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THE USE OF MOBILE SOFTWARE APPLICATIONS IN THE DEVELOPMENT OF THE COMPETENCE OF FUTURE TEACHERS OF PHYSICS AND ASTRONOMY

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ABSTRACT:

The field of education is developing, closely connected with modern technologies. The use of mobile software applications in the preparation of future physics and astronomy teachers is considered as one of the important factors in the development of competence. Mobile applications provide additional opportunities for the educational process and serve to strengthen theoretical and practical knowledge. This article will highlight the advantages of mobile applications in the development of competence of physics and astronomy teachers, the methods of their application and their role in expanding the knowledge base of teachers.

Introduction. Future teachers are required not only to have deep knowledge but also the ability to use technology to effectively organize the educational process. Competence consists of the following:

- Subject knowledge and skills: Understanding the theoretical foundations of physics and astronomy.
- Practical skills: Organizing laboratory work and experiments, working with modern technologies.
- Digital literacy: The ability to use software tools and applications in education.

The use of mobile software applications in developing competence is of great importance in the modern educational process for enhancing the knowledge, skills, and competence levels of both students and teachers. Especially in teaching technical subjects like physics

and astronomy, mobile technologies serve as an innovative approach to visualizing the subjects, deepening understanding, and developing practical skills. Mobile software applications are an essential tool in modern education, effectively assisting physics teachers in improving their knowledge and skills. Below are the key importance and opportunities of mobile applications in developing teachers' competence:

1. Updating and Deepening Theoretical Knowledge

Online learning platforms: Applications like Udemy, Coursera, and Khan Academy provide opportunities to update knowledge in modern physics, quantum mechanics, astrophysics, and other fields.

E-books and databases: Access to new literature and research through applications like Google Scholar, School Textbooks, or other reference apps.

Simulations: Apps like PhET Interactive Simulations help visualize physical processes and develop new teaching methods.

2. Developing Practical Skills

Virtual laboratories: Apps designed for simulating physics experiments (e.g., Virtual Lab) improve teachers' skills in conducting laboratory work.

Telescope and astronomy apps: Applications like SkySafari and Stellarium enable astronomical observations and help explain astronomical processes to students.

3. Tools for Conducting Interactive Lessons

Creating interactive tests: Apps like Quizlet, Kahoot, and Socrative allow teachers to create interactive quizzes and questions to assess students' knowledge.

Physics problem-solving: Apps like WolframAlpha and Physics Toolbox automate complex calculations, saving teachers time.

Visualization tools: Tools like Tinkercad or GeoGebra assist in creating and explaining physical models.

4. Enhancing Pedagogical Competence

Improving lesson plans and methodology: Apps like Lesson Planner and Planboard help teachers plan and manage lessons effectively.

Developing teaching methods: Specialized apps for teachers (e.g., Edmodo, Microsoft Teams) facilitate sharing experiences and learning modern pedagogical approaches.

Online seminars and webinars: Platforms like Zoom and Google Meet enable sharing experiences and learning new pedagogical approaches related to physics.

5. Creating and Sharing Educational Materials

Creating presentations and resources: Apps like Canva and Prezi help prepare aesthetically pleasing and understandable materials.

Managing and distributing resources: Platforms like Google Drive and Dropbox enable quick delivery of lesson materials to students.

6. Learning New Technologies

Artificial intelligence assistance: Apps like ChatGPT help teachers create educational materials.

IoT (Internet of Things): Mobile apps integrated with Arduino or Raspberry Pi are used to model physical phenomena.

7. Personal Development and Time Management

Self-assessment: Gamified learning methods like Duolingo can be used to master new knowledge in physics.

Time management apps: Implementing personal development plans through apps like Trello and Notion.

Mobile software applications are a universal tool for enhancing the competence of physics teachers. They enable the educational process to become interactive, modern, and efficient. With the help of these apps, teachers can not only improve their knowledge and skills but also deliver engaging and practical physics and astronomy lessons to students.

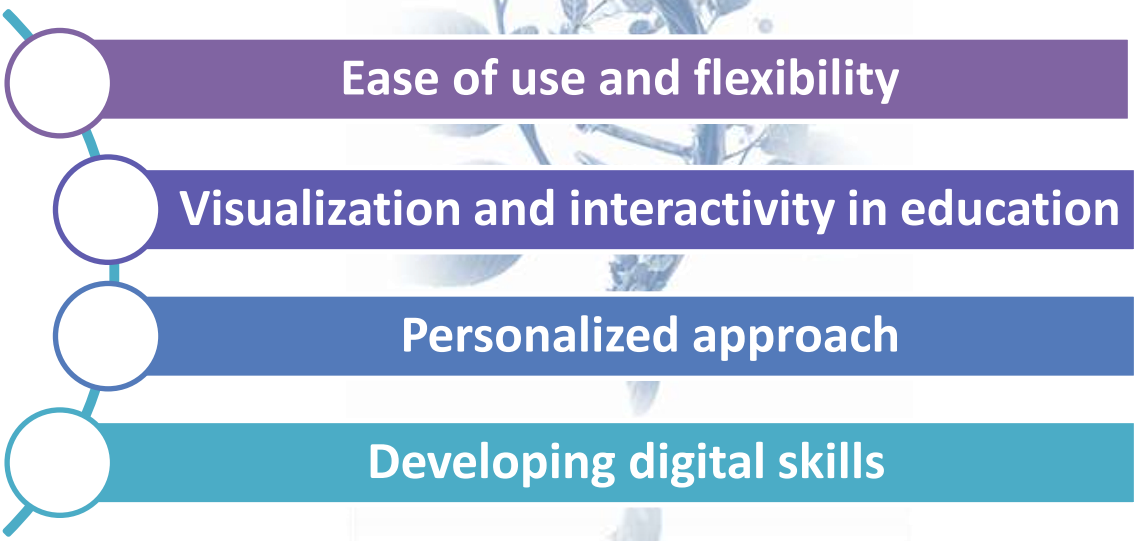

Figure 1. Advantages of developing competence

The advantages of developing competence through mobile software applications are as follows (refer to Figure 1).

1. **Ease of use and flexibility** – Students and teachers can use mobile applications anytime and anywhere. This ensures the continuity of the educational process.
2. **Visualization and interactivity in education** – Mobile apps make it easier to visualize and understand physical and astronomical processes. For example, simulations and 3D models help in studying complex phenomena.
3. **Personalized approach** – Mobile apps allow the creation of individualized learning programs. Each student can complete tasks tailored to their level of knowledge.
4. **Developing digital skills** – Working with mobile apps helps improve technological literacy, which is a necessary competence for modern educators.

The use of mobile applications in conducting classes in physics and astronomy does not always help to achieve the goal. The methodology for using mobile applications during training sessions can be divided into the following parts:

1. **Planning the integration process** – Mobile apps are adapted to the curriculum, and a usage plan related to the topic is developed. For example, using the PhET simulation to organize an experiment in class when explaining the topic of "Light Dispersion".
2. **Assigning interactive tasks** – Students are given tasks to complete independently using mobile apps. For instance, using the Stellarium app to observe the movement of stars.
3. **Using apps in the assessment process** – Students' knowledge and skills are evaluated through tests and quizzes in mobile apps. For example, organizing a quiz on the "Law of Gravity" using the Kahoot! app.
4. **Creating a digital portfolio** – Students collect their work and results from mobile apps into a digital portfolio. For example, analyzing graphs and data obtained from PhET simulations.

Mobile software applications open up new opportunities for developing the competence of future physics and astronomy teachers. These apps enable the mastery of theoretical knowledge, the implementation of practical experiments, and the effective use of digital technologies. Integrating them into the educational process ensures the innovativeness of pedagogical approaches and enhances the productivity of both students and teachers.

Mobile apps are recognized as an innovative approach in modern education and serve as an important tool for developing teachers' professional competence. They help make the pedagogical process interactive, engaging, and effective. By integrating mobile apps into the

educational process, teachers can improve their qualifications and gain new opportunities to achieve pedagogical goals.

Mobile applications that can be used in physics and astronomy education and their impact (see Table 1)

Table 1

Ilova nomi	Area of application	Impact on competence
PhET Simulations	Simulation of physics experiments	Expands practical skills and understanding
Stellarium	Astronomical observations	Develops spatial imagination and analytical skills
Google Classroom	Distance Learning & Management	Develops educational management and technological competence
Kahoot!	Organization of tests and quizzes	Increases evaluation ability
SkySafari	Study of astronomical data	Enhances data analysis and transmission skills

Mobile applications play a significant role in developing teachers' professional competence. They provide teachers with the opportunity to manage the educational process, increase students' interest, and showcase their creative abilities. By selecting the right mobile technologies and integrating them effectively, high results can be achieved in the educational process.

Taking into account the above-mentioned requirements, the following suggestions can be made:

1. **Customizing and developing software applications** – When creating mobile apps for future physics and astronomy teachers, it is necessary to include specialized content and interactive features that fully meet their needs. These apps should not only provide theoretical knowledge but also simulate laboratory work and visualize astronomical phenomena.
2. **Integration with educational platforms** – Mobile apps should be integrated with modern educational platforms. For example, features such as automatic assessment of tasks

completed by students or monitoring of the educational process can be implemented through these apps.

3. **Developing methodological guides** – Methodological guides and specialized training programs for teachers should be created to ensure the effective use of mobile apps. These guides will help teachers utilize the apps' capabilities correctly and efficiently.

Testing and improvement – Before introducing mobile apps into the educational process, it is essential to test them with future teachers and students. During the testing phase, identified shortcomings should be addressed, and the app should be refined to meet user requirements.

Establishing communication and experience-sharing platforms – Online forums or seminars should be organized for teachers who successfully use mobile software applications. These platforms allow teachers to share their experiences and explore new innovative ideas.

Regular content updates – Given the rapid development of scientific discoveries and technologies in physics and astronomy, it is crucial to regularly update the information in mobile apps. This ensures the relevance of the apps and increases user engagement.

Strengthening social support – It is recommended to implement support programs by the government and private sector to promote these apps among students and teachers. This could include grants, free access opportunities, and other incentive mechanisms. These suggestions serve to enrich the topic discussed in the article and enhance its practical effectiveness.

Conclusion. Today, the use of modern technologies in the educational process is of crucial importance. Mobile software applications play a particularly significant role in teaching physics and astronomy. This article demonstrates the effectiveness of mobile applications in developing the competence of future physics and astronomy teachers. Mobile technologies enable not only the reinforcement of theoretical knowledge in the educational process but also the efficient organization of practical classes. Additionally, the article emphasizes the advantages of using mobile applications specially developed for future teachers, such as interactivity, convenience, time efficiency, and the ability to quickly assimilate scientific knowledge. Research results have shown that the implementation of mobile applications is a key factor in enhancing the effectiveness of education. Thus, the article demonstrates the importance of educating future teachers based on modern technologies and contributes to expanding scientific approaches in this field.

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