Kazakh International Journal of
Geography and Environment (KIJGE)
2026, 1(1), 40-50.
https://doi.org/10.51889/KIJGE.2026.1.1.004

Article

Methods for improving cartographic competence of schoolchildren

Razia Kaldybekova[1], Albina Beikitova [1*]

[1] Abai Kazakh National Pedagogical University, Faculty of Natural Sciences and Geography, Department of Geography and Ecology, Almaty, Kazakhstan; (R.K.) razia-75@mail.ru, https://orcid.org/0000-0003-1751-6962; (A.B.) ban_1985@mail.ru , https://orcid.org/0000-0003-1757-2198

*** Corresponding author:** *Albina Beikitova, Kazakhstan, Almaty 050010, 13 Dostyk Avenue, ban_1985@mail.ru, +77025931039*

ARTICLE INFO

Received: 22 June 2026
Revised: 29 June 2026
Accepted: 30 June 2026
Available online: 30 June 2026

CITATION

Kaldybekova, R. & Beikitova, A. (2026) Methods for improving cartographic competence of schoolchildren. *Kazakh International Journal of Geography and Environment (KIJGE), 1(1), 40-50.* https://doi.org/10.51889/KIJGE.2026.1.1.004

IRSTI

14.25.09

SECTION

Geographic Education

KEYWORDS

Map-related knowledge; mapping skills; map-based activity; cognitive skills; analytical thinking.

Abstract: The development of cartographic competence is an important objective of contemporary geography education, as it enables students to interpret spatial information, analyze geographical phenomena, and apply higher-order thinking skills through map-based learning. This study aims to evaluate the effectiveness of methods for improving the cartographic competence of secondary school students using learning tasks structured according to Bloom's taxonomy. A quasi-experimental research design was conducted with 94 students aged 13–14 from Secondary School No. 167 in Almaty, Kazakhstan. Participants were divided into experimental and control groups. Three levels of cartographic tasks aligned with Bloom's taxonomy were developed to assess students' map-reading, analytical, synthesis, and evaluation skills. The experimental group received structured instruction based on taxonomy-oriented map activities and project-based learning, while the control group followed conventional geography instruction. Comparative analysis of the results showed that the experimental group achieved higher performance across all cognitive levels. The largest difference between the groups was observed at the synthesis and evaluation level, where the experimental group outperformed the control group by 34 percentage points. The findings indicate that the systematic integration of Bloom's taxonomy into cartographic instruction effectively enhances higher-order thinking skills, including analysis, synthesis, evaluation, and independent problem-solving. In addition, project-based cartographic activities contribute to the development of practical mapping skills and cartographic literacy. The study demonstrates the pedagogical value of taxonomy-based instruction within the updated geography curriculum of Kazakhstan and highlights its potential to strengthen students' critical thinking and spatial reasoning. The proposed approach provides a practical methodological framework for improving cartographic competence and promoting more effective geography learning in secondary schools.

* * * * * *

1 Introduction

As one of the most critical social institutions, education is continually evolving to align with shifting societal goals and needs, driven by the development and integration of advanced technologies. This reality calls for ongoing exploration, analysis, and tracking of both broader civilizational processes and the operational dynamics of educational systems, aiming to synchronize their key features with social transformations and the primary directions of scientific, technological, and social advancement (Whittaker, 2012). Simultaneously, modernization must target the content of education itself, since the core curriculum lays the groundwork and potential for refining secondary school training programs, while also shaping the standards and quality of higher education (Kyriacou, 2010). The content of contemporary

education influences how society's productive forces develop and are utilized, as well as its material and spiritual culture and the overall well-being of its people (Ahtee et al., 2011).

Today, numerous perspectives exist for outlining the trends shaping 21st-century education. The following major trends can be identified:

- *humanization* of education as a fundamental turn from its technocratic goal (providing production with staff, their adaptation to the needs of production) to the humanistic goals of becoming and developing a personality, creating conditions for its self-realization;

- *democratization* of education as a transition from a rigid centralized and uniform system of organization of education to the creation of conditions and opportunities for every educational institution, every teacher, lecturer and student to fully reveal their potential and abilities;

- *leading development* of general and professional education of individuals in line with the evolving levels of production, equipment, and technology.

In today's educational world of secondary and higher education institutions, not only knowledge is transferred, but also the process of educating motivated, enterprising personality of students is going on. It is necessary to replace the formula "education for life" with the formula "education through whole life". Like other social fields, education requires constant updating, that is, using new methods and forms of organizing education that will help students learn new material, strive for a goal, learn how to work independently, be able to analyze information, learn how to apply skills in practice.

In recent years, the education system of the Republic of Kazakhstan has undergone fundamentally new transformations. The large-scale implementation of the updated curriculum in secondary schools marks the initial phase of reforming the educational institution as a whole. Revising the curriculum is a necessity driven by the demands of the present era. The renewed content of the curriculum will enable the development and enhancement of knowledge and skills for both students and teachers.

The education reform strategy is designed to shift the education system toward a new model, with the aim of making it competitive in the global education arena (Parker & Hurry, 2007; Kaldybekova et al., 2021). It focuses on developing a generation of young people who are both protected and adaptable in the labor market, equipped with the knowledge, skills, and competencies needed to integrate into society at various levels, and capable of lifelong learning.

A map is a source of information that, in the context of information technology (Harrow, 1972; Simpson, 1971) can be viewed as a specific information product resulting from the application of cartographic methods to the study of specific territories. The current curriculum prioritizes tasks that align with the higher levels of Bloom's taxonomy of thinking. This is because the revised Bloom's taxonomy (Anderson & Krathwohl, 2001) places special emphasis on developing the learner's abilities that lead to the formation of creative skills. Nevertheless, teachers remain uninterested in developing mapping skills—an integral component of geography - through such tasks (Marzano, 2006; Costa, 1985).

Given the rapid pace of technological advancement today, individuals need to be able to adjust to any situation. Continuous learning is essential, because knowledge evolves every four to five years, making self-improvement a necessity. Accordingly, education should equip students with practical skills and abilities that serve them in real life, rather than overwhelming their minds with vast amounts of information that has little everyday use. The modern educational system bears the responsibility of raising a generation that is intelligent, multilingual, and eager to keep learning throughout life - one capable of adapting to the conditions of a fast-changing world. Despite the growing international recognition of Bloom's taxonomy as an effective framework for developing higher-order thinking skills, its systematic application through map-based tasks at the secondary school level in Kazakhstan has not been empirically investigated. This study therefore addresses an existing research gap by examining how structured cartographic tasks, designed across all six levels of Bloom's revised taxonomy, can enhance students' cartographic competence and geographic thinking skills within the context of Kazakhstan's updated secondary school curriculum.

2 Materials and methods

The revised content and organization of the geography curriculum are shaped by the unique characteristics of the discipline (Lambert & Balderstone, 2012). Whereas geography was once a science focused on describing new territories and countries through exploration, its current role now encompasses the following objectives:

- assessing the impact of human activity on the environment;
- examining the integrity of ecosystems;
- preventing the detrimental effects of human actions on nature;
- exploring methods to conserve mineral resources;
- identifying causal relationships within natural processes;
- analyzing political, demographic, and economic developments occurring globally.

The purpose of studying this subject is to cultivate specific skills. These skills are categorized according to Bloom's taxonomy.

Table 1. Verbs used in Bloom's Taxonomy

Creating	Create new, design an innovation.
Evaluation	Argue, defend a point of view, validate, predict.
Analyzing	Analyze, check, conduct an experiment, organize, compare, and differentiate.
Applying	Apply, illustrate, solve
Understanding	Describe, explain, identify signs, formulate differently.
Remembering	Make a list, highlight, tell, show, name.

In the course of the study, the methods of mastering new knowledge, methods of forming skills and abilities, practical, visual techniques and methods were used. A feature of these methods is that students are given the opportunity of oral presentation, the formation of mental activity, the use of knowledge through action.

For instance, engage with diverse origins of geographical understanding - such as recounting and appraising the impact of explorers and scholars on the advancement of geography as a discipline. Fulfilling these assessment aims cultivates a range of hands-on competencies in learners, illustrating how theoretical insights can be applied in real-world scenarios. Concurrently, the outlined evaluation objectives and abilities are tailored to the developmental stage of the students.

Working with the updated curriculum shows that students become more autonomous and better at regulating their own learning process. This happens because they can see the final result of their efforts and develop practical skills they can actually use. In this context, the teacher’s role is to teach how to learn - rather than handing out ready-made knowledge, they provide guidance and adjust the learning process in the classroom. Today, people need to build skills and acquire knowledge that are essential for real life. The updated geography curriculum is designed to help students grow into independent and responsible individuals, guided by strong moral and spiritual values.

In the present day, it is impossible to study geography without relying on cartographic data. A map is no longer just a familiar depiction of the Earth's surface; it is now viewed as a source of information that, through the lens of information technology, can be considered a distinct informational product derived from cartographic methods used to analyze specific areas. In contemporary society, there is a growing emphasis on the importance of cartographic science. Without maps, it would be extremely challenging to form a representation of the place we inhabit (Beard et al., 1993; Wood & Fels, 1992).

Becoming familiar with a map involves the following steps:

- developing cartographic knowledge;
- learning practical techniques for using the map;
- grasping the meaning of the map;
- forming spatial perceptions.

In today's world, a shift in perspective is essential across numerous aspects of existence. The cognitive process involves organizing information, progressing from fundamental concepts to increasingly complex ones. This concept is linked to the creation and application of innovative teaching methods within the learning experience. Advanced cognitive abilities in geography pertain to the subsequent intellectual exercise:

- ability to work with geographic concepts and terms;
- transformation of geographic material from one form of expression to another;
- application of knowledge and skills in research activities;
- analyze geographic information;
- make logical conclusions;
- critically process facts;
- correctly present the results of completed studies in academic forms (in the form of a poster presentation, etc.).

Bloom's Taxonomy is an effective hierarchical system in education that enables the efficient use of time while ensuring a systematic approach to learning and facilitating student self-assessment. In the course of research aimed at evaluating academic performance, the aforementioned group of scholars identified several factors influencing the learning process of schoolchildren, both within the educational institution and outside it. One key factor identified was the lack of choice in the learning process.

In particular, teachers used a one-size-fits-all curriculum that did not meet the needs of every student. To address this issue, Bloom and his colleagues concluded that student performance would improve if each teacher worked with an individualized curriculum. This hypothesis formed the basis of Bloom's "Mastery Learning" method—a system in which teachers are trained in specific skills and concepts through a weekly cycle of lessons. At the end of each section, students' knowledge is assessed through reflective tasks and review questions. The assessment of learning outcomes identifies areas requiring additional support, after which students are offered remedial tasks to ensure full mastery of the material. Drawing on Bloom's taxonomy, educators have concluded that students can successfully master a subject if they use a curriculum suited to their needs and set specific learning goals for themselves.

3 Results

The objective of this research is to foster students' advanced cognitive abilities by integrating map literacy into geography instruction. Each task contributes to the development of a distinct array of subject-specific competencies. The cultivation of these competencies, in turn, is linked to hands-on abilities in utilizing diverse information sources, including cartographic ones. A map serves as a tool through which the complete spectrum of information can be accessed.

The study was carried out with 13- and 14-year-old students at Secondary School No. 167 in Almaty. Its purpose was to assess the higher-order thinking skills of learners through cartographic exercises during geography classes. The study was conducted during the 2025–2026 academic year over a period of six months (September 2025 to February 2026). A total of 94 students were divided into two groups: the experimental group (n = 47) and the control group (n = 47). The groups were formed using purposive sampling, ensuring comparable baseline performance levels as verified by prior geography test scores. The experimental group received instruction using Bloom's taxonomy-based cartographic tasks, while the control group followed the standard curriculum without additional map-literacy interventions. For the experiment, we designed three levels of questions based on Bloom's taxonomy. At the first level - covering knowledge and comprehension - the students answered four questions. These questions were crafted to evaluate their foundational cartographic understanding. On this first level, the experimental group's performance was 7.8 percentage points lower than that of the control group (Figures 1 and 2). The difference between the two groups was not substantial. Consequently, we determined that their general cartographic foundational knowledge is adequate. A chi-square test of independence was applied to compare the proportions of correct responses between groups. At the first level, the difference was not

statistically significant ($\chi^2 = 2.14$, $p > 0.05$), confirming comparable baseline cartographic knowledge across groups. The results are presented in the table below (Table 2).

Table 2. Outcomes of the experiment

First-level (knowledge and comprehension)				
Questions	Total	Group	Yes (%)	No (%)
Can you read the map using the legends?	94	Experimental	86 (91.4)	8 (8.6)
		Control	76 (80.8)	18 (19.2)
Is there a distortion on the globe?	94	Experimental	90 (95.7)	4 (4.3)
		Control	73 (77.6)	21 (22.4)
Can you show the location of the main meridian and equator on the map?	94	Experimental	91 (96.8)	3 (3.2)
		Control	88 (96.6)	6 (3.4)
Do you think that cartographic knowledge is needed in everyday life?	94	Experimental	89 (94.6)	5 (5.4)
		Control	87 (92.5)	7 (7.5)
Average median	94	Experimental	94.6 %	5.4 %
		Control	86.8 %	13.2 %

The second-tier questions (focused on application) we developed were more complex than those at the first level; their purpose was to assess skills in using maps, atlases, puzzles, and the ability to differentiate between types of scales. In this case, the experimental group's performance was 16.7 percent lower than that of the control group. This experiment revealed that students require greater emphasis on hands-on map-related activities. Statistical analysis at the second level revealed a significant difference between groups ($\chi^2 = 8.73$, $p < 0.01$), indicating that the experimental group demonstrated significantly stronger application and analysis skills. The experimental outcomes are presented in the table below (Table 3).

Table 3. Findings of the experimental study

Second-level (application and analysis)				
Questions	Total	Group	Yes (%)	No (%)
Can you work with a contour map using atlas?	94	Experimental	88 (93.6)	6 (6.4)
		Control	69 (73.4)	25 (26.6)
If geographic puzzles are given, can you lay down the contour of the mainland?	94	Experimental	89 (94.6)	5 (5.4)
		Control	82 (87.2)	12 (12.8)
Can you distinguish the map by scale?	94	Experimental	79 (84.0)	15 (16.0)
		Control	66 (70.2)	28 (29.8)
Can you determine the location of countries on the contour map?	94	Experimental	83 (88.2)	11 (11.8)
		Control	59 (62.7)	35 (37.3)
Average median	94	Experimental	90.1%	9.9%
		Control	73.4%	26.6%

The questions at the third level of the experiment pertain to analysis and evaluation. The geography-related questions presented here are intricate, demonstrating the capacity to carry out creative assignments. At the same time, they are designed to assess mental, emotional, and social development, as well as traits related to self-expression and research curiosity. Furthermore, they reveal the ability to independently choose geographic data, draw reasoned conclusions, and create presentations and projects that incorporate geographic maps in the course of research. The indicators for the experimental group were notably lower than those for the control group. Specifically, the difference amounted to 34 percent. This experiment highlighted the necessity of strengthening research and creative efforts among students. The third-level difference was the most pronounced and highly significant ($\chi^2 = 18.45$, $p < 0.001$), suggesting that Bloom's taxonomy-based instruction has the greatest impact on higher-order synthesis and evaluation skills. These findings are consistent with international studies such as Aksoy (2019), who

reported similar patterns of improvement in map literacy following structured cognitive-level interventions. The monitoring outcomes are displayed in the table below (Table 4).

Table 4. Results obtained from the experiment

Third-level (synthesis and evaluation)				
Questions	Total	Group	Yes (%)	No (%)
Can you select geographic data (official and unofficial) when conducting research?	94	Experimental	76 (80.8)	18 (19.2)
		Control	43 (45.7)	51 (54.3)
If a geographic text is given, can you make a logical inference from it?	94	Experimental	65 (69.1)	29 (30.2)
		Control	41 (43.6)	53 (56.4)
Will you be able to prepare a presentation on the topic: "Discover the world using map!"?	94	Experimental	61 (64.8)	33 (35.2)
		Control	31 (32.9)	63 (67.1)
Can you prepare a small project on the topic: "Native Land"?	94	Experimental	59 (62.7)	35 (37.3)
		Control	18 (19.1)	75 (90.9)
Average median	94	Experimental	69.3%	30.7%
		Control	35.3%	64.7%

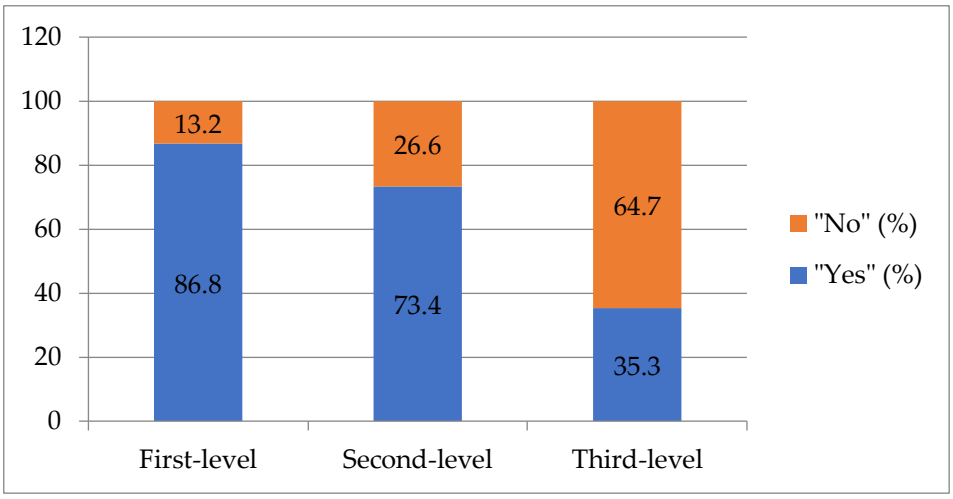

Figure 1. The results of experimental group

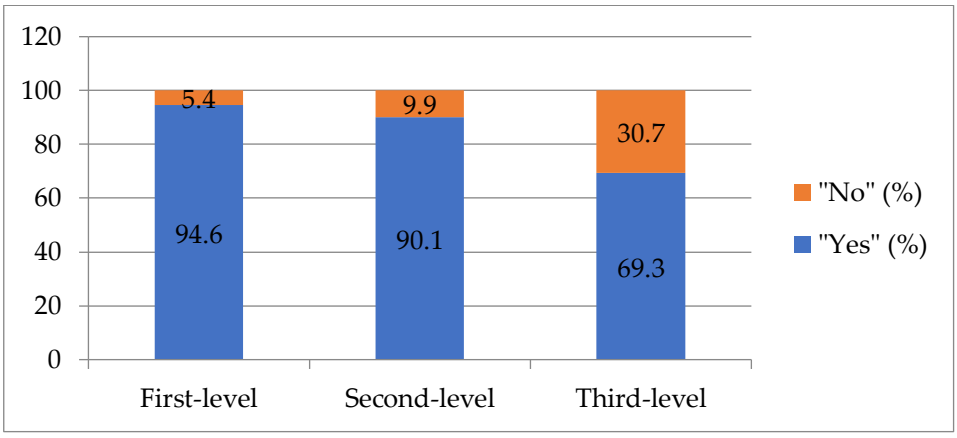

Figure 2. The results of control group

After the results of the experiment were determined, we focused on the correct formulation of questions according to Bloom's taxonomy in geography lessons in order to improve students' cartographic activity through thinking skills.

In the pedagogical environment there are already such concepts as "high-order thinking", "critical thinking". The study of this problem from the point of view of philosophy, psychology and pedagogy was

studied by foreign scientists E. de Bono, J. Dewey, M. Lipman, D. Halpern, D. Klooster, R.K. Johnson, P. Freire, J. Steel, D. Spiro, K. Meridith, Ch. Temple.

The correct formulation of the question is the most powerful tool for the formation of thinking skills (Anderson & Krathwohl, 2001; Bloom, 1956). There is a direct link between the questions we ask students and the answers. Bloom's taxonomy helps broaden higher-order thinking skills. The formulation of higher-order questions is interrelated and interdependent with thought processes. Higher-order questions are built using specific verbal structures, such as: "If I've understood you correctly, does that mean...?" or "What would you do if you were in...?" The ability to craft these types of questions enables you to engage in conversations at various levels, including cumulative discussions, debates, and research-oriented dialogues.

Examples of the correct formulation of questions on geography are given in the following table (Table 5).

Table 5. Examples of correct questions on the subject of geography

Types	Sample questions that can be asked students
Remembering	- List the types of geographic maps? - Remember the types of scales? - What are the meridians and parallels? - How are geographic coordinates determined? - What are the geographical coordinates of the 5 largest cities (London, Canberra, New York, Buenos Aires, Tokyo) of the world? - Mark on the contour map the location of these cities?
Comprehension	- Explain the differences between parallels and meridians? - Compare the length of the equator and the initial meridian. - Give the definition in your own terms: geographical latitude and longitude? - Tell us about the geographical value of the 180 ° meridian. - Give synonyms of the initial meridian. - Distinctive features of the equator from other parallels?
Applying	- What is the significance of geographic coordinates in daily life? - In what ways can cartographic skills be used to explore the geography of one's homeland? - Identify five major world cities (London, Canberra, New York, Buenos Aires, Tokyo) on a hemisphere map, arranging them from north to south. - In a notebook, draw a schematic representation of the globe. Label the equator, the tropics, and the polar circles. Indicate the North and South Poles. - List these seas from west to east: Yellow Sea, Mediterranean Sea, Black Sea, Arabian Sea, Bering Sea.
Analyzing	- What is the role of the map when studying geography? - Analyze the similarities and differences between the globe and the map? - Determine the distance of your settlement from the equator and the initial meridian? - How to measure the distance on the degree grid? - Prove the equality of the lengths of the arc meridians?
Evaluation	- Discuss the meaning and use of maps for science and practice. - Evaluate the role of the map in the study of geography. - Prove that the map is a source of geographic knowledge. - Compare ancient and modern geographical maps.
Creating	- Compose images of continents using geographic puzzles? - Place the names of geographical objects according to their location on the map of the hemispheres (Amazon, Maracaibo, Himalayas, Vancouver, Adriatic) - Prepare a presentation on the topic: "Discover the world using a map".

The questions listed above were compiled in accordance with Bloom's taxonomy. This has shown that it is useful for students to correctly represent geographic knowledge in a systematic sequence, from their understanding to evaluation. These questions are gradually promoting students from answers to easy questions to answers to difficult questions. Having received enough answers to the questions asked above,

we asked to perform the following tasks. These tasks include cartographic actions that are performed using the map.

Using the map data , students are asked to answer the following questions:

1) What is the territory depicted on the map (world map, map of hemispheres, continents, their parts, states, their parts, etc.)?

2) What is the frame of the map (round, rectangular, elliptical)?

3) What lines are the meridians (straight lines, curves) and parallels (straight lines, curves, circles, arcs concentric or eccentric circles)?

4) How do the intervals between the parallels and the meridians change (they do not change, change slightly, increase or decrease and how many times)?

5) What additional features of the projection are depicted on the map (the equator is a straight line or a curve, not shown; the pole is not shown, shown as a dot)?

6) Give a classification of the projection according to the character of the auxiliary geometric figure (azimuthal, cylindrical, conical, their varieties).

Thus, according to the tasks we proposed, the students, working with the map, were able to develop higher-order thinking skills. Thinking skills teach to memorize, apply acquired knowledge, independently make conclusions.

4 Discussion

On knowledge and comprehension, students were able to form terms and concepts that are the basis of geographical knowledge. They learned to distinguish between symbols on geographical maps, identify differences between the globe and the map, and they realized that when the Earth's surface was transferred onto a map, there were more distortions than on the globe. They formed the concept of the importance of the elements of a geographic map - the initial meridian, equator, 180^0 meridian. They also learned how to determine geographic coordinates using meridians, parallels, and a degree grid. These skills have shown that a high level skills are especially among those students who work well with atlas. They understood the need for cartographic knowledge in everyday life, for example, learned to find a place of residence on the world map.

On application and analysis, skills of working with a contour map using an atlas were formed. Skills for shaping the contours of the continents with the help of geographic puzzles were improved. They understand the map, distinguishing types of scales. They can determine the location of states on the contour map. They can give a definition of the importance of geographic coordinates in everyday life. They can use cartographic knowledge in a timely manner when studying the geography of their native land. Note in their dissertation research that new pedagogical technologies facilitate the development of an individual's system of thinking and foster the ability to make specific decisions in various situations (Harrow,1972). Pedagogical principles form the foundation of educational modernization. One of the key tasks at the current stage of development is the technologization of the educational process within the school system. Consequently, various educational technologies are being developed and implemented in school practic. Implementing long-term projects aimed at developing cartographic skills requires a significant amount of time. For instance, in the seventh grade, students spend the entire year creating a model of a hypothetical (imaginary) continent: they map out various thematic features, invent new countries and cities, and construct a history of the continent's discovery and exploration. Work on such a project continues throughout the academic year.

In the first stage, children locate the future continent on the map. While studying the topic of "Geographic Coordinates" they determine its geographic location and the coordinates of its extreme points, noting the parallels and meridians between which it lies. They also identify the oceans that wash its shores and the other continents with which it shares borders. Thus, a new continent is "registered" on the world map. Subsequently, as each new topic is studied, various geographical features appear on the continent.

When studying the "Lithosphere" topic, the children create a physical map of the continent. They mark major landforms on it, drawing upon maps showing the Earth's crustal structure as well as maps of earthquake and volcanic activity zones.

When studying the "Hydrosphere" topic, students identify river systems, examine their flow regimes and feeding patterns, locate major lakes on a map, and analyze their origins. As with the study of other continents, students mark the natural zones of their continent on a map. Furthermore, they determine which animals and plants can inhabit specific natural environments, taking into account the adaptation strategies of living organisms.

5 Conclusion

The necessary skills for determining the placement direction of geographical objects on a map were developed. Students learned how to use geographic maps and scales to calculate the distance of an object from the equator and the prime meridian. The scientific novelty of this study lies in the systematic application of Bloom's revised taxonomy as a structuring framework for cartographic competence development within the Kazakhstani secondary education context, where such an approach had not previously been tested empirically. Unlike general studies on Bloom's taxonomy in education, the present work specifically operationalizes all six cognitive levels through map-based tasks and validates them against measurable student performance outcomes. A critical analysis of the results reveals that while the experimental group demonstrated consistent advantages across all three cognitive tiers, the gains were most pronounced at the higher-order levels (synthesis and evaluation: +34 percentage points), suggesting that structured cartographic tasks are particularly effective for developing complex reasoning skills. However, the absence of long-term follow-up assessment remains a limitation: future studies should examine whether these gains are sustained beyond the intervention period. Additionally, comparison with international benchmarks, such as those established by Aksoy (2019) and Koc & Cifci (2016), indicates that Kazakhstani students in the experimental group reached performance levels comparable to their Turkish counterparts following similar map-literacy interventions, which underscores the cross-cultural applicability of Bloom's taxonomy-based approaches in geography education.

The implementation of new technologies requires a specialist with a creative mindset—someone capable of bringing fresh substance to professional and social life, as well as defining and addressing forward-looking challenges. In recent years, school teachers have been conducting short sessions (lasting 3–5 minutes) to help students develop the necessary skills. Such exercises, aimed at developing map-reading skills, will undoubtedly boost students' self-confidence and teach them to take responsibility for their actions.

For synthesis and evaluation, they were given the chance to build skills for independently selecting geographic data during research, such as distinguishing between official and unofficial data. While working with geographic texts, they learned to draw conclusions based on the main idea. It turned out that some students were able to summarize research findings and present them in the form of a presentation. It was observed that a few gifted students could carry out small research projects. We believe that it is important to adequately emphasize the application and analysis of knowledge among students in the control group as compared to those in the experimental group. To achieve this, we think it would be more effective to hold additional lessons focused on practical tasks. Additionally, in order to enhance students' creative abilities, more attention should be given to fostering their creative potential.

Modern pedagogical and psychological research shows that students not only understand the learning material but also consciously organize their own learning activities. Therefore, a student should ask themselves: "How did I do this? Why did I do this?" Why did I do this? Did I reach any conclusion? Which option is more effective for answering the review questions? Students ask themselves questions, become aware of their actions, and are capable of reflection. Reflection during the learning process fosters a different kind of relationship between teacher and student.

With the teacher's guidance, the student masters new material independently and develops the skill of creative inquiry. Reflection boosts the student's engagement in learning: they begin to recognize their learning goals and, drawing on self-assessment, are able to consciously organize each stage of the learning process. Reflection can take place not only at the end of a lesson but also in various situations or at specific stages, gradually evolving into a continuous internal reflective process as the topic is explored.

Active participation in the learning process is a didactic principle that fosters students' interest in learning and lays the groundwork for independent inquiry, task completion, deep mastery of the material, the acquisition of competence, the ability to formulate and substantiate ideas and explain concepts, and the development of creative abilities. To make such active engagement a habit, the educator must ensure a high level of preparation for every lesson. Consequently, thanks to the skills developed in this way, students will be able to apply the knowledge gained in class to real-life situations. Active learning methods are among the most effective techniques for encouraging students not merely to listen to the teacher, but to participate in the lesson with interest. During every class, active students quickly and correctly complete tasks and exercises, while other students - in contrast - gather around their active peers, striving to grasp new concepts.

Author contributions statement:

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Razia Kaldybekova	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		
Albina Beikitova	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓		

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

Funding: Not applicable.

Conflict of interest: The authors declare no conflict of interest.

Data availability statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgments: The authors are grateful to the students and administration of Secondary School No. 167 in Almaty for their participation and cooperation during the study.

References

Ahtee, M., Juuti, K., Lavonen, J., & Suomela, L. (2011). Questions asked by primary student teachers about observations of a science demonstration. *European Journal of Teacher Education*, *34*(3), 347-361. https://doi.org/10.1080/02619768.2011.565742

Aksoy, B. (2019). Determination of map literacy of undergraduate geography students. *Review of International Geographical Education Online*, *9*(3), 591-603. https://doi.org/10.33403/rigeo.582301

Anderson, L. W., & Krathwohl, D. R. (2001). A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives: complete edition. Addison Wesley Longman, Inc.. https://eduq.info/xmlui/handle/11515/18824

Beard, R., Cooper, A. D., & Crossley, K. R. (1993). Map design education. *The Cartographic Journal*, *30*(2), 159-162. https://doi.org/10.1179/000870493787860003

Bloom, B. S. (1956). Taxonomy of. Educational Objectives, 250.

Costa, A. L. (1985). Developing minds: A resource book for teaching thinking. Association for Supervision and Curriculum Development, 225 N. Washington St., Alexandria, VA 22314. Available online at: https://eric.ed.gov/?id=ED262968 (Accessed 14 February, 2026).

Harrow, A. J. (1972). A taxonomy of the psychomotor domain: A guide for developing behavioral objectives. *(No Title)*. Available online at: https://cir.nii.ac.jp/crid/1971993809809734696 (Accessed 14 February, 2026).

Kaldybekova, R., Aksoy, B., & Abdymanapov, B. (2021). Impact of activity-based map literacy skills teaching on academic achievement levels of secondary school students in Kazakhstan. *Review of International Geographical Education Online*, 11(1), 151-167. https://doi.org/10.33403/rigeo.853728

Koc, H., & Cifci, T. (2016). An investigation into map literacy levels of elementary school teacher candidates based on various variables. *Marmara Geographical Review*, 34, 9-20. Available online at: https://avesis.cumhuriyet.edu.tr/yayin/5667edb3-0b75-466e-8249-620915c78a15/an-investigation-into-map-literacy-levels-of-elementary-school-teacher-candidates-based-on-various-variables (Accessed 15 February, 2026).

Kyriacou, C. (2010). Effective teaching in schools theory and practice. Oxford University Press-Children, Oxford UK.

Lambert, D., & Balderstone, D. (2012). Learning to teach geography in the secondary school: a companion to school experience, Routledge, New York, USA.

Marzano, R. J., & Kendall, J. S. (2006). The new taxonomy of educational objectives, Corwin Press, California, USA.

Parker, M., & Hurry, J. (2007). Teachers' use of questioning and modelling comprehension skills in primary classrooms. *Educational Review*, 59(3), 299-314. https://doi.org/10.1080/00131910701427298

Simpson, E. (1971). Educational Objectives. Behavioral objectives in curriculum development: Selected readings and bibliography, Educational Technology Publications Englewood Clifts, New Jersey, USA.

Whittaker, A. (2012). Should we be encouraging pupils to ask more questions?. *Educational Studies*, *38*(5), 587-591. https://doi.org/10.1080/03055698.2012.663078

Wood, D., & Fels, J. (1992). The power of maps, Guilford Press, New York, USA.

Biographies of authors

Razia Kaldybekova
PhD, Senior Lecturer, Department of Geography and Ecology, Faculty of Natural Sciences and Geography, Abay Kazakh National Pedagogical University, Almaty, Kazakhstan
Geography education
razia-75@mail.ru
https://orcid.org/0000-0003-1751-6962
https://www.scopus.com/authid/detail.uri?authorId=57223989163

Albina Beikitova
PhD, Senior Lecturer, Department of Geography and Ecology, Faculty of Natural Sciences and Geography, Abay Kazakh National Pedagogical University, Almaty, Kazakhstan
Geography, Earth Science, Geomorology, Education
Geography education
ban_1985@mail.ru
https://orcid.org/0000-0003-1757-2198
https://www.scopus.com/authid/detail.uri?authorId=59144032200