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The Effectiveness of a Proposed Strategy for Teaching Geography through Artificial Intelligence Applications in Developing Secondary School Students' Higher-Order Thinking Skills and Achievement

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Abstract

The study investigated the effectiveness of employing a proposed strategy for teaching geography using artificial intelligence applications in developing higher-order thinking skills and achievement among secondary school. The quasi-experimental method was used in this study. An observation card for higher-order thinking skills and an achievement test in the geography subject were used. The sample consisted of (60 female students) selected from the second year of secondary school students. The study showed significant differences at (0.05) between the mean scores of the students in the control and experimental groups on the achievement test in favor of the experimental group in the posttest. Also, differences were shown between the assessment means of the students in the control and experimental groups on the higher-order thinking skills assessment card in favor of the experimental group. The effect size came high. The study recommends the need to emphasize the expansion of the use of artificial intelligence applications in teaching geography.

Keywords: achievement, artificial intelligence applications, geography subject, higher-order thinking skills.

Introduction

Artificial intelligence is the most prominent feature of the knowledge, technological, and communication revolution because the applications of artificial intelligence offer amazing capabilities in terms of accuracy and speed. It is widely used in military, medical, industrial, commercial, service, and educational fields. Among the most prominent features of artificial intelligence is that the applications of artificial intelligence have become a reality we live in and have affected the optimistic outlook towards the future. Through these applications, many aspects of life have been improved, and the individual accomplishes his tasks quickly and accurately with minimal effort. They also have provided solutions to many problems (Al-Farani & Al-Hujaili, 2020). Musa and Bilal (2019) confirmed that artificial intelligence has contributed significantly to developing and improving the educational process, raising the level of its quality, and bringing about fundamental changes to reform the aspects of education and solve its problems. The applications also provided a safe learning environment free from threats and enhanced some aspects of students' self-confidence to take responsibility for their learning. The researcher believes that teaching and learning geography needs to focus more on higher-order thinking skills as education has become concerned with the quality of concepts and experiences that students acquire to practice different thinking skills. The secondary stage is the most sensitive in the growth and integration of personality. Also, there is great interest in higher-order thinking skills at this stage based on the Kingdom of Saudi Arabia's vision (2030). The vision focuses focused on thinking as one of the most important results that it would like to reach to obtain an active citizen. In light of the foregoing, the researcher believes that employing a strategy based on artificial intelligence applications in teaching educational materials for the secondary stage can have the importance of developing higher-order thinking skills among students. Accordingly, there is an urgent need to find out more about its use in teaching geography for the secondary stage. Also, achievement is still a goal because of the understanding and analysis of the learning situation and the achievement degree of objectives for the subject. Therefore, the study aimed to investigate the effectiveness of employing a proposed strategy for teaching a geography course using artificial intelligence applications

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in developing higher-order thinking skills and achievement among secondary school students.

Review of literature

Artificial Intelligence Applications

The Arab British Academy for Higher Education (2014) defined artificial intelligence applications as systems, programs, or devices designed for complex goals by dealing with data in the digital environment and interpreting this data, as well as cognitive thinking and the processing of that data and determining the best actions that must be taken to achieve the specified goal. Al-Sayyid (2021) also defined artificial intelligence applications as machines and software with capabilities that contribute to trying to embody human intelligence, simulate human capabilities, and may even exceed them in some cases. It was also defined by Kaplan and Haenlein (2019) as programs, machines, and applications that have a certain ability to analyze external data and devise new knowledge bases, adapt these rules, and use them to achieve new goals and tasks. Al-Nafi and Al-Farani (2021, p. 41) see that artificial intelligence applications are means of making a device, a robot, or a smart program. This is achieved by studying how humans think while trying to solve a problem, and then using this to develop smart programs and systems. In light of the previous definitions, it is clear that despite the varying concepts presented by researchers for artificial intelligence applications, they are consistent and complementary and indicate that they are systems, software, devices, or techniques that facilitate the implementation of many complex mental operations more easily, simply, flexibly, and in less time.

The importance of artificial intelligence applications is due to giving the educational process the ability to continue in light of the current technological changes. Also, it gains the ability to compete and then improves the performance of teachers and students to produce strong and distinctive outputs. Abdel Razek and Mahdi (2012) indicated that they provide high speed for analysis and identification processes, as well as design, implementation, and control. Also, the various knowledge tools operate in them in an integrated manner, in addition to the continuous renewal of data and information. These applications include knowledge models, semantics models, data convergence models, and knowledge patterns. Al-Sayyid (2021) pointed out that artificial intelligence applications in the field of education work to liberate the student from the one-way method of education. For example, the applications and platforms of private lessons and the various learning platforms that have become compatible with the tendencies, trends, and needs of each student.

One of the most important characteristics of artificial intelligence applications is the representation of knowledge by symbols, the use of the optimistic experimental method, the ability to deal with missing information, as well as the ability to learn. They also use a comparative method of the human method in solving problems, and deal with hypotheses simultaneously, accurately, and at a high speed. Therefore, their construction requires the representation of huge amounts of knowledge in a particular field and thus treat non-numerical symbolic data through logical analysis and comparison processes. They aim to simulate human thought and style and work to spark new ideas that lead to innovation, (Al-Obaidi, 2015).

Some of the artificial intelligence applications used in the current study are Teachmint, Renderforest, and Nearpod. The Teachmint application is known as one of the artificial intelligence applications that are used in the field of education and rely on group chat systems, launching scientific competitions, and sending and receiving tasks and homework (Teachmint, 2021). The Renderforest application is defined as a platform that is employed in educational services through the creation of multimedia, targeted drawings, the construction of digital stories, and models used in education through which activities are received and uploaded. The teacher and the student benefit from them in converting some topics into media (European Schoolnet, 2019). The Nearpod application is one of the applications through which students can interact with it. It depends on smart devices and computers to display the activities designed by students. The teacher can also use it to show slides that include different media to explain the lessons and display models and 3D media. It is an application that provokes enthusiasm, interaction, and participation (Sanmugam et al., 2019).

Higher-Order Thinking Skills

Several definitions of higher-order thinking skills have emerged. Ahmad (2021) defined higher-order thinking skills as a series of mental activities that the brain performs when exposed to a stimulus that is received by one or more of the five senses. Dhuha (2021) argued that they are practical skills to describe something using perception or retrieval, but using information about one thing to get to something else through innovation. Al-Asmari and Al-Shehri (2021) also defined higher-order thinking skills as thinking skills that seek to invent things and find solutions to different situations, find alternatives and move away from the usual stereotypes, and expand abilities through imagination and intuition.

Much of the literature emphasized the importance of higher-order thinking skills for female secondary school students. It was found that this importance is due to the higher-order thinking skills that give society the ability to improve the performance of individuals to reach excellence and the ability to overcome life conditions and to make appropriate decisions without losses, and the desire of societies to prepare a generation capable of advancing the future, as well as the

need for individuals to interact among themselves to achieve interdependence and integration among the members of society. Also, they are important in raising the awareness and capacity of senior leaders to abide by what is required of them in light of the successive developments (Al-Qahtani, 2021; Khamis, 2021; Wahba & Al-Jarrah, 2021).

Achievement

There are several definitions of academic achievement. Rasan (2020) defined it as the extent to which a student obtains grades in achievement tests in a subject such as geography. It is the percentage of what the student acquired from the elements of knowledge: knowledge, concepts, theories, skills, and performance through his interaction with the educational situation as measured by achievement tests (Amin, 2020).

Geography is one of the subjects that require thinking and research because of the nature of geographical and natural phenomena and their dimensions that need interpretation, imagination, and depiction, and relying on artificial intelligence applications may bring the student closer to understanding and inferring them. They are the most prominent contemporary trends in teaching geography. Several studies recommended employing artificial intelligence applications in developing students' abilities and skills in some subjects, including social studies (Al-Jeriwi, 2020; Al-Atl et al., 2021; Al Saud, 2017; Abu Jalala, 2021). Higher-order thinking skills enhance students' ability to overcome some life problems and make them more prepared and able to adapt to the circumstances and to overcome the challenges of the twenty-first century. Regarding academic achievement in geography, attention was paid to it as it is the outcome of the study of geography, and there are complaints from teachers about the low achievement of geography among secondary school students. The current study comes in response to the suggestions of some studies such as Al Saud (2017) and Naseer and Al-Omari (2017). Based on the foregoing, the study attempts to answer the following questions:

1. Are there differences between the means of the control group and those of the experimental group in the posttest of the Higher Thinking Skills assessment card in the geography subject due to the teaching method?
2. Are there differences between the means of the control group and those of the experimental group in the posttest of the achievement test in the geography subject due to the teaching method?

Methods

The study used the quasi-experimental method. It is a scientific method through which the independent variable is controlled, and its effect on one or more dependent variables is clarified by adopting the pre and post-design of two equal groups. The independent variable was a proposed strategy for teaching a geography subject using artificial intelligence applications for the experimental group, and its impact on the dependent variables: higher-order thinking skills, and achievement in geography was measured.

Population and Sample of the Study

The study population consisted of all secondary school students (No. = 24800) in Asir region schools in the kingdom of Saudi Arabia. To implement the experiment, the First Secondary School in Wadi Bin Hashbel governorate was selected. A random sample of (60) female students was drawn and divided into two groups. The control group studied in traditional ways, and the experimental group studied through a proposed strategy based on artificial intelligence applications.

Instruments of the Study

To achieve the objectives of the study, several instruments were used, namely: an assessment card for higher-order thinking skills, an achievement test in the geography subject, and a teacher's guide for teaching geography using artificial intelligence applications.

Assessment card for higher-order thinking skills

Based on the review of the previous literature on higher-order thinking skills for secondary school students, the higher-order thinking skills to be developed for secondary school students were identified. The assessment card consisted of (21) statements distributed into seven higher thinking skills on a three-Likert scale (often, sometimes, rarely) and took the values (3, 2, 1). The degree of the teacher's assessment of the student ranged on the scale from (1-66).

Validly and Reliability

1. The assessment card was reviewed by (10) experts to judge the appropriateness of the statements in terms of wording, content, integrity of language, and placing the statements in each domain where they belong. Their comments and suggestions concerning deletion, addition, or modification were considered.
2. The study instrument was applied to an exploratory sample consisting of (20) students from outside the main study sample. The students were assessed, and the Pearson correlation coefficient was calculated between the degree of the statement and the total degree of the domain, as well as between the degrees of statements and domains with the total degree of the scale (assessment card). All correlation coefficients were statistically significant and ranged between (**.690 and **.939). This indicates that the statements of the card have good validity, and they belong to their related domain and can measure what

they were designed for. Also, a matrix of correlation coefficients was calculated between the degrees of each domain with the total degree. All correlation coefficients were statistically significant and ranged between (**.773 and **.992), indicating that the card has good structural validity.

The reliability of the assessment card for higher-order thinking skills was calculated using Cronbach's alpha equation on the total score of the scale. The reliability coefficient was (0.96), which is high and suitable for the study. Also, the students of the exploratory sample were assessed by another specialized teacher after two weeks after she had been briefed on the program and higher-order thinking skills. The Pearson correlation coefficient was calculated between the results of the two assessments and reached (0.91). This is a high-reliability coefficient and is suitable for the study.

Assessment Card Correction Mechanism

The researcher used a card to assess the higher-order thinking skills of the students of the two study groups. The card consisted of seven areas distributed into (21) items within a triple-scale assessment (high, medium, and low). The degrees take the following values respectively (3, 2, 1).

Achievement Test in Geography Subject

An achievement test was built in the geography subject for the second grade of secondary school. Its items were (30) in the final version. A set of steps and procedures were followed in its writing, validity, and reliability.

Validity and Reliability

The test in its initial version was reviewed by 10 experts in social studies, curricula, educational technology, measurement, and evaluation. Most of their opinions and suggestions were considered. The number of test items did not change. Only some items were reworded.

Also, the validity of content means the inclusion of the test for the topics in the test: lithosphere, hydrosphere, and atmosphere from the geography textbook for the second grade of secondary school. To verify the validity of the content, the study content was analyzed, and the results were as follows (Table 1).

Pearson correlation coefficient was calculated between the degree of the test item and the total degree of the domain, as well as between the degrees of items and domains with the total degree of the test. All correlation coefficients were statistically significant and ranged between (.533** and .923). This indicates that the test items have good internal consistency. Also, a matrix of internal correlation coefficients was calculated between the degrees of each domain with the total degree. All correlation coefficients were statistically significant and ranged between (**.567 and **.945), indicating that the test has good structural consistency.

The reliability of the test was calculated using the Couder Richardson -20 method, by applying the test-retest method to an exploratory sample of (20) students. The reliability coefficient reached (0.92), a high-reliability coefficient. This indicates that the test has good reliability. The re-test test was also calculated between the test and re-test. The researcher re-applied the test for the second time on the sample two weeks after the first test. By calculating the Pearson correlation coefficient between the test and re-test, then the re-test reliability coefficient amounted to (0.93), a reliability coefficient good and acceptable for the current study. Also, difficulty and discrimination coefficients were calculated for the test items. The difficulty coefficients for the test questions ranged between (0.35--0.65). Item discrimination coefficients ranged (0.40 - 0.90), which are good discrimination coefficients indicating that the test is reliable and has good psychometric properties.

To verify the equivalence of the groups before the training program, the students of the control and experimental groups were assessed for higher-order thinking skills. A t-test was used to show the significance of the differences between the means scores of the control and experimental groups on higher-order thinking skills and on the total degree of skills as shown in Table 2.

Table 2 shows that the control and experimental groups are equivalent in higher-order thinking skills before the training program based on a proposed strategy for teaching geography using artificial intelligence applications in developing higher-order thinking skills for secondary school students. The significance level was greater than (0.05). The equivalence of the groups was also verified. The achievement

Table 1: Test specification table

No.	*Topics*	*Page no.*	*Relative importance*	*Levels*						*Total*
				Remembering	*Understanding*	*Application*	*Analysis*	*Composition*	*Assessment*	
1.	lithosphere	26	47.27	2.60	2.60	3.24	2.50	3.04	2.80	14
2.	hydrosphere	8	14.54	0.26	0.66	0.36	0.36	0.36	0.36	5
3.	atmosphere	21	38.18	2.04	1.74	1.40	2.14	1.60	1.34	12
Total		55	100.0	5	5	5	5	5	5	30

test consisting of (30) questions was applied to the control and experimental groups before the program (pretest). A t-test was used to show the significance of the differences between the means scores of the control and experimental groups as displayed in Table 3.

Table 3 shows that the control and experimental groups are equal in achievement before the training program based on a proposed strategy for teaching geography using artificial intelligence applications in developing the achievement skills of secondary school students. The significance level was greater than (0.05).

The Proposed Strategy for Teaching Geography

Several studies were reviewed, and a conscious review of the geography subject was conducted. Steps were relied on to employ artificial intelligence applications in teaching the geography subject. The researcher suggested a strategy for teaching a geography subject for the secondary stage based on the applications of artificial intelligence (Nearpod, Teachmint, Renderforest). Preparing the proposed strategy included the following steps:

1. Determining the scientific content of the proposed strategy, which is three units (lithosphere, hydrosphere, and atmosphere).
2. Dividing the selected content into small parts and preparing electronic content supported by visual graphics for the interactive data of the study information in the three study units.
3. Preparing the content specified in the strategy in an electronic content provided based on artificial intelligence applications.
4. Enhancing learning by displaying short video clips that are hyperlinked online to pre-made artificial intelligence applications for educational content.
5. Presenting electronic learning papers to the students that include questions that the students of each group answer together during and after receiving the electronic educational content.
6. Discussing the presented program and the electronic educational content based on artificial intelligence applications between the teacher and students to provide continuous feedback to the students and correct any wrong perception among the students.

After the researcher prepared the strategy in its initial version, she presented it to 10 experts and asked them to judge the scale in terms of the data link with the scientific content of the study units and the appropriateness of data interaction and adding some appropriate data. As a result, some data that 90%

Table 2: T-test for pre-higher-order thinking skills

Thinking skill	*Group*	*No.*	*Means*	*Standard deviations*	*T*	*df*	*Sig. tailed-2*
Distinguishing relationships and associations	Control	30	4.13	.819	.503	58	.617
	Experimental	30	4.03	.718			
Assumption	Control	30	4.77	.935	.135	58	.893
	Experimental	30	4.73	.980			
Blending	Control	30	4.60	.894	-.142-	58	.888
	Experimental	30	4.63	.928			
Comparison	Control	30	3.73	.450	-.293-	58	.770
	Experimental	30	3.77	.430			
Data representation and display	Control	30	4.60	.814	1.342	58	.185
	Experimental	30	4.30	.915			
Conclusion	Control	30	4.07	.521	-.258-	58	.798
	Experimental	30	4.10	.481			
Presenting points of view	Control	30	3.63	.669	.597	58	.553
	Experimental	30	3.53	.629			
Total	Control	30	29.53	1.548	1.072	58	.288
	Experimental	30	29.10	1.583			

Table 3: T-test for the pre-mean scores of the control and experimental groups

Pre-test	*Group*	*No.*	*Means*	*Standard deviations*	*T*	*df*	*Sig. tailed-2*
Achievement test	Control	30	14.20	4.205	.292	58	.771
	Experimental	30	13.90	3.726			

of experts did not agree on were deleted, and the interaction of some data was modified such as excluding the use of Cortana application within the artificial intelligence applications used in the study.

The strategy based on artificial intelligence applications includes teaching the three units of the geography subject for the secondary stage (during the period between 6/12/2021 and 26/1/2022 (12 class sessions). The units are presented and interaction between students and teachers is through two applications (Nearpod, Teachmint).). The scientific content of the three units is available to them in form of videos and pdf, with the availability of more than one means to simplify and communicate the information on those applications. In addition, the (Renderforest) application helps the teacher and students to create educational videos whose content is compatible with the content and objectives of the units of lithosphere, atmosphere, and hydrosphere included in the geography subject for the secondary stage. The students register on these applications through the mobile phone or the personal computer. Through their intake of the scientific material, they have the opportunity to write down their observations and questions about what was presented, so that these notes become the starting point for discussion and dialogue in the electronic classroom on the two applications of (Nearpod and Renderforest). The teacher records those discussions and notes through the applications, in addition to the worksheets and activities that are accomplished through the groups on these applications. Also, the students communicate through them between themselves and the subject and the teacher as well.

Results and Discussion

The first research question: Are there differences between the means of the control group and those of the experimental group in the posttest of the Higher Thinking Skills assessment card in the geography subject due to the teaching method?

To answer this research question, the independent samples t-test was used. Table 4 shows the differences between the two independent groups.

Table 4 shows that the probability values (Sig.) were less than the significance level (0.05), and the calculated (t) value was greater than the tabulated (t) value at (58) degrees of freedom and the significance level (0.05). This indicates that there were statistically significant differences between the means scores of the two groups in the posttest of the higher-order thinking skills assessment card. The table also shows that the differences came in favor of the experimental group of students. Their means scores were (52.30) while those of the control group students reached (29.00). The researcher interprets these results in the light of the advantages and characteristics of artificial intelligence applications that provided an educational environment rich in drawings, images, media, and activities that aimed at developing thinking and imagination, and fact-finding. They also reinforced female students' tendency towards the geography lesson, and knowledge of geographical concepts included in the textbook through elements of excitement and suspense. In addition, these applications contributed to the speed of memorization and acquisition of knowledge and their use in practice to develop higher-order

Table 4: T-test for the higher-order thinking skills assessment card post-means of the control and experimental groups

Thinking skill	*Group*	*No.*	*Means*	*Standard deviations*	*T*	*df*	*Sig. tailed-2*	*Eta-squared*	*Level of effect size*
Distinguishing relationships and associations	Control	30	4.33	.959	-13.607-	58	.000	.761	High
	Experimental	30	7.47	.819					
Assumption	Control	30	4.33	.758	-17.861-	58	.000	.846	High
	Experimental	30	8.00	.830					
Blending	Control	30	4.17	.699	-15.232-	58	.000	.800	High
	Experimental	30	7.50	.974					
Comparison	Control	30	4.50	.974	14.054	58	.000	.773	High
	Experimental	30	7.67	.758					
Data representation and display	Control	30	4.17	1.085	16.155	58	.000	.818	High
	Experimental	30	7.67	.479					
Conclusion	Control	30	3.67	.758	18.592	58	.000	.856	High
	Experimental	30	7.17	.699					
Presenting points of view	Control	30	3.83	.913	14.292	58	.000	.779	High
	Experimental	30	6.83	.699					
Total	Control	30	29.00	3.983	30.014	58	.000	.940	High
	Experimental	30	52.30	1.489					

Table 5: T-test for the achievement test post-means of the control and experimental groups

Posttest	*Group*	*No.*	*Means*	*Standard deviations*	*T*	*df*	*Sig. tailed-2*	*Eta-squared*	*Level of effect size*
Achievement test	Control	30	13.47	3.517	9.595	58	.000	0.613	High
	Experimental	30	21.53	4.108					

thinking skills. These results are consistent with the results of some studies that emphasized the importance of employing artificial intelligence applications in enhancing teaching and learning processes and directing them towards developing higher-order thinking skills (Khamis, 2012; Hariri, 2021).

The second research question: Are there differences between the means of the control group and those of the experimental group in the posttest of the achievement test in the geography subject due to the teaching method?

To answer this research question, the independent samples t-test was used. Table 5 shows the differences between the two independent achievement test post-means of the control and experimental groups

Table 5 shows that the probability values (Sig.) were less than the significance level (0.05), and the calculated (t) value was greater than the tabulated (t) value at (58) degrees of freedom and the significance level (0.05). This indicates that there were statistically significant differences between the means scores of the two groups in the posttest of the achievement test in geography subject. The table shows that the differences came in favor of the experimental group of students. Their means scores were (21.53) while the means scores of the control group students reached (13.47).

The researcher believes that the applications of artificial intelligence contribute to analyzing students' conditions, knowing their educational needs, and providing the necessary support for them to continue their ambition and acquire concepts. The applications also help students to overcome the barriers of fear and tension when studying geography and complex subjects. In addition, they help to improve awareness, increase students' motivation towards learning, stimulate their enthusiasm, make them more responsible, and increase their self-confidence. They also address the difficulties that students may face in acquiring knowledge. All these factors were reflected in the students in the experimental group, who outperformed the students in the control group in academic achievement. These results are in line with the views presented by (Al-Shukairat & Al-Rasa'i, 2020), who emphasized that the applications of artificial intelligence work treat educational problems and enhance students' abilities to acquire, store, and recall knowledge when needed which contributes to the development of academic achievement.

Recommendations

In light of the study findings, the researcher recommends the following:

1. Emphasis on the expansion of the use of artificial intelligence applications in teaching geography among secondary school students due to the effectiveness of employing the proposed strategy in developing academic achievement and higher-order thinking skills in this study.
2. The necessity of working on developing higher-order thinking skills for female students in schools and training them to use strategies and methods to develop those skills.
3. The importance of future research and studies dealing with the applications of (Renderforest), (Teachmint), and (Nearpod) in education in general as they help to develop the various skills of students.
4. Preparing a proposed program to train in-service teachers on the use of various artificial intelligence applications and their impact on their performance in teaching.

References

Abdel Razek, U. & Mahdi, H. (2012). Artificial intelligence and the difficulties of its application in information technology. *Journal of the College of Basic Education, University of Babylon*, (1), 248-257.

Abu Jalala, S. H. (2012). Developing higher-order thinking and creative thinking skills. *Education Journal: Qatar National Committee for Education, Culture and Science, 41*(181), 165-194.

Ahmad, A. (2021). The effect of using educational aids on deductive thinking among middle school students in the subject of geography. *Adab Al-Farahidi Journal: Tikrit University - College of Arts 13*(45), 422-436.

Al-Asmari, N. & Al-Shehri, F. (2021). The degree to which postgraduate students at the Faculty of Education at the University of Bisha possess metacognitive thinking skills from their point of view and that of their professors. *Umm Al-Qura University Journal of Educational and Psychological Sciences: Umm Al-Qura University, 13*(1), 301-339.

Al-Atl, M., Al-Ajmi, A., & Al-Enzi, I. (2021). The role of artificial intelligence in education from the point of view of students of the College of Basic Education in the State of Kuwait. *Journal of Educational Studies and Research: Al-Ataa Center for Educational Consultations, 1*(1), 30-64.

Al-Farani, L. & Al-Hujaili, S. (2020). Factors affecting the teacher's acceptance of the use of artificial intelligence in education in light of the unified theory of acceptance and use of technology. *The Arab Journal of Educational and Psychological Sciences 4*(14), 215-252.

Al-Jeriwi, S. (2020). The effect of using artificial intelligence technology in the e-learning environment on developing future thinking skills and academic achievement in science for middle school students. T*abuk University Journal of Humanities and Social Sciences: Tabuk University*, (9), 261-289.

Al-Nafi, S, & Al-Farani, L. (2021). The reality of using artificial intelligence techniques in enrichment programs in talented centers in the Kingdom. *The Scientific Journal of King Faisal University - Humanities and Administrative Sciences: King Faisal University, 22*(special), 39-45.

Al-Obaidi, R. (2015). The role of artificial intelligence in achieving green production: an exploratory study of the performance of managers in a sample of operating industrial companies. *Kirkuk University Journal of Administrative and Economic Sciences, Kirkuk University, 5*(1), 37-62.

Al-Qahtani, R. (2021). Obstacles to using productive thinking skills in learning Arabic among female trainees of the Technical College for Girls in Khamis Mushait in the Kingdom of Saudi Arabia. *Journal of the Islamic University of Educational and Psychological Studies: The Islamic University of Gaza, 29* (1), 181-208.

Al-shukairat, M. & Rasa'i, M. (2020). The effect of using the educational platform Edraak on the academic achievement in mathematics of tenth grade students and their attitudes towards it. *Journal of Educational and Psychological Sciences: Gaza National Research Center, 4* (48), 127-144.

Amin, S. (2020). The comparison between the teaching methods of Arabic according to the level of high-low achievement. *Journal of Arts, Literature, Humanities and Sociology*, (59), 296-312.

Arab British academy for higher education (2014). *Artificial intelligence*. Available at: www.abahe.co.uk.

Dhuha, I. S. (2021). The effectiveness of the flipped classroom strategy on academic achievement, creative thinking skills, and creative self-efficacy and its impact on course satisfaction and the attitude towards generalizing distance learning among the students of the Faculty of Education, Damanhour University. *Journal of Scientific Research in Education: Ain Shams University - Girls' College of Arts, Sciences and Education*, *5*(22), 132-174.

European Schoolnet. (2019). Europeana Learning Scenario. Retrieved from (https://teachwitheuropeana.eun.org/files/).

Hariri, India. (2021). A proposed vision for using artificial intelligence to support education in universities in the Kingdom of Saudi Arabia to confront the coronavirus pandemic (Covid-19) in light of benefiting from the experience of China. Journal of the Islamic University of Educational and Social Sciences: The Islamic University of Madinah, (special), 365-427.

Kaplan, A., & Haenlein, M. (2019). Siri, Siri, in my hand: Who's the fairest in the land? On the interpretations, illustrations, and implications of artificial intelligence. Business Horizons, 62(1), 15-25.

Khamis, K. (2015). A proposed unit in teaching geography based on electronic maps and its impact on developing dimensions of spatial awareness among primary school students. Journal of the Educational Society for Social Studies: The Educational Society for Social Studies, (72), 183-227.

Musa, A., & Bilal, A. (2019). Artificial intelligence: The revolution of the age technologies. Cairo: The Arab Group for Training and Publishing.

Rasan, S. (2020). The effect of using the divergent thinking questions strategy on the achievement and acquisition of concepts among second-grade students in the middle school in Arabic. Journal of Arts, Literature, Humanities and Sociology, (56), 327-339.

Sanmugam, M., Selvarajoo, A., Ramayah, B., & Lee, K. W. (2019). Use of Nearpod as interactive learning method. INTED2019 Proceedings, 1, 8908-8915.

Sayyid, W. (2021). The effectiveness of using artificial intelligence applications to automatically identify the acoustic-physical characteristics of the speech of students with speech disorders in the primary stage. Educational Journal: Sohag University - College of Education, 88, 1126-1176.

Teachmint. (2021). Teachmint, Classplus draw a post-pandemic map for B2B edtech. Retrieved from (https://www.nishithdesai.com/Content).

Thursday, M. (2021). The effect of a proposed educational program based on active learning in developing creative thinking skills for seventh grade students in Jordan. The Jordanian Journal of Applied Sciences - Human Sciences Series: Private Applied Sciences University - Deanship of Scientific Research and Graduate Studies, 28 (1), 1-19.

Wahba, F., & Al-Jarrah, A. (2021). Designing an Edmodo educational platform for teaching Arabic and measuring its impact on academic achievement and developing pivotal thinking skills for third grade students in Jordan. Journal of the Islamic University of Educational and Psychological Studies - Islamic University, 29), (1), 318-340.