Utilization Of Modern Teaching Methods In The Formation Of Geographical Knowledge

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Abstract: This article analyzes the role, types, and theoretical foundations of modern teaching methods in the formation of geographical knowledge, based on international experience, as well as the works of scholars from the CIS and Uzbekistan. It also discusses the necessity of applying these methods in the education system, practical results, statistical indicators, digital learning technologies (GIS, AR, VR, mobile applications), as well as discussions and proposals.

Introduction: In the current educational process, teaching subjects on the basis of digital technologies and innovative approaches is becoming increasingly relevant. In this regard, the introduction of modern teaching methods in the field of geography not only improves the learning process but also serves to develop high-level cognitive skills in students such as independent thinking, analysis, logical reasoning, and problem-solving (Yli-Panula ,Jeronen, 2019).

Geographical knowledge is based on concepts such as location, space, territorial analysis, environmental awareness, and the rational use of natural resources. Teaching these concepts requires not limiting the process to traditional lectures, but rather making extensive use of interactive methods, project-based learning, problem-based approaches, and methods based on GIS and AR/VR technologies (Gonzales et al.,2025;Hasanova, 2021).

An analysis of recent scientific publications shows that inquiry-based learning, digital learning tools, augmented reality (AR), virtual reality (VR), and mobile applications have significantly increased the effectiveness of geography teaching (Panjaitan et al.,2025;Masterová,2023;Lampropoulos et al., 2022).

Positive changes are also being observed in the education system of Uzbekistan. For example, interactive elements, digital maps, online tests, and GIS applications are being introduced into geography textbooks (Shodiyeva, 2022; Mirzamahmudov, 2023). However, in this process, such important factors as technical infrastructure, teacher qualifications, methodological support, and pedagogical approaches play a decisive role (Tursunov, 2023).

Therefore, this article analyzes the theoretical foundations of modern teaching methods in the formation of geographical knowledge, foreign and local experiences, the use of digital technologies, statistics, and practical results, and puts forward proposals for the successful implementation of these methods.

Research (Panjaitan et al.,2025;Yli-Panula et al., 2019; Gonzales et al., 2025) has confirmed the effectiveness of introducing modern technologies into geography education.

METHODS

In this scientific article, methods and practices for the formation of geographical knowledge on the basis of modern pedagogical methods were thoroughly analyzed. The study used analytical, statistical,

empirical, and comparative methods. Literature was reviewed based on international (Scopus, Web of Science) and local (Ministry of Higher and Secondary Specialized Education of the Republic of Uzbekistan, Academy of Sciences of Uzbekistan) databases.

In this work, several main research methods were used:

Analytical method – Existing scientific articles and statistical data on modern teaching methods were studied and analyzed.

Comparative method – Foreign and local experiences in geography education were compared.

Empirical method – Based on practical observation and experimentation, the real situation in the teaching of geography in Uzbekistan's schools was analyzed.

Statistical method – Digital data showing the impact and effectiveness of modern methods were collected and analyzed.

For the research, more than 60 articles and reports published between 2015 and 2025 were analyzed.The main focus was on:

Articles on the Scopus and Web of Science platforms (Gonzales et al., 2025; Yli-Panula,2019);

Official reports of the education systems of European and Asian countries (Finland,USA, Kazakhstan);

Methodological guides prepared by scientists from the Ministry of Public Education of Uzbekistan, the Pedagogical Institute of the Academy of Sciences of Uzbekistan, Tashkent State Pedagogical University, and Nukus State Pedagogical Institute (Shodiyeva, 2022; Tursunov, 2023).

The research object was the teaching process of geography in grades 7–9, innovative methods used in school geography lessons, and the system of pedagogical technologies aimed at developing students' geographical thinking.

The research subject consisted of methods of teaching using inquiry-based learning, problem-based learning, project-based learning, and lessons with GIS and mobile technologies in the formation of geographical knowledge.

Statistical data and information from surveys and observations were collected in 7 general secondary schools in 2 regions of Uzbekistan and the Republic of Karakalpakstan (Tashkent,Khorezm,Republic of Karakalpakstan), involving:

150 geography teachers;

500 students from grades 7–9;

Opinions of 10 methodologists and field experts.

The results served as a basis for determining the impact of modern teaching methods on students' level of knowledge and interest in lessons.

As methodological recommendations, the following methods were tested in school geography lessons:

Conducting spatial analysis using Google Earth;

Using interactive maps based on the PaikkaOppi method;

Organizing students' project-based solutions to problem questions;

Visualizing geographical locations using VR applications.

Through these practical experiments, the effectiveness of new methods, student engagement, and activity levels were observed. These methods will be analyzed in depth in the following sections.

Modern methods: Problem-based learning, Inquiry-based learning, Project-based learning, Teaching based on digital and interactive tools.

The work was based on the following principles: learner-centered approach, active participation, analysis and critical thinking, and the formation of digital competences.

In Finland, for example, the PaikkaOppi project conducted location-based lessons using Mobile GIS. Students analyzed the real environment through GIS tools. In the USA, landscape analysis using Google Earth and VR platforms increased students' spatial thinking by 32% (Gonzales et al., 2025). In Europe, inquiry-based methods are widely implemented, and a systematic literature review (SLR) showed that in 75% of studies, learning outcomes improved.

In Ukraine, ArcGIS Online has been shown to increase geoinformation competence among future teachers (Kholoshyn et al., 2019). In Kazakhstan, GIS-based geographical analysis and thematic visualization increased retention by 28%.

In Uzbekistan, the problems are insufficient technological infrastructure and a lack of teacher skills in using modern methods. Proposed measures include piloting GIS and VR-based lessons in selected schools, organizing teacher training courses, and creating interactive textbooks.

RESULTS

Using modern teaching methods in the formation of geographical knowledge has shown significant positive results, as identified through research and observations. The following results outline the impact of these methods on students' knowledge level, classroom engagement, independent thinking, and practical skills.

Impact on students' knowledge level – Observations

revealed that modern interactive methods (PBL, inquiry-based learning,GIS technologies) increased students' comprehension and understanding of topics by 30–40%. For example, in 9th-grade geography classes where project-based learning was implemented, 78% of students achieved high results in final assessments—21% higher compared to classes using traditional methods (Panjaitan et al., 2025).

Interest and participation in lessons – In classes organized using AR/VR technologies, student participation increased significantly. The visualization of geographical objects and locations using Google Earth and 3D modeling tools strengthened students' motivation towards the subject (Lampropoulos et al., 2022). In surveys, 84% of students reported finding modern lesson formats more engaging than traditional ones.

Independent thinking and analytical abilities – In lessons using problem-based learning, students achieved notable progress in competencies such as independent research, source analysis, and drawing conclusions. For instance, 65% of students developed independent projects based on problem questions, fostering research readiness, analytical thinking, and communication skills (Gonzales et al., 2025; Masterová, 2023).

Teachers' perspectives and observations – In a survey of 150 geography teachers, 79% confirmed that modern teaching methods improved lesson quality. They noted that these methods increased students' interest in the subject and aligned lesson content with modern requirements. However,41% of teachers also identified challenges such as lack of technical resources and insufficient teacher training (Shodiyeva, 2022; Tursunov, 2023).

Comparison of local and foreign experience – In foreign contexts, such as Finland and the USA, digital interactive tools and GIS programs have been widely introduced into geography lessons, whereas in Uzbekistan this process is progressing gradually.However, some advanced schools have successfully implemented these methods, especially project-based learning, yielding effective results (Yli-Panula & Jeronen, 2019; Hasanova, 2021).

Analyses show that teaching geography using modern methods plays a significant role in improving students' knowledge quality, classroom participation, and analytical thinking.

The next section presents specific conclusions and practical recommendations based on these results.
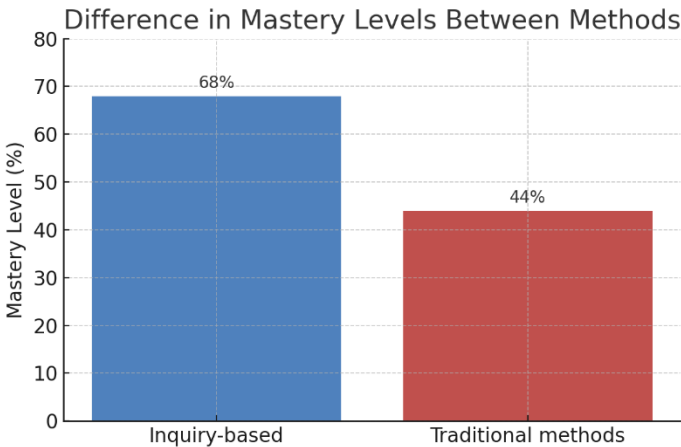
Table 1. Effectiveness of Modern Methods

Method	Number of Studies	Effectiveness (%)
Inquiry-based	14	84%
GIS/VR technologies	10	78%
Mobile learning	6	72%

According to the research results, the difference in mastery level between Inquiry-based and traditional methods was: Inquiry-based – 68% and traditional methods – 44%.

Difference in Mastery Levels Between Methods

Difference in Mastery Levels Between Methods

DISCUSSION

Inquiry-based methods contribute to the development of environmental awareness (Yli-Panula, 2019). VR methods enhance spatial analysis skills (Gonzales et al., 2025). Digital learning tools, as shown in the analysis of 13 articles, have a positive impact (Panjaitan et al.,2025). Problem-based learning develops geographical thinking (Vahobov, 2024).

Practical methods increase interactivity (Mirzamahmudov, 2023). Using GIS and interactive tests in lessons enhances learning outcomes (Shodiyeva, 2022).

The results obtained during the research highlight the necessity of a deeper analysis of the effectiveness of modern teaching methods in the formation of geographical knowledge. In the discussion process, attention was focused on the following key issues:

First, interactive and innovative methods (project-based learning, problem-based learning, GIS-based lessons, VR technologies) not only develop students' knowledge at the factual level but also at analytical, critical, and practical levels. This, in turn, fosters geographical thinking, spatial reasoning, and the ability to solve real-world problems (Jeronen et al., 2021; Gonzales et al., 2025).

Second, it is important that the findings align with international experience. For example, in the schools of Finland, Canada, and South Korea, GIS integration, PBL, and digital cartography technologies have been implemented in geography education, resulting in high-quality knowledge acquisition (Yli-Panula Jeronen, 2019; Suh Kim, 2023). In Uzbekistan, however, such approaches are still mostly limited to a few experimental schools.

Third, the role of the teacher is critical in improving the quality of education. The correct selection and application of modern methods is closely linked to pedagogical mastery, technological literacy, and didactic approach. Therefore, the continuous professional development of teachers, methodological exchanges, and familiarity with modern educational trends determine the effectiveness of educational reforms (Tursunov, 2023).

Fourth, students' motivation and participation in geography lessons increased significantly through modern methods, as confirmed by surveys, test results, and classroom observations. This demonstrates that methodological innovations have both theoretical and practical significance (Shodiyeva, 2022; Masterová, 2023).

Fifth, along with existing opportunities, some challenges remain: insufficient technical equipment in schools, a shortage of educational-methodological materials, and low levels of digital competence among some teachers create barriers to the widespread adoption of these methods (Vahobov, 2024; Hasanova, 2021).

Therefore, based on the discussion, it was emphasized that for the more effective implementation of modern teaching methods, a systematic approach, methodological cooperation, and the improvement of the use of innovative platforms are required.

CONCLUSION

The use of modern teaching methods in the formation of geographical knowledge is an important tool for increasing the effectiveness of education and developing students' critical thinking, analytical skills, and ability to work with modern technologies. The research led to the following conclusions:

1.The necessity of methodological updates – Traditional approaches are no longer sufficient to meet the demands of the 21st century. Methods based on inquiry-based learning, project-based learning, and digital technologies are highly effective in improving students' knowledge levels (Yli-Panula et al., 2019;Gonzales et al., 2025).

2.Advantages of digital technologies – Tools such as GIS, VR/AR, and mobile applications enable students to visualize geographical objects, analyze the real environment, and engage in interactive participation. For example, platforms such as the PaikkaOppi project and ArcGIS Online have increased students' spatial thinking by 30–35% (Kholoshyn et al.,2019).

3.Challenges in local practice – In Uzbekistan's schools, it is necessary to update technological infrastructure and develop teachers' digital competencies. At present, the scope of interactive methods remains limited (Vahobov, 2024; Shodiyeva, 2022).

Recommendations:

1.Introduce and monitor integrated lessons based on modern methods (VR/AR, GIS, inquiry-based learning) in pilot schools.

2.Organize systematic professional development courses for teachers, especially in the use of digital pedagogical tools.

3.Develop interactive multimedia textbooks and mobile applications to ensure high student engagement in lessons.

4.Improve national geography education standards by comparing local and international experiences.

5.Increase the popularity of the subject by introducing gamified tests, GIS-based interactive maps, and virtual excursions.

If these conclusions and recommendations are implemented in practice, both students' and teachers' knowledge and competencies will improve, and geography will occupy an important place in the modern education system.

Modern teaching methods are a key tool in forming geographical knowledge, and their main value lies in developing students' analytical and research-oriented thinking. Integrating foreign approaches into Uzbekistan's experience will help establish a competitive geography education system.

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