



ELECTRONIC RESOURCES IN GEOGRAPHY EDUCATION: RESULTS AND ANALYSIS OF GEOGRAPHY LESSONS USING THE PLICKERS APPLICATION

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Abstract

The use of electronic educational resources is becoming increasingly widespread in modern education systems. In this context, integrating modern electronic educational resources into geography instruction makes the learning process more effective, interactive, and up-to-date. This article is intended for 7th-grade geography teachers in general education schools, methodologists, and practicing educators. It highlights the relevance and importance of electronic educational resources — such as interactive maps, virtual globes, video lessons, and online testing platforms — in teaching geography. Particular attention is paid to the practice of conducting quick assessments using the “Plickers” application; the effectiveness of lessons utilizing Plickers is demonstrated through the results of experimental trials. The article provides over 20 ready-made test questions for 7th-grade geography, along with methodological recommendations for teachers. These materials can be utilized to effectively organize geography lessons.

Keywords: Electronic educational resources, geography, Plickers, interactive, digital education, experiment.

INTRODUCTION

Integrating multimedia educational resources —specifically interactive courses — into the educational process is a prevailing trend in various regions worldwide, including parts of Russia, the USA, Korea, Japan, and France. In the USA,



institutions such as Stanford, Princeton, the University of California, and Columbia University, as well as certain universities in Tennessee, New York, and Nebraska, offer online open courses that enable interactive learning via the Internet. Such e-learning systems play a significant role in modern professional training and development [6]. As emphasized in the “Incheon Declaration: Education 2030,” adopted within the global educational framework: “In the modern era, knowledge is power, and education is the means to develop its generation” [5]. Given that knowledge is the primary source of power, it is essential to examine every element and aspect that contributes to improving the quality of education.

In modern education systems, electronic educational resources are becoming an integral component of the learning process. Electronic educational technologies are transforming the nature of learning itself. The subject of geography applies theoretical knowledge to practice, and electronic educational resources (hereinafter referred to as EER) make this process more effective and engaging.

LITERATURE REVIEW

The State Educational Standard for general secondary education specifically emphasizes the need for dedicated standards for geography instruction and the use of electronic resources to foster visual and spatial concepts. Furthermore, the “Concept for the Development of the Public Education System until 2030” (Decree No. PF-5712, dated April 29, 2019), issued by President Sh.M. Mirziyoyev, mandates the integration of general education schools into a unified data transmission network and the implementation of a “safe school internet” concept — achieved through the automatic filtering of permitted online resources [1] — thereby demonstrating the significant direct impact of electronic educational resources on learning outcomes.

Electronic educational resources have been the subject of numerous scholarly studies. For instance, platforms such as Khan Academy and Coursera provide students with free access to academic knowledge through open-source materials. Virtual laboratories and simulations offer visual explanations of complex natural phenomena, while artificial intelligence technologies expand opportunities for personalized learning. Effective research is being conducted to create an



innovative information-educational environment within the global education system, widely implement modern information and communication technologies in the teaching process, enhance electronic educational resources, and ensure students achieve a deep and thorough mastery of general education subjects. In particular, it is crucial to foster students' literacy in exact and natural sciences, creative abilities, logical thinking, and scientific worldviews—as well as to encourage independent learning — through the effective use of electronic educational resources, modern digital devices, and interactive software tools in teaching general education subjects. Amidst the global trends of educational mobilization, informatization, and integration, scientific research is being pursued to expand the use of electronic educational resources in modern schooling; this includes approaches — implemented in developed nations such as Australia, the UK, the USA, Finland, Russia, South Korea, and Japan — that aim to enhance students' educational activities through electronic learning and distance education technologies. These studies are significant because they focus on the important task of facilitating the emergence of new fields within general education subjects and addressing the pedagogical and psychological challenges associated with integrating existing educational processes into an information-educational environment [10].

METHODOLOGY

The experiment was conducted between September and December 2025 in six selected schools across the Surkhandarya and Kashkadarya regions, involving two 7th-grade classes at each school. The classes were divided into two groups: a control group and an experimental group.

Control group: Lessons were conducted using traditional methods — oral questioning and paper-based written work.

Experimental group: Lessons incorporated digital educational resources (Google Earth, video lessons) and utilized Plickers for quick assessments during every class.

The study covered the same topics and used an identical final test for both groups. The research evaluated the effectiveness of the Plickers mobile application as a teaching tool. Plickers is a free mobile application that allows teachers to conduct



quick in-class polls. Each student is provided with a unique card featuring a QR code. The teacher displays a question on the screen, and students hold up their cards oriented to match their chosen answer (A, B, C, or D). The teacher scans the cards using their phone's camera, and the results appear on the device's screen within seconds.

Required equipment:

- 1) Teacher's phone (with a camera; Android or iOS);
- 2) Computer and projector (to display questions);
- 3) Printer (to print the cards);
- 4) Internet connection (on the teacher's phone and computer – minimal data usage). Students can be quickly assessed using the “Plickers” app to conduct express tests.

Table 1.1 Time efficiency analysis

No.	Indicator	Control group (traditional)	Experimental group (Plickers)
1	Number of students questioned per lesson (average)	6–7 students	30 students (entire class)
2	Time spent on questioning	12–15 minutes	3–4 minutes
3	Time for grading and recording	10–15 minutes (outside of class)	0 minutes (automatic)
4	Error analysis	General only	By individual student and question

As the data in the table indicate, the time spent on questioning in the experimental group decreased fourfold. During this time, the teacher was able to explain the topic in greater depth or engage in practical work.

RESEARCH RESULTS

Changes in students' levels of knowledge, attention, and engagement. The same test was administered at the beginning and end of the experiment (20 questions covering 5 topics).



Table 1.2 Comparison of control and experimental groups

No.	Group	Initial average score (20-point scale)	Final average score	Increase
1	Control (7-B)	12.3	14.1	+1.8 (+8.7%)
2	Experimental (7-A)	12.1	15.9	+3.8 (+18.6%)

From the information above, we can see that the growth in the experimental group was more than double that of the control group.

Table 1.3 Analysis by topic

No.	Topic	Control (correct answers %)	Experimental (correct answers %)	Difference
1	Natural zones of the African continent	68%	84%	+16%
2	Relief of South America	65%	82%	+17%
3	Geographical location and boundaries of Eurasia	72%	85%	+13%
4	Ocean currents	58%	79%	+21%

We can conclude from the table that the most significant difference occurred regarding the topic of “Ocean Currents.” This is because the names and directions of the currents were repeatedly tested using Plickers, thereby reinforcing retention.

We can also observe differences in the levels of student attention and engagement between the control and experimental groups. These observations were conducted over the course of 20 lessons.

Table 1.4 Students’ level of attention and engagement

No.	Indicator	Control Group	Experimental Group
1	Students distracted during the lesson (average)	5–6	1–2
2	Those who did not participate in answering test questions	2–3 (due to fear or lack of interest)	0–1 (due to technical reasons)
3	Those who consistently completed homework	72%	89%



Unlike the control group, almost all students in the experimental group actively answered questions. This is because Plickers records each student's response and displays the results on the screen immediately, creating a competitive atmosphere in the classroom; no one wants to be left without answering.

According to the teacher who participated in the experiment:

1. "The time spent grading and calculating scores in notebooks has been completely eliminated. Now, after the lesson, I simply open the Plickers report, and the scores are ready."
2. "Tracking each student's progress has become easier. It is clear who is struggling with which topic."
3. "Incorporating Plickers questions into the lesson plan takes only 5–10 minutes, yet the benefits are significant."

DISCUSSION AND ANALYSIS

Limitations and drawbacks of Plickers. Every method and technology inevitably has its shortcomings alongside its advantages and benefits. Educators and researchers must approach this objectively. Below, we examine a number of the drawbacks and limitations of the Plickers application.

Table 1.5 Limitations and drawbacks of Plickers

No.	Limitation	Description	How to overcome it?
1	Answers limited to A, B, C, D	Cannot use open-ended questions or questions with multiple correct answers	Conduct a separate written assignment or oral assessment for open-ended questions
2	Phone battery	Camera and app drain the battery quickly	Bring a backup power bank
3	Lighting requirement	Cards are not read well in a dark classroom	Hold the lesson during daylight hours or in a well-lit room
4	Losing cards	Students might forget or lose their cards	Print two cards for each student; keep them in the classroom
5	Limitation	Description	How to overcome it?



Additionally, the free version limits the ability to create tests to a maximum of five. Despite these limitations, effective use of this electronic educational resource makes geography lessons engaging and interactive, enabling both teachers and students to achieve their educational goals.

CONCLUSION

Electronic educational resources are revolutionizing the teaching of geography. They make the learning process interactive, personalized, and modern, while also providing students with access to a global knowledge base. By utilizing such tools, students can gain a deeper understanding of the scientific world, develop practical skills, and prepare for modern careers.

Integrating electronic educational resources into the learning process not only presents students with a comprehensive overview of the subject matter but also enables independent mastery of the material, the individualization of learning, and mechanisms for assessment and self-assessment — thereby enhancing the overall effectiveness of the educational process. This is particularly significant in the teaching of geography. Furthermore, a key advantage of modern electronic educational resources is that they allow students to freely access and assimilate information according to their individual needs, effectively shifting the instructional role from the teacher to the student. In this context, the teacher acts primarily as a facilitator, providing the necessary guidance to help students navigate the flow of information and resolve any challenges that arise.

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