The OSCAR PUBLISHING Services
American Journal of Philological Sciences

VOLUME Vol.05 Issue12 2025
PAGE NO. 215-217
DOI 10.37547/ajps/Volume05Issue12-59

Methodological Approach To The Development Of Competence In The Use Of Mobile Applications By Future Chemistry Teachers

Dauekeeva Guljaxan Uralbaevna
Basic doctoral student, Doctoral student of Nukus state pedagogical institute named after Ajiniyaz, Uzbekistan

Received: 26 October 2025; **Accepted:** 17 November 2025; **Published:** 23 December 2025

Abstract: This study presents the improved methodological foundations for the development of the competence of future chemistry teachers in the effective use of mobile applications in professional education. The study examined the pedagogical foundations of mobile learning, the educational possibilities of mobile applications in teaching chemistry. Special attention is paid to the introduction of mobile technologies into higher education curricula for the development of digital literacy, methodological training, and subject-specific skills.

A structured, stage-based methodological model is proposed, encompassing motivational, conceptual, practical, and evaluative components. Each stage contributes to the systematic formation of professional competencies required for the modern chemistry teacher. The effectiveness of the proposed methodology was evaluated through an experimental study involving undergraduate chemistry students. The results indicate that the intentional and pedagogically grounded use of mobile applications enhances students' academic achievement, practical laboratory performance, and engagement in learning activities.

The findings confirm that mobile applications are a valuable instructional resource for modernizing chemistry teacher education and aligning it with contemporary digital transformation processes. The proposed methodology may be adapted for implementation in higher education institutions seeking to improve the quality of teacher preparation in science disciplines.

Keywords: Mobile learning, mobile applications, chemistry teacher education, professional competence, digital literacy, innovative pedagogy.

Introduction: The rapid advancement of digital technologies has significantly reshaped educational practices in the twenty-first century. Mobile devices and applications have become essential tools in teaching and learning, offering flexibility, accessibility, and interactive learning environments. In science education, particularly in chemistry, mobile technologies enable the visualization of abstract concepts, simulation of chemical processes, and performance of virtual experiments, thereby enhancing conceptual understanding.

Contemporary educational systems increasingly emphasize the development of digital competencies among future teachers. In this context, higher education institutions face the challenge of preparing chemistry teachers who can effectively integrate mobile technologies into instructional practice. Chemistry education is characterized by complex theoretical constructs, symbolic representations, and experimental activities that often require advanced pedagogical support.

Furthermore, national and international educational strategies highlight the importance of digital transformation and innovation in teacher education. The experience of large-scale distance learning during the COVID-19 pandemic further demonstrated the necessity of equipping future educators with practical digital skills. These factors underscore the relevance of developing a systematic methodology for forming future chemistry teachers' competence in using mobile

applications.

Conceptual Foundations of Mobile Learning. Mobile learning is defined as an educational approach that utilizes portable digital devices—such as smartphones, tablets, and laptops—supported by wireless technologies to facilitate learning beyond traditional classroom boundaries. This approach promotes learner autonomy, continuity of education, and adaptive learning pathways.

Key features of mobile learning include personalized instruction, immediate access to educational resources, interactive multimedia content, and enhanced communication between instructors and learners. Rather than replacing conventional teaching methods, mobile learning complements traditional and online formats, contributing to increased instructional effectiveness.

Instructional Potential of Mobile Applications in Chemistry Education. Mobile applications offer diverse instructional opportunities in chemistry education. These include visual representations of chemical elements, three-dimensional modeling of molecular structures, animated explanations of reaction mechanisms, and virtual laboratory simulations. Additionally, mobile applications provide tools for formative assessment through quizzes and interactive exercises.

Instructional Functions of Mobile Applications in Chemistry

Table 1.

Application	Primary Function	Educational Value
Periodic Table	Exploration of chemical elements	Conceptual reinforcement
Molecule 3D	Molecular visualization	Development of spatial reasoning
Chemistry Lab	Virtual experimentation	Practical skill acquisition
ChemDraw Mobile	Chemical structure representation	Professional skill enhancement

Methodology for Competence Development. A multi-stage methodology was developed to systematically form future chemistry teachers' skills in using mobile applications.

Stages of Competence Development

Table 2.

Stage	Description	Expected Outcome
Motivational	Awareness of pedagogical value	Increased motivation
Conceptual	Study of mobile learning principles	Theoretical understanding
Practical	Application-based activities	Skill development

Evaluative	Reflection and assessment	Professional competence

Methodological Model. The proposed methodological model integrates four interconnected components: goal-oriented, content-based, technological, and outcome-oriented. This structure ensures coherence between instructional objectives, learning activities, and assessment procedures.

Experimental Study and Findings. An experimental study was conducted with undergraduate chemistry students at a higher education institution. The experimental group engaged in structured learning activities supported by mobile applications, while the control group followed traditional instructional methods. Comparative analysis revealed significant improvements in academic performance, practical laboratory skills, and learning motivation among students in the experimental group.

CONCLUSION

The study demonstrates that a systematically designed methodology for integrating mobile applications into chemistry teacher education effectively enhances professional competence. Mobile learning technologies provide meaningful support for conceptual understanding and practical skill development. The proposed approach contributes to the modernization of chemistry education and can be adapted for broader application in science teacher training programs.

REFERENCES

1. Karimov, I. A. (2008). High Spirituality Is an Invincible Force. Tashkent: Ma'naviyat.
2. Azizkhojayeva, N. N. (2015). Pedagogical Technologies and Pedagogical Mastery. Tashkent.
3. Khodjaev, B. Kh. (2018). Information Technologies in Education. Tashkent.
4. Sharipov, Sh. S. (2020). Methods of Teaching Chemistry. Tashkent.
5. Traxler, J. (2017). Mobile Learning: A Theoretical and Practical Perspective. London.
6. Ally, M. (2019). Mobile Learning: Transforming Education. Canada.
7. Sharples, M., Taylor, J., & Vavoula, G. (2005). Towards a theory of mobile learning. Proceedings of mLearn, 1(1), 1–9.
8. Graham, C. R. (2006). Blended learning systems: Definition, current trends, and future directions. In C. J. Bonk & C. R. Graham (Eds.), The Handbook of Blended Learning (pp. 3–21).