

ANNOTATION

to the dissertation of Uteulyiev Nurgali Sabitovich for the degree of Doctor of Philosophy (PhD) in the educational programme 8D01510 – Mathematics

Research topic: Methodological preparation of future mathematics teachers for the use of digital educational resources in teaching a school geometry course

The aim of the research: to determine the theoretical foundations of the methodological preparation of future mathematics teachers for the use of digital educational resources (DER) in teaching the school geometry course, to develop content and methodology, and to conduct an experimental evaluation of its effectiveness.

Research objectives:

1. Analyze the current state of pedagogical research on the issue, study the psychological and pedagogical features of teaching the school geometry course using DER, and determine the theoretical foundations for the methodological preparation of future mathematics teachers to apply DER.

2. Clarify the concept of the methodological preparation of future mathematics teachers for the use of DER in teaching the school geometry course, main components, didactic conditions for its implementation.

3. Organization of the educational process of methodological preparation of future mathematics teachers to use DER when teaching the school geometry course, as well as development of the content and methods of teaching the special disciplines "Information technologies in mathematics" and "Selected chapters of the methodology of teaching geometry".

4. Develop criteria and indicators for assessing the level of methodological preparation of future mathematics teachers to use DER in teaching the school geometry course, and experimentally validate the effectiveness of the developed methodology.

Research methods:

- Analysis of psychological, pedagogical, and scientific-methodological literature related to the research topic;

- Study of educational programs and curricula of higher education institutions for training future mathematics teachers, along with an analysis of school geometry curricula, textbooks, and DER effective for teaching geometry.

- Monitoring of the educational process, conducting surveys, interviews, observations and tests with students, analyzing the results.

- Experimentation, application of statistical research methods, data processing and discussion of the results at methodological seminars and scientific-practical conferences.

The main provisions (proven scientific hypotheses and other conclusions that are new knowledge) submitted for defense

1. Theoretical foundations of the methodological preparation of future mathematics teachers for the use of DER in teaching the school geometry course.
2. Essence, components, didactic conditions of the methodological preparation of future mathematics teachers for the application of DER in teaching the school geometry course.
3. Contents, forms and tools of organizing the educational process of methodological training of future mathematics teachers for the use of DER in teaching the school geometry course;
4. Educational and methodological complexes and methods of teaching special subjects "Information technologies in mathematics" and "Selected chapters of the methodology of teaching geometry";
5. Criteria and indicators for determining the level of methodological preparation of future mathematics teachers for using DER in teaching the school geometry course.

Description of the main research results

Based on the results of the analysis of psychological, pedagogical, scientific and methodological literature and research works: the concept of DER was defined, opportunities for their use in teaching geometry were identified, and recommendations for their implementation were provided. Additionally, key requirements for the design and development of such resources were determined. A review of the current state of the field was conducted.

As a result of the analysis of scientific and methodological researches conducted on the research problem, it was established that: sufficient experience of scientific research on the issue of using DER in the training of future mathematics teachers has been accumulated. At the same time, it was revealed that the issue of methodological training of future mathematics teachers to teach geometry using DER was not considered as a separate, scientific research problem. The need to use DER in teaching the school geometry course and the lack of theoretical and methodological foundations for the methodological training of future mathematics teachers determined the relevance of this research work.

Psychological and pedagogical aspects of DER usage in teaching school geometry were analyzed, and several key benefits of their application were identified. DER were classified based on their didactic capabilities. An analysis of the documentation of Higher education institutions preparing future mathematics teachers - such as curricula, course content, and educational programs - was conducted. Based on this, the theoretical foundations of the methodological preparation of future mathematics teachers for the use of DER in teaching school geometry were determined.

The essence of methodological preparation for future mathematics teachers was thoroughly analyzed, and four key components necessary for assessing their methodological readiness to use DER in teaching geometry were identified: motivational, scientific-theoretical, information-technological, evaluation-reflective.

To ensure the effective methodological preparation of future mathematics teachers for the use of DER, the following didactic conditions were developed: a

comprehensive approach to learning, methodological preparation, conducting practical and laboratory sessions, developing critical thinking, psychological and pedagogical aspects, promoting collaboration and knowledge sharing, also evaluating results.

Structure of organizing training for methodical preparation of future mathematics teachers for using DER in teaching school geometry have been developed. Additionally, the content of two specialized disciplines "Information technologies in mathematics" and "Selected chapters of the methodology of teaching geometry" was created, their forms and tools of training have been determined, and they have been introduced into the educational process. A methodology for teaching these courses was also developed.

Based on the proposed components of methodological preparation for future mathematics teachers to use DER in geometry lessons, criteria and indicators for assessing their level of preparedness were developed. The effectiveness of the proposed methodology was confirmed through experimental results, which were validated using methods of mathematical statistics.

Justification of the novelty and importance of the obtained results:

1. The psychological and pedagogical features of the use of DER in teaching the school geometry course were analyzed, a classification of DER by their didactic capabilities was developed, and the theoretical foundations of the methodological training of future mathematics teachers to use DER were determined;

2. The essence of the concept of methodological training of future mathematics teachers to use DER in teaching the school geometry course, main components, didactic conditions of its implementation was identified.

3. An educational process of methodological training of future mathematics teachers for the use of digital educational resources in teaching the school geometry course has been organized, and the content and methods of teaching the disciplines "Information technologies in mathematics" and "Selected chapters of the methodology of teaching geometry" have been developed;

4. Criteria for determining and indicators for assessing the level of methodological training of future mathematics teachers for the use of DER in teaching the school geometry course have been developed, and the effectiveness of the proposed methodology has been confirmed during the experiment.

Compliance with the directions of scientific development or state programs:

The topic of the dissertation is characterized by the main directions specified in the Law of the Republic of Kazakhstan "On Education", in the Concept of Development of higher education and science of the Republic of Kazakhstan for 2023-2029, as well as in the state compulsory standards of higher and postgraduate education.

Description of the doctoral student's contribution to the preparation of each publication:

The main provisions of the research, the content of theoretical and practical scientific results were published at international scientific and practical

conferences, as well as in scientific publications recommended by the Committee for quality assurance in the field of Science and higher education of the MSHE of the Republic of Kazakhstan, as well as in a scientific journal included in the Scopus scientometric database:

1. The importance of digital educational resources in the training of future mathematics teachers and the features of their use // Proceedings of the international scientific and practical conference "Auezov Readings - 19: 30 Years of Independence of Kazakhstan". - Shymkent, - 2021. - P. 104-107. (Co-authors: Madiyarov N.K., Drobyshev Yu.A., the share of the doctoral student is 80%).

2. Digital educational resources and platforms for teaching mathematics // Proceedings of the international scientific and practical conference "Auezov Readings - 19: 30 Years of Kazakhstan's Independence". - Shymkent, - 2021. - P. 107-110. (Co-authors: Madiyarov N.K., Drobyshev Yu.A., the share of the doctoral student is 80%).

3. Possibilities of using new digital technologies in teaching geometry course to students // "Bulletin of Yasawi University" - 2022. - No. 2 (124). - P. 253-265. (Co-author: Madiyarov N.K., the share of the doctoral student is 90%).

4. Application of augmented reality in the process of teaching geometry // Mathematics and problems of education: Proceedings of the 41st International Scientific seminar of teachers of Mathematics and Computer science of universities and pedagogical universities. – Kirov: VyatGU. - 2022. - P.169-171. (the share of doctoral students is 100%).

5. Features and efficiency of using dynamic geometry system in teaching geometry course to future mathematics teachers // Bulletin of the L.N. Gumilyov Eurasian national university. Series: Pedagogy. Psychology. Sociology. - 2022. - No. 2 (139). - P.63-75. (Co-author: Madiyarov N.K., the share of doctoral students is 90%).

6. Methods of teaching the school geometry course to future mathematics teachers in the context of digitization of education // Bulletin of the L.N. Gumilyov Eurasian national university. Series: Pedagogy. Psychology. Sociology. - 2022. - No. 4 (141). - P.357-368. (Co-authors: Madiyarov N.K., Azhibekov K.Zh., doctoral student's share - 80%).

7. Assessment of the readiness of future mathematics teachers to use digital educational resources in the study of geometry in Kazakh universities // European Journal of Contemporary Education. - 2023. - 12(2). - 667-677 p. (Co-authors: Madiyarov N.K., Drobyshev Yu.A., Azhibekov K.Zh., the share of doctoral students is 70%).

8. Use of modern digital educational resources in geometry lessons in higher educational institutions of the Republic of Kazakhstan // Scientific Herald of Uzhhorod University Series «Physics». - 2024. - 56. - 42-49 p. (Co-authors: N., Azhibekov K.Zh., Ashirbayev N., Sultanbek T., the share of doctoral students is 70%).

9. Features of digital educational resources in teaching geometry in the context of digitalization of education // Ensuring the integration of science, education and production based on innovative technologies: International scientific

and practical online conference. - Jizzakh. - 2024. - P. 11-17. (Co-authors: Drobysheva I.V., Madiyarov N.K., the share of doctoral students is 80%).

10. Criteria for assessing the methodological preparedness of future mathematics teachers for the use of digital educational resources in teaching school geometry // World of science: collection of articles of the IX International scientific and practical conference. - Penza: MCNS "Science and Education". - 2024. - P. 117-123. (Co-authors: Drobysheva I.V., Madiyarov N.K., the share of doctoral students is 80%).