Using Artificial Intelligence-Supported Programmed Learning based on Deep learning and its Impact on Learning Achieving for the Preparatory year Students at the University of Bisha

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Abstract:

This study aimed to find out using Artificial Intelligence-supported programmed learning based on deep learning and its impact on learning achieving for the preparatory year students at the University of Bisha. To achieve the objectives of the study, the researcher used the quasi-experimental method using the experimental and control groups, each group has 25 students. The results of the study showed that there are no statistically significant differences at the level of (0.05) in learning achievement between the grade point averages of the control and experimental group in the pre-test, There are also statistically significant differences at the level of (0.05) in learning achievement between the means of scores of the post-test for the control group and the experimental group's performance, the difference is in favor of the experimental group. In light of these results, the study recommended: Adopting using Artificial Intelligence-supported programmed learning in teaching the preparatory year students to increase the development of their skills and learning achievement.

Key words: Programmed Learning. Artificial Intelligence. Deep Learning .Learning Achievement.

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المستخلص:

هدفت هذه الدراسة إلى الكشف عن استخدام التعلم المبرمج المدعوم بالذكاء الاصطناعي القائم على التعلم العميق وأثره على التحصيل الدراسي لطلاب السنة التحضيرية بجامعة بيشة. ولتحقيق أهداف الدراسة، استخدم الباحث المنهج شبه التجريبي باستخدام المجموعتين التجريبية والضابطة، تكونت كل مجموعة من (٢٥ طالباً). وأظهرت نتائج الدراسة أنه لا توجد فروق ذات دلالة إحصائية عند مستوى (٠,٠٥) في التحصيل الدراسي بين متوسطات الدرجات للمجموعة الضابطة والتجريبية في الاختبار القبلي، كما توجد فروق ذات دلالة إحصائية عند مستوى (٠,٠٥) في التحصيل الدراسي بين متوسطات الدرجات في الاختبار البعدي لأداء المجموعة الضابطة والمجموعة التجريبية، والفرق لصالح المجموعة التجريبية .في ضوء هذه النتائج، أوصت الدراسة بما يلي :تبني استخدام التعلم المبرمج المدعوم بالذكاء الاصطناعي في تدريس طلاب السنة التحضيرية لزيادة تنمية مهاراتهم وتفوقهم الدراسي.

الكلمات المفتاحية: التعلم المبرمج، الذكاء الاصطناعي، التعلم العميق، التحصيل الدراسي.

Introduction

The current era which is well known as the digital age and the era of the Fourth Industrial Revolution, has formed a civilizational leap in the production and share of knowledge through digital tools, programs, and smart applications such as: cloud computing, the Internet of Things, and Artificial Intelligence, these things make it possible to benefit from information and data, and overcome the barriers of time and space in dealing among individuals and organizations , and then corporations and organizations in various fields competed to explore the opportunities of this transformation and seize them with the aim of achieving competitive advantages.(Sima. al, 2020).

Through Artificial Intelligence (AI), we can track the actions of each learner and guide them while highlighting their points of strengths and weaknesses and provide them with appropriate support. Artificial Intelligence can help in providing the teaching staff with data about the student's performance and his correct response to each step, and then determines how to interact with the learner to help improve his performance and provide feedback. The feedback can be immediate or after completing all educational tasks, and a remedial learning activity can also be provided, (Murphy, 2019).

The contemporary educational trends emphasize the importance of programmed education, which moves the focus of the educational process from the academic subject to student. It also highlights to discover the student's inclinations, readiness, abilities, and personal skills with the aim of planning for their development according to his own needs, and this contributes to highlighting individual differences among the students and giving each of them the opportunity to move at their own pace (Abdul Hafez, 2001).

Statement of The Problem:

Arab countries are experiencing severe changes as a result of the Covid-19 pandemic, affecting the economy and education in particular, and therefore, they need rapid change now more than ever, and to benefit from Artificial Intelligence technology to contain the crisis, in order to achieve growth in education, and it will even positively affect the systems where The development that will occur in education will benefit

all sectors, as Artificial Intelligence technology has entered everything, and accordingly, there will be a boom in economic and scientific growth in the Arab countries. There are many studies and conferences held in this field, including, for example, the First Scientific Conference on Information Systems and Information Technology, which explained that developing Artificial Intelligence methods and tools may contribute greatly to the use of computers in the educational process (Al-Mutairi, 2022).

Therefore, despite the Kingdom of Saudi Arabia's efforts to develop in all fields of the educational process, and the keen interest in digital development in particular, studies that dealt with Artificial Intelligence and innovation and their role in development educational process in general, and higher education in particular are very few, and more studying is recommended in the field of Artificial Intelligence in higher education (Alamri, 2023).

Based on the researcher's work as a faculty staff member, he found that modern teaching methods arouse interest of the students and motivate them to learn and increase their desire for knowledge. It also motivates them to participate with the professor and also takes into account individual differences and helps achieve goals. The methods are also consistent with the nature of mental activity students, and the nature of the content. Additionally, they also force the professor to choose an appropriate teaching method. The researcher also noticed decline.in learning achievement for students, and that may be for several reasons, including the use of traditional teaching methods Which reduces students' motivation toward the syllabuses. Based on some studies that recommended using Artificial Intelligence technologies in teaching at higher education and measuring its impact on increasing learning achievement. Accordingly, the problem of the study is formed in the following main question:

What is the extent of using Artificial Intelligence-supported programmed learning based on deep learning and its impact on learning achieving for the preparatory year students at the University of Bisha? The following sub- questions arise from the main question:

1| Are there are statistically significant differences at the level of statistical significance (0.5) between means of scores of the experimental group that was taught using Artificial Intelligence-supported programmed learning based on deep learning and means cores of the control group taught in the traditional way in the post-achievement test in favor of the experimental group?

2| Are there statistically significant differences at the level of (0.05) in learning achievement (understanding level) between means of scores of the post-test for the experimental and control group in favor of the experimental group?

3| Are there statistically significant differences at the level of (0.05) in learning achievement (application level) between means of scores of the post-test for the experimental and control group in favor of the experimental group?

Objectives of The Study:

This study aims to identify:

1) if there are statistically significant differences at the level of statistical significance (0.5) between the means of scores of the experimental group that was taught using Artificial Intelligence-supported programmed learning based on deep learning and means of score of the control group taught in the traditional way in the post-achievement test in favor of the experimental group.
2) If there are statistically significant differences at the level of significance (0.05) in learning achievement (understanding level) between the means of scores of the post-test for the experimental and control group were in favor of the experimental group.
3) If there are statistically significant differences at the level of significance (0.05) in learning achievement (application level) between the means of scores of the post-test for the experimental and control group in favor of the experimental group.

Significance of The Study:

The importance of the study lies in the fact that it mays participate in rising learning achievement. It also contributes to spreading the culture of Artificial Intelligence-supported programmed learning based on deep learning among students. The study may help to train the

students to earn some practical skills. It may also benefit faculty members in lectures preparation based on Artificial Intelligence-supported programmed learning based on deep learning, It encourages them to use modern teaching methods which encourage the students towards deep learning and give them its skills. It is also useful for faculty members in developing students learning achievement beside enriching research library The importance of the current study may also appear in that scientific research urgent need to use technology in the era of the knowledge. The study also comes as a fulfillment of contemporary societies' interest in developing and improving education systems and reaching the highest quality of educational outputs.

The Concept of Programmed Education:

Programmed learning is one of the systematic educational methods that is based on experimental foundations and aims to reach an effective system in providing information and concepts to the learner and ensuring his understanding through the positive activities he performs. Debs and Alyan (2003), and Khamees (2003), see that it is one of the methods of individual education, but it is not synonymous with it. Individual education is older than programmed education, which appeared in 1954 AD. If programmed learning applies the foundations and principles of individual education, as one of its forms, it adds other principles to it as its own feature that distinguishes it from other forms of individual education, which principles are derived from procedural conditioning and reinforcement theory.

Adyat (2014), stated that programmed learning is a method of presenting educational content, including explanations, exercises, and follow-up, partially or comprehensively, in the classroom or remotely, using programs stored on the computer or through Internet. Al-ayasirah 2017), and Al-Zend (2004) see that programmed learning is a method in education that depends on designing the educational material and dividing it in a sequential interconnected manner from easy to difficult. It depends on explanation and questions. It enables the learner to discover information and process it on his own, relying on his own abilities and capabilities, and on his teacher's directions. The learner cannot move

from one part to another until he masters and answers all the questions related to the previous part. He also has a major role in evaluating his performance in the educational process.

Al-zaytoon (2002), stated that one of the most important goals of programmed learning is teaching an individual how to practice educational experiences on his own, and confirming the learner's ability to understand the aspects of education in which he is present, the learner uses his abilities and aptitudes in order to reach his goal and practices his learning according to his academic and achievement capabilities. The learner gains self-confidence as a result of taking responsibility for learning.

Al-Harsh and Muhammad (2012) believe that justifications for programmed learning is represented in increasing the amount of cognitive structure, which makes it difficult for school curricula to absorb this large amount of information to teach students, this is why it is necessary to invent new educational systems that make the learner self-reliant. Also increasing the number of students, as programmed learning can accommodate a large number of students at one time, so it has become an urgent necessity with the increase in population. This in addition to the low cost of programmed learning compared to other traditional education systems. Technological development with the tremendous development in information and communications technology, programmed learning has become linked to it, as its programs can be downloaded to the mobile phone.

The Concept of Artificial Intelligence:

Artificial Intelligence is a technical breakthrough, the goal of which is not only to improve technical quality; rather, it simulates human behaviour in mental processes, such as perception and deduction. The American scientist McCarthy John was the first to use the term Artificial Intelligence in 1959, and at that time it referred to the science of engineering smart industries, referring to computer programs (Al-Rutimi, 2018).

AI can be defined as the science that enables smart industries to be able to think with mechanisms equivalent to the human mind Bernard, (2018).

The science of Artificial Intelligence aims to understand the nature of human intelligence through enabling computer programs to mimic intelligent human behaviour, which means that computer programs have the ability to solve problems or make decisions in specific situations. This is considered an important turning point that goes beyond what is so-called information technology. In information technology, the process of thinking is carried out by humans; the most important reason for sing a computer is limited to its high speed, Al-Mutairi, (2022).

Many published literatures have mentioned how augmented reality can be applied to students of the College of Education. Below are the methods to be determined and considered as standard steps for applying augmented reality technology in colleges of education in Saudi Universities Lund, (2019, Hannah, et al, (2017), Avila, 2018. Lund& Agbaji, (2018), Pope, (2021) Tang, (2018), Traas, et al, (2020):

- Create augmented reality presentation around the college campus, and install an augmented reality app (AR) in all presentations.
- Place posters explaining how to use augmented reality and how it works, and place them behind each presentation screen.
- Presentation topics and sources are divided and distributed to college departments, and the sources of each college department are used on the real site specified to each department.
- This planning aims to support the student in how to complete their research through one integrated course after completing the school day, to find innovative ideas to complete their academic tasks.

The Roles of Artificial Intelligence Technologies in Developing University Students:

There are many roles played by Artificial Intelligence technologies that contribute to developing the skills of students in education colleges, including:

- **Robots used in the educational process:** It is an important part of Artificial Intelligence systems, as it is software that simulates the conversational processes of real people, in addition to providing interaction between the learner and the prepared programs, using text or voice messages, as it is programmed to work independently without

human intervention, and the goal of using these robots is to answer questions that the student may be asked and provides the answers stored in his database, and he retrieves them and answers the questions and inquiries of others as a real person would, Fryer, et al., (2019).

- **Smart teaching systems:** These systems provide specialized educational lessons for students in different subjects and specializations. These systems are applied using Artificial Intelligence to resemble the teaching process carried out by the teacher inside the classroom, in addition to evaluating classroom and extracurricular activities that suit the learner's needs, which contributes to reducing teaching burdens for the teacher inside the classroom, Siau, (2018).
- **Smart content:** It means digital content using a robot with the same skills as humans. Artificial Intelligence can help transform books and notes into an educational digital format for students of all ages, and make them available at any time and place via the Internet. Digital content is also diversified in the way it presents media, and virtual content has become such as lectures. Digital and virtual conferences are a reality that was widely acknowledged during the Corona crisis Jin, (2019).
- **Expert systems:** They are programs designed and customized to resemble human behaviour or skills, and follow the capabilities of expert systems in that way they can be used at any time to support, improve and enrich learning processes, as it is a type of computer software that contains many aspects of cognitive and skill learning in a specific science Sbarahmanyam, (2018).
- **Assessment:** It is based on evaluating students using Artificial Intelligence techniques in several aspects, such as homework and language levels. Compared to traditional evaluation, the value of Artificial Intelligence is that it takes into account more aspects of learning in the evaluation processes in addition to the students' shortcomings, Lufeng, (2018).

The Concept of Learning Achievement:

Sanusi (2013), Ahmed (2022), and Abdul Ghani (2018) indicate that Learning achievement represents the knowledge that an individual obtains through a school program or curriculum in order to adapt it to the

environment and school work. Al-gundi (2015) reported that the concept of learning achievement is that it represents the measurement of the student's ability to comprehend the prescribed academic subjects and the extent of his ability to apply them through means of measurement that the school experiences through oral and written examinations that take place at different times in addition to daily and semester examinations.

Learning achievement has a number of characteristics, features, and knowledge embodied in the various academic subjects, which are represented in the following:

Al-Ziyadi (2001), Learning achievement is characterized by the content of the curriculum of a specific subject or group of subjects, each of which has its own knowledge, and it is good for the majority of ordinary students are in the class. It is a collective method based on employing unified collective examinations, methods and standards in issuing evaluative judgements, usually through answers to semester written and oral exams.

Al-Dosari (2000), reported that measuring learning achievement represents one important aspect of the educational process about which information must be collected, and it represents the most important dimensions that the school is concerned with working on and developing. Therefore, measuring learning achievement helps in making many teaching and evaluation decisions, and identifying the levels of individual students or within groups with certain characteristics. However, measuring achievement alone is not sufficient to provide comprehensive information about the student's performance, as other decisions can be taken that are not less important than the decisions that achievement tests serve.

There are three types of learning achievement, as seen by Mohammed (1999), and Al-Bashir (2014):

1. Good learning achievement: It is a behaviour that expresses an individual's academic performance exceeding the level expected of him in light of his own abilities and aptitude,
2. Average learning achievement: In this type of achievement, the grade obtained by the student represents half of the capabilities he possesses,

and his performance is average to the extent that his benefiting from information is average.

3. Poor learning achievement: It is a state of weakness, deficiency, or lack of interest in achievement growth due to mental, physical, social, or emotional factors, such that the degree of intelligence decreases to the normal level.

Al-Hadi and Nasr al-Din (2000), see that learning tardiness is the distinguishing feature for students who suffer from difficulties in learning. There are no difficulties in education without the presence of academic problems. Some students may suffer from deficiencies in all subjects of study, while others may suffer from deficiencies in one or two subjects. Al-Ziyadi (2001), adds that the problems the student may suffer from, such as weak motivation to study, inappropriate study habits, cause poor learning achievement.

Deep Learning:

Deep learning helps in investigations to fight COVID-19 Nayak, et al, (2021), Alzubaidi, et al, (2021). Is it a part of the big picture of Artificial Intelligence. Deep learning is a branch of machine learning that aims to develop a model that matches the level of the human brain in solving complex problems in the real world by utilizing artificial neural networks and simulation learning, Fong, et al, (2018), Lake, et al (2016). Each created model must achieve two primary deep learning assignments tightly; mining semantic information from input and producing meaningful output, Schaefer et al, (2021), and deep learning tries to reach the level of these neural connections by simulating the human brain through artificial neural network techniques, which is the core of deep learning. It consists of an input layer, an output layer, and one or more extra hidden layers, each of which involves a collection of weighted nodes or neurons that are attached to one another. Deep learning requires the use of high levels of cognitive skills such as analysis (compare, contrast) and synthesis (integrate knowledge in a new learning Parisi, et al, (2019) – Farhan and Jasim (2022). Moreover, deep learning improves the understanding and application of lifelong learning.
The main features of deep learning are the intrinsic motivation that learns as a source of satisfaction, meaning-centered learning, linking new

knowledge with other subjects, encouraging expertise and real life, and promoting a critical spirit and analysis. Deep learning is characterized by the speed of learning, as it enables learning from large amounts of data, which humans cannot handle. Therefore, deep learning may draw ideas and conclusions that humans cannot reach. Deep learning takes advantage of image recognition, weather forecasting, and agriculture. It has also been utilized in automotive technology and medical fields. Hence, Artificial Intelligence has been essential in supporting and enriching the lives of people and society.

There are many studies that have dealt with this topic, including: Ahmed (2020) , which aimed to determine the impact of using computers in teaching on learning achievement for basic education pupils in computer course. The most important results of the study include that computer enhances the level of students' interaction with the course content and lessons, and there are a number of difficulties and obstacles that limit the use of computer in teaching and learning. Abdul-Ghani (2018) conducted a study that aimed to find out the impact of using technology in raising the level of learning achievement for the seventh-grade students at basic mathematics subject, The most important results of the study revealed that there are statistically significant differences between the students of the experimental group and the control group in favour of the experimental group, and the use of the computer as an educational method has a positive impact on learning achievement. Muhammad (2017) carried out a study that aimed to determine the effect of using programmed learning in teaching Arabic language for grade two students at secondary school through computer compared to the traditional method. The study found that there are statistically significant differences between means of the two groups in the achievement of the post-test in favour of the experimental group that was taught using programmed learning using the computer. There are statistically significant differences between means of the two groups in the achievement of the postponed test in favor of the experimental group that studied through computer programmed learning.

Al-Bashir (2014) conducted a study that aimed to identify the effect of teaching mathematics using the programmed learning method on the learning achievement of the second year in physics department at Faculty of Education, University of Khartoum. The results of the study showed that statistically significant differences were found between the means of the achievement scores of the experimental group who were taught in programmed learning and means of the scores of the control group that was taught in the traditional way in the post-test, and the differences are in favour of the experimental group.

AwadAllah (2003) conducted a study aimed at knowing the impact of the programmed teaching method and its impact on the traditional teaching method on students' achievement in grammatical rules, and one of the most important results of the study is that there are statistically significant differences at the level (0.05) between the traditional education method and the programmed learning method in students' achievement in favour of programmed learning. .Abdul-Jawad, Mahmoud and Sheikh (2019), conducted a study that aimed to know the impact of different categories of feedback given by Artificial Intelligence-based programme on developing cognitive aspects and skill aspects of the third grade students in the second stream at basic education. The study findings showed that there are statistically significant differences among means of scores of the first experimental group, the second experimental group and the third experimental group in the post-application for testing achievement in the total scores and at all levels of objectives, in favour of for the third group.

Abdul Wahab (2020), aimed to identify the effect of the interaction of some Artificial Intelligence systems and the educational stage on self-awareness and quality of life among a sample of teenagers. The results indicated the presence of positive correlation between self-awareness and quality of life among the participants. There is also statistically significant interaction between the educational stage and teaching method on self-awareness for the participants, in addition, statistically significant interaction was found between the educational stage and teaching method on quality of life for the participants.

Al-Mutairi (2022), conducted a study aimed to measure the impact of Artificial Intelligence-based electronic learning environment an intelligence-based electronic learning on developing electronic learning among female students of the College of Education at Umm Al-Qura University. The findings of the study showed that there are statistically significant differences means of scores of female students of the experimental group in developing cognitive aspects and performance aspects in both the pre-application and the post-application, and the differences are in favor of the post-application. In light of the results of the study, the researcher recommended working on developing intensive training programs to develop electronic learning skills for female students, and the necessity of employing Artificial Intelligence skills in the syllabuses for female students at the university.

Field Study Methodology and Procedures:

Study methodology: The study adopted quasi-experimental method, based on two groups, an experimental group taught through using Artificial Intelligence-supported programmed learning based on deep learning, and a control group was taught in a post-learning method, with pre- and post-measurement for the two groups, then comparing the two groups performance1.

The study population: The study population includes 468 preparatory year students at the University of Bisha, according to the official statistics in the summer semester for the academic year 1444/1445 AH.

The study sample: The study sample included 50 students, who were randomly selected, then divided into two identical and equivalent groups; one of them is an experimental group consisting of: 25 students and the other is a control group consisting of 25 students.

The Equivalence of The Two Groups (experimental and control): T-test was used to calculate the differences between the means of the two independent groups of equal numbers in order to compare their means.

The Equivalence in Learning Achievement: The researcher made sure that the experimental and control study groups were equal in terms of learning achievement, through pre-test results, to measure the level of achievement for the students. The test was conducted at the beginning of

the academic year with the help of the professor who taught the courses. The researcher monitored the grades of the students, where he took their scores on the pre-test which was applied in the year2023. The highest third and lower third were determined in both the experimental group and the control group according to their scores in the diagnostic test, and their number was 8.students in the upper third and 8 students in the lower third.

Table (1) shows the arithmetic mean and standard deviation for the experimental and control groups, and their statistical significance for the scores of the students in the experimental and control groups, while table (2) shows the scores of high achievers and low achievers in the experimental and control groups in pre-test.

Table No. (1): Arithmetic means and standard deviations for the scores of students in the experimental and control groups and the T-value in the pre-test

Significance level	T value	Control group (25)		Experimental group (25)		Item
Not significantly	1.203	10.19	mean	11.87	mean	Level of achievement
		5.87	standard deviation	5.87	standard deviation	

Table No. (2): Arithmetic means and standard deviations for the scores of high-achieving and low-achieving students in the experimental and control groups, and the T-value in the pre-test

Significance level	T value	Control group (25)		Experimental group (25)		Item
Non-functional	0.587	6.45	Mean	10.12	mean	The level of achievement among high achievers
		3.23	standard deviation	1.78	standard deviation	
Non-functional	0.198	8.83	SMA	9.38	SMA	The level of achievement among low achievers
		2.50	standard deviation	2.10	standard deviation	

The tabular (t) value is at a significance level of 0.05 = 2.02

From table (1), the experimental and control groups are equal in terms of learning achievement in the preparatory year courses, and also from table (2) it is clear that the high achievers and low achievers in the experimental and control groups are equal in learning achievement in the preparatory year courses.

Validity of The Achievement Test:

It means making sure that the test is good enough to measure what is intended to be measured, as it also means the test as a tool is inclusive for all the elements that must be included in the analysis on one hand, and the clarity of its items and vocabulary on the other hand, so that they are understandable to everyone uses them.

Face validity: after finishing designing the achievement test; it was shown to a number of assessors who are experts in the field. They were requested to express their opinions on the clarity of the expressions, and the extent to which it is appropriate to achieve the objective of the study.

Formative validity (Internal validity): after ensuring face validity; internal validity was measured as shown in the table below:

Table No. (3): correlation coefficients between the scores of each question on the test and the total score on the test.

Indication	Correlation coefficient	Question number
Significant	0.803	Test questions (52 questions)

From table (3) above it is noticed that correlation coefficient between the scores of each phrase of the questions and the total score of the question that the phrase belongs to are all good and reasonable correlation coefficient, where they were all significant level (0.05).

Validity of peripheral comparison: Validity of peripheral comparison was calculated for the achievement, the results were as follows:

Table (4): shows Validity of peripheral comparison.

Levane's test for consistency		T-test			
Significance level	F value	The difference between means	Significance level	Degree of freedom	T value
0.103	12.29	25.39	0.00	24	10.10

Based on what is seen in table (4) above, it appears (F) value is (12.29), at significance level (0.103), which is greater than (0.05), this indicates the consistency of the study tool, the validity of the tool and its applicability of achieving the objective of the study.

Reliability of Achievement Test:

Reliability means when a test is applied multiple times on the same sample, it can give almost the same results. The test gives similar

indications every time it is used, even if the test was applied to different persons repeatedly. Reliability of achievement test was measured as follows:

a) Reliability by Cronbach Alpha method: Chronbach' Alpha coefficient was used to ensure reliability of achievement test, as the table below shows:

Table (5): shows the values of reliability coefficients according to Chronbach Alpha equation for questions of the achievement test:

Reliability coefficient using Cronbach's alpha method	Question number
0.894	Test questions (52 questions)

The results in table (5) indicate that reliability coefficients according to Chronbach Alpha are suitable for study main purpose. The results in the table also indicate that reliability coefficients according to Chronbach Alpha are higher than the total score of the achievement test, whereby the value is (0.894). This high value indicates that the test is reliable, so the results it gives are reliable too.

Statistical Analysis Methods:

The statistical packages for social sciences analysis was used to analyze and process the data, then the researcher presented, discussed and interpreted the results. The statistical tests used were

Pearson correlation coefficient and peripheral comparison and using Mann-Whitney test to calculate the validity of the achievement test, Cronbach's Alpha coefficient to calculate the reliability of the achievement test, Arithmetic means and Standard deviations in addition to T-test for two related groups and T-test for two independent groups.

Discussion and Analysis of The Study Findings:

To answer the study questions, the researcher compared mean scores of the students of the experimental group, who were taught using Artificial Intelligence-supported programmed learning based on Deep learning and means of scores of the control group, the researcher used the statistical test (T-test) to come to the findings.

Answering The First Question Which is Stated as: Are there statistically significant differences at the statistical significance level (0.5) between means of scores of the experimental group that was taught

using Artificial Intelligence- supported programmed learning and the control group in the post-achievement test in favor of the experimental group?

Table (6): shows arithmetic means and standard deviation of the performance of the students of the experimental and control groups in the post-achievement test.

Indication	T value	Correlation	Freedom	deviation	mean	Groups
0.000	13.46	.2780	24	4.116	43.73	**Control**
0.000	19.25	0.223	24	8.811	75.98	**Experimental**

Tabular T value at the significance level of 0.05 = 2.02

From the table above it is clear that there are clear statistically significant differences between the two groups, as the degree of significance (0.00), which is less than (0.05). This confirms that there are statistically significant differences between the control and experimental groups in the post-test in favor of the experimental group that was taught using Artificial Intelligence-supported programmed learning based on deep learning There are also statistically significant differences between the two groups in post-test achievement in favor of the experimental group that was taught using Artificial Intelligence-supported programmed learning based on deep learning.

This result came to match with the result reached by Mahmoud (2017) in his study, where he indicated that there are statistically significant differences between the two groups in the achievement of the post-test in favor of the experimental group that was taught by programmed instruction using computer, and there are statistically significant differences between the two groups in the achievement of the post-test in favor of the experimental group taught using computer-based programmed instruction.

The Second Question Which is Stated As: Are there statistically significant differences at the level of (0.05) in learning achievement (understanding level) between the means of scores for post-test for students of the experimental and control group in favor of the experimental group?

Table (7) shows arithmetic means and standard deviation of the performance of the students in the experimental and control groups in post-achievement test for level of understanding.

Indication	T value	Correlation	Freedom	deviation	mean	Groups
0.000	12.245	0.513	24	2.007	33.180	**Control**
0.000	15.120	0.558	24	6.168	44.754	**Experimental**

Tabular T value at the significance level of 0.05 = 2.02

From the table above it is noticed that there are clear statistically significant differences between the two groups, as the degree of significance (0.000), which is less than (0.05), and this confirms that there are statistically significant differences between the control and experimental groups in the post-test for the level of understanding, and this result is consistent with the result reached by Al-Sheikh (2004) in his study, where he indicated that there are statistically significant differences between the achievement of female students who had studied mathematics using the programmed technological method and those who had studied the same subject in the traditional way at the level of understanding, composition and application level is in favor of the experimental group.

Answering the third question which is stated as: are there statistically significant differences at the level (0.05) in learning achievement (application level) between means of scores of the post-test for the students of the experimental and control group in favor of the experimental group?

Table (8) shows arithmetic means and standard deviation of the performance of the students in the experimental and control groups in post-achievement test for the application level.

Indication	T value	Correlation	Freedom	deviation	mean	Groups
0.000	11,541	0.487	24	2.217	33.99	**Control**
0.000	14.621	0.478	24	5.118	42.90	**Experimental**

Tabular T value at the significance level of 0.05 = 2.02

From the table above it is noticed that there are clear statistically significant differences between the two groups, as the degree of significance reached (0.000), which is less than (0.05), and this confirms that there are statistically significant differences between the control and

experimental groups in the post-test for the level of application. This result is consistent with the result reached by Al-Sheikh (2004) in his study, where he indicated that there are statistically significant differences between the achievement of female students who had studied mathematics using the programmed technological method and those had studied the same subject in the traditional way at the composition level and the application level. the differences were in favor of the experimental group.

Summary of The Findings and Recommendations:

Based on the analysis; the study came to the following findings and recommendation:

- There are no statistically significant differences at the level (0.05) in learning achievement for the level (understanding, application) between the means of scores of the students in the control and experimental group in pre-test.
- There are statistically significant differences at the level of (0.05) in learning achievement for the level of understanding between the means of scores of the post-test for students of the control group and the experimental group's performance. The differences were in favor of the experimental group.
- There are statistically significant differences at the level of (0.05) in learning achievement for the application level between the means of scores of the post-test for the students of the control group and the experimental group's performance. The differences were in favor of the experimental group.
- Adopting Artificial Intelligence-supported programmed teaching based on deep learning in education may lead to an increase in learning achievement in the level of understanding, application, and analysis compared to the traditional method.
- Implementing Artificial Intelligence-supported programmed teaching based on deep learning in teaching.
- Adapting courses so that they can be easily taught through Artificial Intelligence-supported programmed teaching based on deep learning.

- Working to overcome the obstacles for Artificial Intelligence-supported programmed teaching based on deep learning.
- Training faculty members on using Artificial Intelligence-supported programmed teaching based on deep learning.
- Providing computer laboratories in universities to help in the process of using Artificial Intelligence-supported programmed teaching based on deep learning.

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