.

The study will employ methods and approaches such as comparative analysis, experimentation, surveys, and observation. In order to assess the effectiveness of using mobile applications in teaching biology, experimental studies will be conducted, and students' responses and academic performance levels will be compared.

The hypothesis of the study is that mobile applications and tablets enhance students' engagement in learning biology and contribute to a deeper understanding of the subject matter. As students' use of mobile technologies increases, their learning motivation and academic achievement are expected to improve as well.

This research aims to explore the potential for the effective use of mobile applications in the education system and to improve the methodology of teaching biology. The results of the study will assist educational institutions in optimizing the integration and use of mobile technologies. Moreover, the study will offer effective strategies for both teachers and students to use mobile applications as learning tools.

Research materials and methods. Teaching methods based on mobile applications

1. Gamification: Incorporating game elements into the learning process helps increase students' interest and engagement. Through this method, learners feel as though they are playing a game, which enhances their activity levels and strengthens learning motivation. Examples: Mobile applications such as «Kahoot!» and «Quizlet» are designed to test, review, and reinforce students' knowledge [2]. Teachers can use these tools during lessons to create a more engaging learning environment.

2. Interactive Simulations: Mobile applications allow students to observe real biological processes in a virtual environment. This method enables students to experience theoretical material in a practical, hands-on way. Example: The «PhET» interactive simulations app offers interactive simulations in subjects like chemistry and biology.

3. Virtual Labs: In biology education, mobile app-based virtual labs are effective tools for students to conduct experiments independently. These platforms allow learners to explore biological processes and perform virtual experiments [3]. Example: Through the «Labster» app, students can carry out a variety of biology experiments in a simulated lab setting.

4. Augmented and Virtual Reality (AR/VR): Specialized mobile applications and tablets enable students to visualize biological processes and structures in 3D models, thereby improving learning efficiency. AR/VR technology helps students understand complex biological concepts through visualization. Examples: applications such as «Google Expeditions» and «Anatomy 4D» allow students to explore complex anatomy and other biology content in a virtual format.

5. Mobile learning platforms: This method supports the development of personalized learning pathways for students. With mobile applications, learners can study independently, complete quizzes and assignments, and track their progress [4]. Additionally, these platforms provide opportunities for assessment and feedback. Examples: platforms such as «Edmodo» and «Google Classroom» can be used to manage the learning process, assign tasks, and administer assessments.

The effectiveness of mobile applications in increasing student engagement. Mobile applications enhance students' motivation and ensure their active participation in the learning process. Moreover, they encourage students to study independently, complete tasks, and assess their own knowledge. All of these contribute to improving the overall quality of education. The effectiveness of mobile applications in increasing student engagement can be examined through several aspects based on research and scientific literature:

– *Making the learning process interactive.* Mobile applications make the learning process more interactive, which increases students' interest in the material. Instead of passively listening, students complete tasks, check their answers, and reinforce their knowledge through various games and quizzes. Examples: applications like «Quizlet» and «Kahoot!» allow students to test their knowledge, review material, and participate in group activities [5].

– *Enhancing self-directed learning skills.* Mobile applications provide students with opportunities to learn independently. They can complete homework assignments, evaluate their understanding, identify gaps in knowledge, and work to improve them. This fosters a sense of responsibility in learners. Examples: language-learning apps like «Duolingo» or educational biology apps offer students a chance to study at their own pace and on their own initiative.

– *Increasing students' interest and motivation.* Mobile applications enhance students' learning motivation through tasks presented in a game-like format and simplified information. Learners acquire knowledge with the help of various gamified elements, which increases their engagement. For example, applications such as «Classcraft» or «Kahoot!» allow students to learn through play, thereby boosting their activity levels.

– *Repetition and deepening of knowledge.* Mobile applications provide opportunities for revisiting learning materials. Students can return to the content at any time to reinforce and deepen their knowledge. This approach enables learners not only to practice during the learning phase but also to review their knowledge later. For instance, applications such as «Quizlet» and «Anki» allow students to practice using flashcards [6].

At present, the widespread use of mobile devices and applications is opening up new opportunities in education. Facilitating the acquisition of learning materials, increasing students' interest through interactive tasks, and individualizing the learning process are among the key advantages of mobile learning. Moreover, mobile technologies contribute to remote access to educational resources, the development of self-regulation skills, and the cultivation of creative thinking. Thus, teaching methods based on mobile applications can modernize the educational process, making it more effective and accessible compared to traditional teaching approaches.

Several significant differences and advantages can be clearly observed when comparing mobile application-based teaching methods with traditional approaches (Table 1).

Table 1 – Differences and advantages of mobile application-based teaching methods compared to traditional methods

No	Indicator	Teaching through mobile applications	Teaching through traditional methods
1	2	3	4
1	Interactivity	Students complete tasks through mobile applications, immediately view results, and receive feedback	Teaching is conducted mainly through teacher explanations and textbooks, with limited active student participation.
2	Personalized learning trajectory	Students choose their own learning pace and level of content mastery.	The teacher conducts lessons at the same pace for all students.
3	Time and space	Students can use mobile applications anytime and anywhere, revisiting and deepening learning materials.	Traditional methods depend on the class schedule and in-class learning process.
4	Role of the teacher	The teacher monitors students' results and progress through the use of mobile applications.	The teacher mainly acts as a transmitter of information and evaluates students only at the end of the process.

1	2	3	4
5	Student motivation	Students check their knowledge through applications, complete engaging tasks, and develop independently.	Мұғалім тек теориялық білімді береді, оқушылардың мотивациясы оқытудың монотондығына байланысты.
6	Feedback	Students receive immediate results, suggestions, and corrections after completing tasks.	Feedback is provided only after the lesson or during assessment..
7	Task completion	Students complete tasks through games, quizzes, or exercises in mobile applications, with opportunities for repetition.	Tasks are performed traditionally in written or oral form and depend solely on the teacher's evaluation.
8	Impact on individual work	Students effectively organize independent work and acquire knowledge on their own.	Opportunities for independent work are limited and mostly guided by the teacher.
9	Use of technological tools	Mobile applications integrate updated technologies and introduce innovative methods into the learning process.	Technologies are mostly used only as supporting tools (e.g., multimedia, electronic boards).
10	Student engagement	Increased engagement enhances motivation, enabling students to explore additional learning materials independently.	Engagement is mostly limited to responding to teachers' questions.

Discussion of Results. Regarding the challenges of using mobile applications and ways to address them, it is important to note that identifying these difficulties and finding solutions is crucial for enhancing the effectiveness of the learning process. In this regard, several key challenges may arise when integrating mobile applications into the educational process. However, with appropriate solutions, these challenges can help improve learning outcomes [7].

1. Accessibility of devices and lack of infrastructure. To effectively use mobile applications, it is essential for schools to have the necessary devices and internet connectivity. Unfortunately, not all schools provide students with access to mobile devices or the internet. This situation can hinder students' full participation in the learning process. To address this issue, schools should consider distributing mobile devices, improving internet connectivity, or providing alternative devices for learning [8]. In addition, introducing offline features in mobile applications can help create favorable conditions for students to continue learning.

2. Low level of technological literacy. Teachers and students may lack the necessary knowledge to effectively use mobile applications. Inability to apply these tools properly can negatively affect learning outcomes. To overcome this challenge, it is necessary to organize specialized training for teachers and students, as well as conduct courses on how to use the applications. Developing skills in the proper use of technology and explaining how applications influence the learning process are also important [9].

3. Lack of student motivation. Some students may consider mobile applications uninteresting or use them only for gaming and leisure activities. In this case, to increase students' motivation, it is necessary to integrate engaging and interactive tasks within mobile applications. Adding diverse content and learning materials, as well as providing game-based assignments, can foster students' active participation in the learning process.

4. Poor quality of information. The quality of educational materials within mobile applications can vary, and in some cases, the content may be incomplete or inaccurate. This may prevent learners from accessing reliable information. To address this issue, it is necessary to check the quality of the applications and work with credible sources in the field of education.

Furthermore, ensuring that the applications align with specific educational topics is essential [10].

5. Lack of systematic monitoring. Monitoring students' results while using mobile applications can be challenging. Some applications have limited monitoring capabilities, or they do not function properly. To solve this problem, it is necessary to introduce specialized monitoring systems for teachers. This requires the use of additional tools to collect and regularly check students' performance.

6. Complexity of technology for teachers. The integration of new technologies can be difficult for teachers, especially for those with no prior experience using such tools. In this case, it is essential to organize special training programs and provide methodological support for using mobile applications. This will enable teachers to use technology effectively and modernize the learning process.

7. Inconsistency of content. The format and content of educational materials may vary across different applications. This inconsistency can create difficulties for students and reduce the clarity of the learning process. To address this, it is necessary to adopt certain standards, select applications aligned with the curriculum, and structure learning materials in a consistent way.

8. Students' dependence on social networks. Mobile applications are used not only for learning but also for games and social networking. Students may spend excessive time using mobile devices for entertainment rather than education. To prevent such dependency, it is important to direct students' attention toward specific learning goals. Teachers should clearly define assignments and objectives, and encourage the use of applications intended solely for educational purposes [11].

9. Technical issues of applications. Mobile applications may experience technical failures or errors, which can temporarily disrupt the learning process or hinder students' ability to complete tasks correctly. To overcome these difficulties, applications should be updated regularly, and technical support services should be ensured. It is also important to test the proper functioning of applications and provide users with additional assistance systems.

10. Difficulty of monitoring (Anonymity). The use of mobile applications may raise issues related to maintaining students' anonymity, which complicates monitoring their participation in the learning process. To address this, it is necessary to introduce special systems and reporting mechanisms for tracking student engagement. Mobile applications should also include specific tools and functions designed to monitor students' level of participation.

Recommendations for teachers and students. When integrating mobile applications into the learning process, teachers must ensure that they are used in alignment with educational objectives. It is important to demonstrate to students how to properly use applications, select appropriate supplementary materials, and incorporate them into lessons in order to increase student engagement. Each application should be designed around clearly defined learning objectives and relevant tasks.

By using these applications, teachers should help learners develop independent work skills and organize the learning process effectively. Moreover, teachers should pay particular attention to selecting mobile applications that correspond to the students' level of knowledge and individual needs. Since each student's academic level differs, applications should be adapted to their personal abilities. Before choosing an application, teachers should consider the developmental level of the students and adjust tasks according to their capabilities. This approach will help to enhance students' interest and active involvement in the learning process [12].

Teachers should integrate mobile applications with traditional teaching methods. This blended approach increases students' interest and enables the use of diverse teaching strategies. For example, lectures can be supplemented with mobile applications, while laboratory sessions

can be supported through interactive tasks. By combining technology with traditional methods, teachers can create favorable conditions for students to effectively master learning materials. Furthermore, teachers should provide students with systematic feedback when using mobile applications. This allows for monitoring progress, identifying challenges during the learning process, and addressing them in a timely manner. Offering individual consultations, additional tasks, and explanations regarding achievements and errors can further enhance the effectiveness of the teaching process. Feedback also plays an important role in increasing students' learning motivation [13].

Professional development is essential for teachers. Participating in continuous training programs on the use of mobile applications and improving professional skills is highly important. Through professional development, teachers can acquire effective technological skills, refine teaching methodologies, and thereby contribute to improving the quality of students' learning outcomes.

Students, in turn, should actively use mobile applications for educational purposes and complete tasks independently. They are encouraged to explore supplementary materials, engage in revision, and develop self-directed learning skills. This approach promotes active participation in the learning process and improves academic performance. Mobile applications also provide students with the opportunity to set their own learning pace. In addition, students can deepen their knowledge by engaging with new information through mobile applications in an enjoyable way. They are encouraged to use interactive and gamified learning methods, as such approaches help maintain focus and increase interest in studying [14]. By doing so, students can remain motivated and actively engaged in the learning process.

It is also important for students to establish active communication with teachers while using mobile applications. By asking questions and seeking additional assistance regarding classroom tasks and challenges, students can overcome learning difficulties. Interaction with teachers provides learners with guidance in the educational process and contributes to deeper knowledge acquisition.

Students should further develop self-directed learning skills by using applications that allow them to learn at their own pace, explore supplementary resources, and search for relevant information. This strengthens their ability to study independently, increases responsibility, and raises interest in the learning process. Students are encouraged to define clear learning objectives and use mobile applications as tools to achieve them. They should understand the purpose of each task and choose the appropriate path to reach the desired outcomes [15]. By planning their learning trajectories and monitoring their own progress, students can organize the learning process more systematically and achieve better results.

These recommendations will support teachers and students in effectively using mobile applications, improving the learning process, and enhancing the quality of education.

Conclusion. The use of mobile applications in teaching biology at school is becoming an essential component of the modern education system. These technologies increase students' interest and make the learning process more interactive, efficient, and engaging. With the help of mobile applications, students can independently enhance their knowledge and gain a deeper understanding of learning materials. In addition, applications enable teachers to plan the teaching process comprehensively, establish feedback with students, and foster their active participation.

Compared to traditional teaching methods, mobile applications often simplify the learning process and promote the development of students' independent learning skills. Furthermore, such methods contribute to quicker information processing as well as the development of creative and critical thinking abilities. However, to use mobile applications effectively, teachers must continuously improve their skills in working with new technologies. For this purpose, it is important to organize specialized courses and training programs. At the

same time, the selection and use of applications should be methodologically justified to help guide students in using them properly.

In conclusion, the effective use of mobile applications in teaching biology can improve students' academic performance and elevate the learning process to a new level. These technologies will remain an integral part of the education system in the future, and their proper application will further enhance the efficiency of education.

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ОҚУШЫЛАРДЫҢ БЕЛСЕНДІЛІГІН АРТТЫРУ ІСІНДЕГІ МОБИЛЬДІ ҚОСЫМШАЛАРҒА НЕГІЗДЕЛГЕН ОҚЫТУ ӘДІСТЕРІ

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Аңдатпа. Қазіргі заманғы білім беру жүйесінде цифрлық технологиялар қарқынды дамып келе жатқан оқыту процесінде жаңа мүмкіндіктер ашылуда. Әсіресе, мобильді қосымшаларды пайдалану оқушылардың белсенділігін арттырып, оқу материалына деген қызығушылығын күшейтуде маңызды рөл атқарады. Биология пәні визуалды материалдарға бай болғандықтан, оны тиімді оқыту үшін мобильді технологияларды қолдану аса өзекті болып отыр. Бұл мақалада оқушылардың белсенділігін арттыруда мобильді қосымшаларға негізделген оқыту әдістерінің тиімділігі қарастырылады. Мақалада ойын арқылы оқыту (gamification), интерактивті симуляциялар, виртуалды зертханалар, қосымша және виртуалды шындық (AR/VR) сияқты инновациялық әдістердің оқу процесіне әсері талданады. Gamification әдісі арқылы оқушылар білім аруды қызықты ойын түрінде қабылдайды, бұл олардың ынтасын арттырады. Интерактивті симуляциялар мен виртуалды зертханалар биологиялық процестерді нақты модельдеу арқылы оқушылардың тәжірибелік дағдыларын дамытуға көмектеседі. AR/VR технологиялары арқылы оқушылар күрделі тақырыптарды тереңірек меңгеріп, зерттеу жұмыстарын жүргізу мүмкіндігіне ие болады. Сонымен қатар, мақалада мобильді қосымшаларды қолдану барысында кездесетін қиындықтар мен оларды шешу жолдары қарастырылады. Зерттеу нәтижелері көрсеткендей, бұл әдістер оқушылардың белсенділігін арттырып қана қоймай, олардың пәндік материалды терең меңгеруіне оң әсерін тигізеді.

Тірек сөздер: биологияны оқыту, мобильді қосымшалар, gamification, AR/VR, интерактивті оқыту, оқушылардың белсенділігі, инновациялық әдістер.

МЕТОДЫ ОБУЧЕНИЯ НА ОСНОВЕ МОБИЛЬНЫХ ПРИЛОЖЕНИЙ В ДЕЛЕ ПОВЫШЕНИЯ АКТИВНОСТИ УЧАЩИХСЯ

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Аннотация. В современной системе образования цифровые технологии стремительно развиваются быстрыми темпами, открывая новые возможности для учебного процесса. Особенно важную роль в повышении активности учащихся и усилении их интереса к учебному материалу играют мобильные приложения. Биология как предмет, насыщенный визуальными материалами, предполагает использование эффективных методов обучения, и использование мобильных технологий становится актуальным. В статье рассматривается эффективность методов обучения, основанных на мобильных приложениях, для повышения активности учащихся.

Анализируются такие инновационные методы, как геймификация, интерактивные симуляции, виртуальные лаборатории, дополненная и виртуальная реальность (AR/VR), их влияние на учебный процесс. Метод геймификации позволяет учащимся воспринимать обучение как увлекательную игру, что повышает их мотивацию. Интерактивные симуляции и виртуальные лаборатории помогают развивать практические навыки учащихся через моделирование биологических процессов. Технологии AR/VR предоставляют учащимся возможность глубже осваивать сложные темы и проводить исследовательскую работу.

В статье также рассматриваются трудности, которые могут возникнуть при использовании мобильных приложений, и предлагаются способы их решения. Результаты исследования показывают, что эти методы не только увеличивают активность учащихся, но и способствуют более глубокому освоению учебного материала.

Ключевые слова: преподавание биологии, мобильные приложения, геймификация, AR/VR, интерактивное обучение, активность учащихся, инновационные методы.