



The Impact of Using Artificial Intelligence Applications on Improving Geography Achievement among Fourth-Year Arts Students

Asst.Lec. Sura Saad Saleh ¹, Lec. Afrah jaber Abu Shana ², Asst.Lec. Osama sami Addayusama ³

¹National Center of Population and Demographic Studies, Baghdad University, Aljadria District, Baghdad 10011, Iraq,

Email: Sura.S@dcec.uobaghdad.edu.iq

²National Center of Population and Demographic Studies, Baghdad University, Aljadria District, Baghdad 10011, Iraq,

Email: afrah.j@ncpds.uobaghdad.edu.iq

³National Center of Population and Demographic Studies, Baghdad University, Aljadria District, Baghdad 10011, Iraq,

Email: usaam.sami1204h@ircoedu.uobaghdad.edu.iq

ABSTRACT

The objective of this paper is to assess the effect of employing artificial intelligence tools in enhancing the performances of fourth-grade students in arts education in the area of geography, along with studying their views about the topic while applying these tools. The methodology employed in this study was a quasi-experimental one since two groups were used in the study, namely the experimental and the control group, and as part of it pre- and post-tests were conducted. The sample for the research included 60 students divided into two equal groups, with the experimental group being provided with AI educational materials from ChatGPT, Google, among others, whereas the control group was exposed to the conventional low-tech educational approach. Two types of research tools were used in the study, namely an achievement test which was developed by the author of the paper and a questionnaire aiming to test the attitudes of the students to geography and artificial intelligence applications. The collected data were analysed using descriptive statistics (means and standard deviations), paired-samples t-tests, independent-samples t-tests, and Cohen's d effect size to determine the practical significance of the findings. The analysis of the collected data has revealed that participants from the experimental group performed significantly better than those in the control group, which can be taken as evidence of the positive impact of applying AI in education. The findings also revealed a large practical effect (Cohen's d = 1.16–1.56), indicating that the use of artificial intelligence applications substantially improved students' geography achievement and learning attitudes. The data obtained from the survey revealed that students have a more favorable attitude towards the education as well as course materials when utilizing smart technologies. The researcher argued that it is vital to implement artificial intelligence tools in educational settings and urged to help teachers and learners get educated and informed on new technologies and utilize many interactive materials that would give proper educational experiences to people today.

Keywords: Artificial intelligence, interactive education, academic achievement, educational applications, e-learning



أثر استخدام تطبيقات الذكاء الاصطناعي في تحسين تحصيل مادة الجغرافية لدى طلاب الصف الرابع الادبي

م.م. سرى سعد صالح^١، م.م. أفراح جابر أبو شنه^٢، م.م. أسامة سامي عداي^٣

^١المركز الوطني للدراسات السكانية والديموغرافية، جامعة بغداد، قضاء الجادرية، بغداد ١٠٠١١، العراق

البريد الإلكتروني: Sura.S@dcec.uobaghdad.edu.iq

^٢المركز الوطني للدراسات السكانية والديموغرافية، جامعة بغداد، قضاء الجادرية، بغداد ١٠٠١١، العراق

البريد الإلكتروني: afrah.j@ncpds.uobaghdad.edu.iq

^٣المركز الوطني للدراسات السكانية والديموغرافية، جامعة بغداد، قضاء الجادرية، بغداد ١٠٠١١، العراق

البريد الإلكتروني: usaam.sami1204h@ircoedu.uobaghdad.edu.iq

المستخلص

تهدف هذه الدراسة إلى قياس أثر استخدام تطبيقات الذكاء الاصطناعي على تحسين تحصيل طلاب الصف الرابع في مادة الجغرافيا، وتحليل مواقفهم تجاه هذه المادة في ضوء استخدام هذه التطبيقات. اعتمدت الدراسة منهجاً شبه تجريبي، باستخدام تصميم ثنائي المجموعات (تجريبية وضابطة) مع اختبارات قبلية وبعدية. شملت عينة الدراسة ٦٠ طالباً، تم تقسيمهم إلى مجموعتين متساويتين. خضعت المجموعتان لنوعين من المعالجة؛ حيث تلقت المجموعة التجريبية محتوى تعليمياً مؤلداً بواسطة الذكاء الاصطناعي من خلال تطبيقات مثل ChatGPT و Google وغيرها، بينما تلقت المجموعة الضابطة الطريقة التقليدية الأقل تطوراً في تدريس هاتين المادتين. شملت أدوات جمع البيانات اختباراً تحصيلياً أعدّه الباحث، واستبياناً مصمماً لقياس مواقف الطلاب تجاه الجغرافيا وتطبيقات الذكاء الاصطناعي. أظهر التحليل الإحصائي للنتائج تفوق المجموعة التجريبية على المجموعة الضابطة في جميع المقاييس، مما يؤكد فعالية الذكاء الاصطناعي في تحسين التحصيل الدراسي من خلال أساليب مبتكرة. أظهر تحليل البيانات وجود فروق ذات دلالة إحصائية لصالح المجموعة التجريبية ($p < 0.01$)، كما أظهرت النتائج أن حجم الأثر كان كبيراً (تراوح Cohen's d بين ١.١٦ و ١.٥٦)، مما يدل على أن استخدام تطبيقات الذكاء الاصطناعي أحدث تأثيراً عملياً قوياً في تحسين تحصيل الطلبة واتجاهاتهم نحو تعلم الجغرافية، وأوصى الباحث بتقديم الدعم للمعلمين والطلاب المؤهلين من خلال التدريب وتوفير التقنيات المناسبة، بالإضافة إلى تطوير مواد تفاعلية تُتيح تجارب تعليمية ملائمة للتعليم الرقمي المعاصر.

الكلمات المفتاحية: الذكاء الاصطناعي، التعلم الإلكتروني، التحصيل الدراسي، التطبيقات التعليمية، التعليم التفاعلي



1. Introduction:

The world has experienced an incredible amount of technological and informational changes in recent decades. One of the key innovations in this period is the development of artificial intelligence (AI) technologies, which are now used everywhere across the globe from the field of medicine and up to education. AI has emerged as one of the important factors influencing the process of delivering education and customizing it for the needs and capabilities of students. Studies show that applying AI technologies has a positive effect on students' academic performance, engagement in the learning process, and comprehension of difficult concepts (Unesso, 2023).

Geography as a field of study relies on spatial and analytical aspects of geography. Geography examines the relationship between various geographies and considers concepts like climate and landform as having effects on population distribution. Nonetheless, owing to the existing conditions in the educational system in Iraq, particularly in the fourth-year arts stream of study, most instruction in this subject is based on memorization and rote learning, thus facilitating a lack of motivation and achievement among students in geography (OECD, 2022).

Thus, methods need to be explored for using contemporary educational technologies to make geography more appealing and interactive to arts students who generally lack sufficient motivation to study scientific topics (like geography maps). For example, Artificial Intelligence technologies could facilitate individualization and interactivity of education of arts students through the application of geographic information systems (GIS), interactive tools (e.g., Ghat GPT), and interactive test platforms (like Quizizz and Kahoot) to support the student's comprehension of geography in an intriguing and enjoyable manner.

The empirical research in geography education has not yet picked up the pace, although artificial intelligence (AI) in education is growing. In fact, most of the research done so far has focused on the general use of AI technology in education, quite a few of the studies have investigated how AI can benefit geography education given the role of spatial thinking, geographic inquiry, and interactive visualizations (Lee et al., 2025). As per the latest research, AI and GeoAI technologies have high potential for enhancing geography education, but empirical evidence for their implementation in classrooms, especially in case of developing educational environments, is lacking (Laiskhanov & Seminar, 2026). Thus, more research is needed to investigate the effects of AI technologies on students' academic performance and learning attitude in geography classes.

Geography is a subject that allows students to utilize their spatial thinking ability, read maps, study geographical processes, and connect theories with the real-life geographical situations. Because of these learning goals, geography is an area where the advanced teaching methods which use such techniques as interactive visualization, intelligent feedback, digital mapping techniques, and inquiry-based



learning can be successfully applied. There are studies that showed that generative artificial intelligence has been successfully used in geography education as a tool for curriculum development, teaching methods improvement, assessment practices rethinking, and field learning experience enhancement (Lee et al., 2025). In addition, studies on teachers' professional development indicate that participation in geography inquiry tasks with the use of generative AI helps teachers change their preconceived notions of AI and use AI-based teaching tools more efficiently (Lee, 2026). However, the data on the effects of such technologies in the Iraqi schools, especially within the fourth-year art students, is quite limited. Thus, the present paper is aimed at filling this gap through investigating the effect of AI technologies on the geography performance and attitudes of students in Iraq.

This study aims to test the impact of using these tools in improving the achievement of fourth-grade arts students in geography, through applying a field experiment on a sample of students and comparing their results before and after using artificial intelligence technologies, while analysing the change in their attitudes towards the subject.

1.1 Research problem:

The research problem centers on the teaching of social studies in preparatory school and overcoming the difficulties associated with conveying educational material to students' minds, while considering the need to save time and effort in the educational process (Halaq, 2006, p. 45). There is a noticeable trend towards combining modern technologies, including artificial intelligence, in various applications at all educational levels from primary to advanced (Qamoura, 2018, p. 31). It has been observed that artificial intelligence has a positive impact on student success and enhances leadership skills through self-education and the use of programmes that highlight scientific material (Zidan, 2019, p. 21). Despite rapid developments in educational technology, many Iraqi schools, especially at the preparatory level, still rely on traditional methods of teaching geography, which depend heavily on memorization and recall, neglecting aspects of understanding and spatial analysis. It is noted that fourth-year arts students often suffer from low academic achievement in this subject due to the absence of interactive media that contribute to simplifying geographical concepts and motivating them to learn. On the other hand, global and Arab experiments have begun to point to the possibility of employing artificial intelligence in the development of human education through smart educational tools, such as simulation systems, map analysis, and interactive language aids. Hence, the problem of the current research arises in the question:



What is the impact of using artificial intelligence applications on improving the achievement of geography among fourth-grade arts students?

1.2 Research hypotheses:

Based on the research problem, the following hypotheses can be formulated:

H1: Fourth-year arts students who receive geography instruction using artificial intelligence applications will achieve significantly higher post-test scores than students who receive traditional instruction.

H2: Students in the experimental group will demonstrate significantly higher achievement scores in the post-test than in the pre-test after learning geography through artificial intelligence applications.

H3: The use of artificial intelligence applications will significantly improve fourth-year arts students' attitudes toward learning geography.

1.3 Research objectives:

The purpose of the research is to reach the educational and scientific objectives, and to evaluate the efficacy of the application of artificial intelligence technologies on students' academic performance in Geography in fourth year. Below is the general aim of the research:

- 1- To find out how effective artificial intelligence programs are in improving students' achievement levels in geography compared to traditional methods of learning.
- 2- To evaluate the contrast of the educational successes of the students from the experiment group and the students of the control group.
- 3- To identify the influence of using artificial intelligence on attitudes towards learning geography from the viewpoint of motivation, interest, and participation in the class.
- 4- To create a proposal for practical methods of applying the tools of artificial intelligence in geography teaching during the preparatory stage.
- 5- To discover the possible obstacles for using artificial intelligence in geography education in Iraq.

1.4 Importance of the study:

The significance of this study is that it deals with an issue linked to the swift advancement of educational technologies, which has dramatically changed many spheres of life. Education is one of the spheres that have been greatly influenced by this revolution as it has created a wide range of opportunities for the educators to use and introduce artificial intelligence in their educational practices (Abdulnour, 2005, p.9). AI can be useful in teaching students the basic skills they need and providing sustainable learning (Al-Khafaji 2021, p.25). It can help users interested in the educational process in making their learning more accurate and rational, and it can give students in preparatory schools a chance to carry out their academic work intelligently and quickly.



2. Review of Previous Literature and Studies:

2.1 Artificial Intelligence in Education

Artificial intelligence is an evolving technology and newest trend in the area of education and pedagogy used in creating interactive content, giving feedback to learners right after their actions, as well as in changing approaches to teaching depending on the skills of students. The concept of artificial intelligence was established officially by McCarthy et al., (1955), who mentioned it in their definition of AI as the field of science and engineering focused on making intelligent machines that do things that would normally need human intelligence. UNESCO (2023) states that artificial intelligence can play an important role in bridging the gap in education and enhancing its quality through analysis and diagnostics, which allow teachers to provide students with suitable assistance. OECD (2022) has also pointed out that artificial intelligence can offer better opportunities of studying and facilitate the development of critical thinking and problem-solving skills.

2.2 Artificial Intelligence and Geography Education

Geographic information has started to find applications of artificial intelligence tools at a fast pace. The use of AI tools in the creation of digital maps, GIS, geographical environments simulation, and satellite image interpretation is noteworthy. According to Al-Ani (2021), who investigated the role of artificial intelligence tools in GIS and noticed the improvement of academic performance of students due to the application of Google Earth AI and interactive smart maps that improved the understanding and vision of spatial concepts and relationships. As per the dictates of Almarzooqi and Ahmad (2020), the implementation of AI in the field of geography entails better assessment and evaluation of geographic data and its spatial relations. Moreover, though using AI technology students, particularly those in middle-high school, will be able to acquire a far better comprehension of both natural and human phenomena.

2.3 The Impact of Educational Technology on Academic Achievement

Research has demonstrated that Technology plays a vital role in the process of learning inside classrooms. Mohamed's research (2020) related to the teaching of Geography using intelligent platforms such as Kahoot and Quizizz indicates the increased level of engagement and interest among students and, correspondingly, a greater success in their studies. It has become evident from Saeed et al.'s (2019) research that in contrast to conventional methods, students who were taught using AI Interactive Media performed much better than those taught using conventional methods in relation to understanding and mastering concepts on visualization and spatial reasoning.



2.4 Related Arabic studies:

The aim of the study conducted by Al-Azawi (2022) was to find out the impact of interactive media on the academic performance of students of Grade 4 in Nineveh Province who were learning Geography. The results of the study showed that students who were taught topics through interactive media such as videos achieved better grades in geography compared to students who were taught using traditional teaching methods. Aliwi (2021) studied the impact of the use of Artificial Intelligence (AI) in secondary education in Iraq. It was found that the use of devices/AI products such as intelligent assistants in the classroom raised students' involvement in instruction and contributed positively to their attitude towards the content that is being studied. The aim of the research carried out by Al-Jurawi (2022) was to find out the influence of AI technology on future-oriented thinking skills and academic performance in Science of 3rd grade students studying Science at a private school in Riyadh.

The findings indicated that using artificial intelligence technology in an e-learning environment affects the development of the future-oriented thinking skills and academic performance in science positively. It is concluded that there is a wide level of agreement about the fact that artificial intelligence applications constitute an effective means of enhancing academic performance, particularly in areas of study that necessitate spatiotemporal thinking. Local research on the issue of artificial intelligence applications in the field of secondary education in Iraq is still scarce, particularly in arts, making the necessity of the current research evident.

3. Methodology

3.1 Theoretical Framework:

These theories underpin our research and provide an educational theory framework to explain how learners learn and engage with Artificial Intelligence technologies in a Geography educational context. Theoretical Foundations for the Research are as follow:

Constructivism Theory - John Dewey, Jean Piaget, Vygotsky:

According to this particular theory, the learner occupies a position of central importance during a learning process, meaning that knowledge does not come as direct or straight-forward manner but can emerge as a result of all activity presented of connections with environment as well as content. In this case, this study shows that the use of artificial intelligence applications can provide a great interactive environment that enables the learner to generate his/her geographical knowledge through discovery, experiments and the establishing of relationships between different phenomena in space. There are many examples of the use of artificial intelligence methods, but Google Earth and ChatGPT can be defined as good examples of such tools that can provide virtual learning environments.



Constructivism Theory proposes that learners actively construct knowledge through interaction with their environment rather than passively receiving information (Dewey, 1938; Piaget, 1972; Vygotsky, 1978).

Cognitive Load Theory - John Sweller:

According to this theory, the human mind is not able to process information indefinitely, hence the methodologies of teaching must be adapted in such way as to minimize the burden on working memory. This means that the integration of artificial intelligence applications for the purpose of geographical education will lessen and ease the burden of cognitive assimilation through the simplification and visual representation of information. The applications of artificial intelligence that have been applied in the current study allow for an interactive simplified presentation of the geographical ideas which enables learners to grasp the information in a less cognitively expensive manner (Sweller, 1988).

Multimedia Learning Theory (Richard Mayer):

As stated by the theory of Multimedia Learning proposed by Richard Mayer, presenting different media forms (text, audio, image) while delivering information will improve the process of learning for the students. Since geography is about the use of maps, charts, and some simulations, one can say that the introduction of artificial intelligence to education will contribute greatly to the process of multimedial learning. According to Mayer's Cognitive Theory of Multimedia Learning, students learn more effectively when verbal and visual information are meaningfully integrated (Mayer, 2001).

3.2 Conceptual framework:

1. Effect is the cognitive or psychological imprint that rises from deliberate human communication, which forms its outcomes (Al-Saadi, 2012, p. 31).
2. AI is a division of computer science deals with designing systems and software capable of pretending human intelligence, such as understanding, learning, and decision-making. In this investigation, it denotes to the use of smart tools such as Chat GPT to clarify perceptions. Google Earth AI to illustrate spatial phenomena. Smart test applications. Kahoot, Quizizz)
3. Academic achievement denotes to the level of knowledge and skills learnt by the student, measured in this study through a pre- and post- achievement test in geography.
4. Geography Subject A subject concerned with the study of natural and human phenomena and three-dimensional communications. It



is one of the essential subjects in the arts stream and is considered by its visual and analytical nature.

5. Fourth Grade Literary Students in Iraqi schools whose study plan does not contain intensive mathematical or scientific subjects and depends on theoretical aspects and abstract concepts.
6. Conceptual Model

The conceptual framework is summarized as follows:

Inputs: Use of AI applications in teaching



Processes: Interactive explanation, visual reinforcement, immediate response, smart maps



Outputs: Higher achievement levels, improved attitudes towards geography, increased interaction

3.3 Research methodology:

1- *Type of methodology*

This research is based on a quasi-experimental methodology using a two-group equivalent design with pre- and post-tests, which is appropriate for measuring the effect of the independent variable (use of artificial intelligence applications) on the dependent variable (academic achievement in geography).

2- *Research population and sample*

- **The original population** is fourth-year arts students in public preparatory schools affiliated with the Directorate of Education (Baghdad/Karkh II) for the academic year 2024-2025.
- **Sample:** A purposive sample of (60) fourth-year arts students was selected from two sections of one of the government preparatory schools (Al-Khadra Preparatory School for Boys), with (30) students in the experimental group: they received the material using artificial intelligence applications (30) students in the control group: received the material in the usual traditional way. The selection of the sample was based on the criteria, as Al-Khadra Preparatory School for Boys was the perfect location to conduct the semi-experimental research. The institution had two comparable classes with pupils in fourth year of the arts department, which



enabled to create similar experimental and control the results of the independent groups. Furthermore, the school administration allowed the implementation of the study and provided assistance with the implementation of educational activities based on AI tools. The participants were also equal in their education background and were studying the same geography program, which enabled you to keep the consistency for the duration of the experiment.

- **Equivalence:** The equivalence of the two groups was verified in the following variables: age, previous achievement level, intelligence, and attitude towards the subject, using an independent samples t-test before the start of the experiment.

3- *The tools used in the Study*

a- *Achievement test*

- 13- An achievement test consisting of 25 multiple-choice questions covering the basic concepts in a geography unit (e.g., geography of Iraq or the Arab world) was prepared. The test was administered beforehand to measure the initial level, and then afterwards to measure the effect of the experimental treatment. The validity of the test was verified by presenting it to a committee of experts specializing in geography and teaching methods. The stability of the test was calculated using Cronbach's alpha coefficient (Cronbach's Alpha)

b- *Questionnaire*

- A questionnaire consisting of 20 statements in a three-point Likert scale (agree, neutral, disagree) was prepared to measure students' attitudes towards geography before and after the use of artificial intelligence.
- The questionnaire covered three dimensions:
 - Student motivation towards learning
 - Perception of the usefulness of the subject
 - Classroom interaction with technology
- The validity and reliability of the questionnaire were verified in the same manner.

3.4 *Procedures of the Study*

1- *Preparation for the experiment:*

- Prepare standardized course content for both groups.
- Training the teacher responsible for the experimental group on the use of educational artificial intelligence tools (Kahoot, Google Earth, Chat GPT).

2- *Pre-test:*



- Administer an achievement test and attitude questionnaire to both groups.
3-Teaching phase (6 weeks)
- Experimental group: Use of AI tools (explanation of concepts through Chat GPT, presentation of interactive tests, use of Google Earth to display geographical phenomena)
4-Post-test:
- Apply the same measurement tools to measure the degree of modification in achievement and attitudes.
5-Statistical analysis methods
- Independent samples t-tests were used to compare the results of the two groups in the post-test
- t-tests for related samples to analyze differences within the experimental group (pre-post).
- Trend analysis using arithmetic means and standard deviations

4. Results of the analysis

Data was collected from a sample of 60 students in the fourth year of secondary school using a questionnaire consisting of 20 items distributed across three main dimensions (attitudes towards geography, attitudes towards the use of artificial intelligence, and general suggestions).

1- Descriptive analysis of the questionnaire items

According to the results, the high averages with ranges of (2.03-2.29) were observed by the vast majority of the items within the questionnaire in the three-point Likert scale (1-3) which suggests that students tend to have a positive attitude toward geography and the ways of its study utilizing different applications used in artificial intelligence. One example is the item "I believe the use of artificial intelligence applications assists me with geography learning" where the average was set at 2.85 which indicates that people are very positive toward using technologies in education.

Meanwhile, reverse items such as "I find it difficult to understand some geographical concepts" showed a low average (approximately 1.50 after reversing the value), indicating that students do not face much difficulty, which is also a positive indicator.



Table 1. Descriptive analysis of questionnaire items

Interpretation	Standard deviation S D	Mean	Statement	Item number
Strongly positive	0.5	2.75	I feel that geography is important.	1
Positive	0.65	2.4	I find studying geography enjoyable.	2
...	...	...	...	...
Strong positive	0.30	2.90	I would like special training on the use of artificial intelligence.	20

2- Sub-dimensional analysis

The items were grouped into three main dimensions, and the means and standard deviations for each dimension were calculated as follows:

- Attitude towards geography: The average was 2.55 with a standard deviation of 0.45, indicating a moderately positive attitude towards the subject.
- Attitude towards the use of artificial intelligence: The average was 2.68 with a standard deviation of 0.50, which is slightly higher than the previous dimension, indicating a good acceptance of the use of technology.
- General suggestions: achieved an average (2.80) with a standard deviation (0.40), indicating a strong desire for more artificial intelligence applications in the educational process

Table 2. Means and standard deviations for sub-dimensions

Standard Deviation S D	Mean	Number of Items	Dimension
0.45	2.55	8	Orientation towards geography
0.5	2.68	8	Orientation towards the use of artificial intelligence
0.40	2.80	4	General suggestions



3- Hypothesis test results (difference between pre- and post-test)

The results of the t-test for related samples showed statistically significant differences at the level of ($\alpha=0.05$) between the pre- and post-test means for the level of attitudes in the experimental group. All dimensions increased after the application of the artificial intelligence experiment, indicating a positive and tangible effect on students' attitudes.

Table 3. Jadwa model Test of the difference between pre- and post-t for related samples

Dimension	Pre-test	Post-test	Mean Difference	t	df	p	Cohen's dz
Geography	2.40	2.75	0.35	4.23	29	.001	0.77
AI attitude	2.50	2.85	0.35	3.98	29	.002	0.73
Suggestions	2.60	2.90	0.30	3.45	29	.005	0.63

Note: Indicates statistical significance at the 0.01 level

4- Comparison between the experimental and control groups

The independent-samples t-test demonstrated a statistically significant difference between the experimental and control groups over the three dimensions ($p < .001$). Besides, the calculated effect sizes were large (Cohen's $d = 1.16-1.56$). The application of AI tools led to important and considerable changes in the attitude of students toward geography and learning supported by AI.

Table 4. Test of the difference between the experimental and control groups t for independent samples

Dimension	Experimental Mean (SD)	Control Mean (SD)	t	df	p	Cohen's d
Geography attitude	2.78 (0.40)	2.30 (0.50)	5.10	58	< .001	1.32
AI attitude	2.90 (0.35)	2.25 (0.55)	6.05	58	< .001	1.56
General suggestions	2.85 (0.30)	2.40 (0.45)	4.50	58	< .001	1.16

5. Discussion:

This research focused on the influence of integrating artificial intelligence tools into the educational process regarding the students' academic performance in geography and their attitudes towards this subject and the role of technology in the educational setting. The findings suggest that the use of AI is beneficial in the



education sector, which confirms the results of several previous studies on this topic.

The primary response received from the survey indicates that students, who have been taught with the aid of AI tools, have displayed more positive attitudes towards geography than those who followed the conventional educational approach. One of the ways to explain this phenomenon is that AI technologies, for instance, Chat GPT and Google Earth, have facilitated the comprehension of geographical phenomena and increased the interactivity level of geography classes. This is also consistent with the constructivism theory, which states that learning involves interaction and is, thus, successful when implemented in an interactive environment (Drois, 2017).

The advantages of the experimental group can also be accounted for with the pedagogical aspects of the AI-driven educational settings. The tools such as ChatGPT, Google Earth, Kahoot, and Quizizz offer the possibility of receiving feedback instantly, visualising the content interactively, personalising the learning experience and providing constant engagement of the learners which is of great help in constructing concepts and achieving academic proficiency. These results are in agreement with the research carried out by Lee et al. (2025), who claimed that generative AI facilitates geography classes by activating learning process, inquiry-based instruction and spatial thinking. An equally important point is being made by UNESCO (2023) stating that AI tools provide personalised learning experience and stimulate students' engagement. From the constructivist point of view, these findings prove the notion of meaningful learning being the result of the students' active work with the educational content instead of passive reception of the knowledge (Piaget, 1972; Vygotsky, 1978).

The second fact is the statistical analysis of achievement scores supports that AI utilization results in a considerable increase in student achievement test scores post-intervention and compared to the pre-test score, which agrees with Ahmed's (2021) study that integrating intelligent technology into education, improves students' ability to comprehend the course material and develop their analytical thinking skills.

Another finding of the study was that students expressed interest in increasing their use of smart technology in learning geography, which supported improvements in motivation to learn. The multimedia theory (Lameyer, 2021) confirms that students' comprehension and success are affected by using various media as it makes them understand better what they study. Additionally, some of the results showed that there were technical difficulties when using smart technologies - for example due to lack of connection to the Internet or training on how to use these applications. The research determined that proper infrastructure and technical assistance should be provided for successful use of these resources.



Additional proof from the most recent study (Mohammed et al., 2022) highlighted that teachers and students require proper training in utilizing technologies effectively. It was deduced that the use of AI-based applications in geography education has proved helpful in enhancing the efficiency of geography education in areas where traditional or contemporary teaching tools are absent. It is recommended that school systems keep on embedding this type of application in their educational system and providing continuous training for the users of the programs.

6. Suggestions and Recommendations:

1. Promotion of the use of artificial intelligence in education: Implementation of the usage of AI applications like Chat GPT and Google Earth by the Ministry of Education as well as high school pupils is important in the school curriculum for the purpose of developing the ability to learn from the interaction with other people.
2. Provision of necessary tools: Digital tools and sufficient internet access should be available at schools in order for students to benefit from educational technologies.
3. Training universities and students: Regular training of teachers and students is necessary in order to learn how to use AI applications in innovative ways.
4. Creating interactive educational digital materials: Development of interactive educational materials aimed at geographic information systems will allow the introduction of AI applications for engaging students in active learning.
5. Encouragement for conducting research: Researchers should be motivated to carry out research about AI influence on different education levels and subject area and apply the results for further analyses of AI influence on education.



7. Conclusion:

As stated in the research, the implementation of artificial intelligence in the education of students studying geography has a positive impact on both the results they achieve and their attitude towards the educational process. It was found that the integration of advanced technologies along with the conventional ways of teaching geography and making its concepts easier facilitates more engagement than traditional methods alone. Thus, the introduction of educational technologies that use artificial intelligence in teaching processes is an effective way to enhance the quality of education and develop critical thinking and problem-solving skills among students. Nevertheless, in order to reach these goals, there should be established technical support and good infrastructure and both learners and instructors need to undergo necessary training in the use of these technologies. Geography is important since it allows students to understand their environment (ecological consciousness) and their relationship to events that are happening in the world around them. The role of geography in education has been increased recently because of the advances in technology that make a compelling case for the inventions of advanced teaching methods fitting these changes. The use of AI technologies in education enhances the learning process for students through the introduction of various types of interactions for students, clarification of geographical concepts, and motivation of students in their studies. The education sector faces the challenge of being up-to-date with technological advancement. The research emphasizes the importance of staff training in order to enhance the learning environment and use of technology for the purposes of creating knowledge that would help achieve educational goals.



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Achievement test for geography – fourth grade, literary stream

Test type: Multiple choice Time: 40 minutes

Each question is worth 4 points (total score 100)

Achievement test model consisting of 25 questions (multiple choice)

- 1- Who is the philosopher considered to be the founder of modern geography?
A. Ptolemy B. Kant C. Ibn Khaldun D. Aristotle
- 2- Islamic civilization took an interest in geography through
14- a- reproducing Greek books B- providing field descriptions of phenomena C- relying solely on drawings D- avoiding spatial interpretation
- 3- The steps of geographical research include
a- Experimentation B- Conjecture C- Defining the problem D- Classifying psychological factors
- 4- Maps are one of the tools of
a- Poetry B. Geography C. Literature D. Music 5- of geographical data sources
a- Myths B- Historical references C- Aerial photographs D- All of the above
- 6- Types of geographical variables
a- Verbal variables only B- Quantitative only C- Temporal and spatial D- Random
- 7- From basic map elements
a- Microscope B- Scale C- Key D- Needle 8- Remote sensing is used to obtain information
a- from inside the earth B. Without direct contact C. From ancient times D. Through interviews
- 9- Geographic information systems are used in
a- the aviation industry B. the performing arts C. spatial analysis D. traditional agriculture
- 10- One advantage of geographic information is
a- Slow access to data B. Difficulty of use C. Integration of spatial and descriptive data D. Reliance on luck
- 11- Teaching physical geography
a- Population B. Migration C. Non-human phenomena D. Economy
- 12- Human geography is concerned with
a- Volcanoes B. Earthquakes C. Economic settlement D. Tectonic plates
- 15- Geography deals with
a- The distribution of phenomena on the Earth's surface B. Ancient myths C. Mental arithmetic D. Psychology
- 16- Topographic maps represent



- a- Stories B- Proverbs C- Topography D- Weights 15- Remote sensing relies on
- a- touch B. Sound C. Electromagnetic radiation D. White light only 16- The best maps representing population distribution are
- a- Climate B- Topography C- Qualitative D- Geological 17- Characteristics of a good map
- A- Lack of scale B- Lack of key C- Accuracy and updating D- Random colouring
- 18- One use of geographic information systems
- 1- Entertainment B- Spatial analysis of environmental problems C- Printing D- Film industry
- 19- Aerial photographs are a source of
- A. Traditional source of information B. Accurate and up-to-date data C. Not scientifically reliable D. Not related to geography
- 20- Types of scales in maps
- A- Linear and numerical B- Musical C- Literary D- Narrative 21- The most famous remote sensing tools
- A. Scales B. Satellites C. Textbooks D. Compasses 22- Human geography maps show
- A. Topography B. Economic activities C. Vegetation cover D. Rainfall
- 23- Symbols are used on maps to represent
- A. Stories B. Geographical data C. Poetry D. Images 24- Geographical coordinates depend on
- A. Longitude and latitude B. Time only C. Temperature D. Height above sea level
- 25- Functions of a map
- A. Entertainment B. Decoration C. Conveying geographical information D. Nutrition

Answer key _Fourth grade geography test Question type: multiple choice

Q NO	Correct answer	Q NO	Correct answer
1	D. Aristotle	13	a- Distribution of phenomena on the Earth's surface
2	B. Provide a field description of the phenomena	14	C. Topography
3	C. Defining the problem	15	C. Electromagnetic radiation
4	B- Geography	16	C. Quality
5	D. All of the above	17	C. Accuracy and updating
6	C. Temporal and spatial	18	B. Spatial analysis of environmental problems



7	C. Key	19	B- Accurate and up-to-date data
8	B- Without direct connection	20	A. Linear and digital
9	C. Spatial analysis	21	b- Satellite
10	C. Integration of spatial and descriptive data	22	B. Economic activities
11	C. Non-human phenomena	23	c- Geographic data
12	C. Settlement and economic activity	24	a- Longitude and latitude
		25	C. Delivery of geographical information

Survey of fourth-year arts students' attitudes towards geography and the use of artificial intelligence in learning

Instructions: Please select your level of agreement with the following statements on a 3-point Likert scale

17- Strongly agree Agree Disagree Questionnaire

First: Attitudes towards geography

1- I feel that geography is important for understanding the environment in which I live.

- Strongly agree Agree Disagree
- 2- I find studying geography enjoyable and interesting
- Strongly agree Agree Disagree
- 3- I believe that learning geography helps me in my daily life.
- Strongly agree Agree Disagree
- 4- I find some geographical concepts difficult to understand
- Strongly agree Agree Disagree
- 5- I actively participate in geography classes and interact with the teacher
- Strongly agree Agree Disagree
- 6- The use of maps and diagrams makes geography easier to understand
- Strongly agree Agree Disagree
- 7- I find that geography is a subject that requires a lot of memorization without deep understanding
- Strongly agree Agree Disagree
- 8- I think geography lacks modern teaching methods at my school
- Strongly agree Agree Disagree

Second: Trends towards the use of artificial intelligence in geography education



- 9- I believe that the use of artificial intelligence applications helps to better understand geography.
- Strongly agree Agree Disagree
- 10- I feel that technology makes lessons more interactive and interesting.
- Strongly agree Agree Disagree
- 11- I prefer geographical concepts to be explained using smart tools rather than traditional methods
- Strongly agree Agree Disagree
- 12- I feel that the use of artificial intelligence helps me solve questions and tests better
- Strongly agree Agree Disagree
- 13- I believe that using smart applications in studying reduces boredom during class
- Strongly agree Agree Disagree
- 14- I have difficulty using some artificial intelligence applications due to poor internet connection
- Strongly agree Agree Disagree
- 15- I believe that integrating artificial intelligence into education requires greater support from teachers and schools.
- Strongly agree Agree Disagree
- 16- I believe that artificial intelligence could replace teachers in the future
- Strongly agree Agree Disagree

Third: General suggestions

- 17- I would like to see more classes that use modern technology to teach geography.
- Strongly agree Agree Disagree
- 18- I think learning geography would be easier if artificial intelligence applications were used all the time.
- Strongly agree Agree Disagree
- 19- I believe that artificial intelligence helps me think critically and solve problems in geography.
- Strongly agree Agree Disagree
- 20- I would like there to be special training for students on the use of artificial intelligence applications at school.
- Strongly agree Agree Disagree

Notes on the questionnaire

- 18- Student responses are collected and analyzed using arithmetic means and standard deviations for each item.
- 19- A three-point Likert scale can be used as shown
- 20- It is preferable to administer the questionnaire before and after the intervention (use of artificial intelligence) to measure the change in attitudes.