THE ROLE OF USING ARTIFICIAL INTELLIGENCE IN ENHANCING THE BRAIN-BASED LEARNING STRATEGY IN TEACHING HIGH SCHOOL HISTORY IN IRBID GOVERNORATE

Researcher's preparation

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دور استخدام الذكاء الاصطناعي في تعزيز استراتيجية التعلم القائمة على الدماغ في تدريس التاريخ للمرحلة الثانوية في محافظة إربد

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أستاذ مساعد في فلسفة التدريس ومناهج التاريخ والدراسات الاجتماعية
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الملخص

هدف البحث إلى تعزيز مشاركة الطلاب وتحفيزهم في دروس التاريخ. كما يهدف إلى تعزيز فهم أعمق للمفاهيم التاريخية ومهارات التفكير النقدي. وجد البحث أن التعلم الشخصي: التعلم المخصص يصمم تجارب التعلم وفقا لاحتياجات الطلاب الفردية واهتماماتهم ووتيرة التعلم. في التعلم القائم على الدماغ ، ويعد هذا أمرا بالغ الأهمية لأنه يدرك أن دماغ كل طالب يعالج المعلومات بشكل مختلف عن الآخر. ويساعد على خلق بيئة تعليمية تتناسب مع الأسلوب المعرفي للفرد ، مما يساعد على تحسين المشاركة والاحتفاظ والتحفيز. أوصت الأبحاث بأن الدماغ موصل للحداثة والملاءمة. يعمل التعلم المخصص على تكييف التعليمات مع الاحتياجات الفردية للطلاب واهتماماتهم وأساليب التعلم. هذا يساعد على جذب الانتباه وزيادة الدافع وجعل التعلم أكثر جدوى .

Abstract

The research aimed to enhance students' engagement and motivation in history lessons. It also aimed to promote a deeper understanding of historical concepts and critical thinking skills. The research found that personalized learning: Personalized learning tailors learning experiences to individual students' needs, interests, and pace of learning. In brain-based learning, this is critical because it recognizes that each student's brain processes information differently. It helps to create a learning environment that matches an individual's cognitive style, which helps improve engagement, retention, and motivation. Research has recommended that the brain is wired for novelty and relevance. Personalized learning adapts instruction to students' individual needs, interests, and learning styles. This helps to capture attention, increase motivation, and make learning more meaningful.

1.1.Introduction:

Brain-based learning (BBL) is a pedagogical approach that is rooted in neuroscience and aims to optimize learning by aligning teaching methods with the brain's natural processes. In recent years, there has been a growing interest in integrating artificial intelligence (AI) into education to enhance learning outcomes. This paper explores the potential of using AI to augment BBL strategies in teaching high school history in Irbid Governorate, Jordan.

1.2.Importance of the Study

This study holds significant importance for several reasons:

- Filling a Knowledge Gap: There is a dearth of research on the specific application of AI-enhanced BBL strategies in teaching high school history, particularly in the context of Irbid Governorate. This study aims to contribute to the growing body of literature on educational technology and its impact on learning outcomes.
- Improving Educational Practices: The findings of this research can inform the development of more effective and engaging teaching methods in high school history classrooms. By demonstrating the benefits of AI-enhanced BBL strategies, this study can encourage educators to adopt these approaches and improve the quality of education in the region.

1.3.Study Objectives

The primary objective of this research is to investigate the effectiveness of AI-enhanced BBL strategies in improving high school students' understanding and retention of historical concepts in Irbid Governorate. Specifically, the study aims to determine if the use of AI tools can:

1. Enhance student engagement and motivation in history lessons.
2. Foster deeper understanding of historical concepts and critical thinking skills.
3. Improve students' ability to apply historical knowledge to real-world situations.

4.Promote personalized learning experiences tailored to individual student needs.

1.4.Study Problem

Despite the growing recognition of the importance of BBL in education, its implementation in high school history classrooms in Irbid Governorate may be limited by various factors, such as lack of resources, teacher training, and appropriate instructional materials. Additionally, the potential benefits of integrating AI into BBL strategies in this context remain largely unexplored

1.5.Study assumptions

The following hypotheses will be tested in this research:

1.There is a role for personalized learning in a brain-based learning strategy.
2. There is a role for interactive learning in a brain-based learning strategy.
3. There is a role for adaptive assessment in a brain-based learning strategy.

1.6.Study variables

Independent variable: “using artificial intelligence ”

Personalized Learning – Interactive Learning - Adaptive Assessment.

Dependent variable: “the brain-based learning strategy”

Storytelling - Experiential Learning - Personal Relevance.

1.7.Previous studies

1.7.1. Study (Al-Shammar, 2024) entitled " Role of Artificial Intelligence in Enhancing Learning Outcomes of Pre-Service Social Studies Teachers ".

The increasing use of artificial intelligence (AI) in academia has created a need to evaluate its effectiveness before its widespread incorporation into school teacher training; AI is known to improve preservice teachers' classroom management skills, but its role in improving learning outcomes has not been well studied. This descriptive study aimed to examine whether the use of artificial Intelligence (AI) improves the learning outcomes of Kuwaiti preservice social studies teachers. A questionnaire survey was administered to a random sample of 100 female teachers from the Faculty of Education at Kuwait University. Data were analyzed using SPSS software and single regression analysis to derive Pearson's correlation coefficient, Cronbach's alpha, mean, frequency, percentage, and standard deviation. The results revealed that the use of AI applications significantly improved participants' learning outcomes, indicating that AI has the potential to transform educator training. Preservice teachers demonstrated a strong understanding of the value of AI in education and proficiency in incorporating AI into their classrooms. .

1.7.2. Study (Shifflet, 2019) entitled " All teaching should be integration”: Social studies and literacy integration in preservice teacher education"

Shifflet and Hunt's (2019) study aims to explore how integrating literacy and social studies curricula is an effective strategy to encourage civic-oriented social studies teaching in elementary schools. The study relied on a qualitative approach that used interviews as a tool for the study. The study sample consisted of 14 teachers. In addition, the findings revealed a clear understanding of the challenges of integration and the importance of the thoughtful preparation needed for successful integration. Furthermore, teacher candidates required exceptional integration models throughout their clinical training In order to overcome the limitations of typical compartmentalized scheduling. Interns discussed the value of curriculum integration and stated that they wanted to combine literacy and social studies. They mentioned several barriers that they believed hindered or prevented them from integrating properly, and admitted that despite their aspirations to integrate, they were not consistently able to achieve the desired integration.

1.7.3. Study (Kartal, 2020) entitled " An overview of social studies in primary education: A meta-synthesis study "

Kartal's (2020) study aims to conduct a meta-synthesis of social studies education in elementary schools. This meta-synthesis review interprets and evaluates qualitative data, examines findings from related studies, and highlights similarities and differences. Data collection began on October 10, 2017, and continued until June 30, 2018, when the article was completed. Furthermore, the findings indicated that the research primarily focuses on curriculum evaluation, subject/unit analysis, and values education. Studies evaluating curriculum mostly focus on social studies programs for grades one to five; they rarely include topics such as children's literature, critical thinking standards, family, democracy, and social studies in elementary education. The majority of qualitative research on social studies education in elementary schools has been action, case study, or phenomenological research; in contrast, there are very few well-established theory-based or ethnographic studies on the same topic.

1.7.4. Study of (Yetişensoy, 2024)entitled " Tomorrow's Teachers and Artificial Intelligence: Exploring Attitudes and Perceptions of Turkish Prospective Social Studies Teachers "

Yetişensoy's (2024) study is where the current study comes into play, as it aims to determine how prospective social studies teachers feel about AI. The study sample consisted of 342 social studies teachers. The research adopted a mixed method approach that utilized the Attitude Toward AI Scale, which was created by Schepman and Rodway and modified by Kaya et al. for Turkish culture. The results showed that the variable of perceived expertise in AI explained the differences in aspiring teachers' attitudes toward AI. As a result, individuals who reported having a high level of expertise in AI showed significantly more positive attitudes than those with a medium or low level of understanding. The study also found that male prospective teachers had significantly more positive feelings and significantly fewer negative attitudes than female prospective teachers. The results showed no clear difference between positive and negative attitudes based on grade level or daily internet use. The qualitative findings also showed a serious dearth of knowledge about the nature of AI and its applications. The study found that many of the AI concepts espoused by aspiring teachers lacked a theoretical foundation. Many of them pointed to the potential for AI to pose a serious threat .

Chapter One: The theoretical section of the study

1.1.Using artificial intelligence

1.1.1.The concept of using artificial intelligence

Artificial intelligence (AI) has the potential to revolutionize the way high school history is taught. By leveraging AI-powered tools, educators can create more personalized, engaging, and effective learning experiences for students.

One of the most significant benefits of AI in history education is the ability to create personalized learning paths for each student. AI algorithms can analyze students' individual learning styles, strengths, and weaknesses to tailor educational content and pacing accordingly. This ensures that students are always challenged and supported at their own level, leading to increased engagement and better outcomes (Mabungela, 2023).

Interactive and Engaging Content:

AI can also be used to create interactive and engaging content that brings history to life. For example, AI-powered virtual reality experiences can transport students to historical events, allowing them to experience firsthand what it was like to live in the past. Additionally, AI can generate personalized quizzes, games, and simulations that make learning history fun and exciting.

AI can also help to improve accessibility in history education. For instance, AI-powered speech-to-text and text-to-speech technologies can benefit students with visual or auditory impairments. Additionally, AI can translate historical texts into multiple languages, making them accessible to students with language barriers

1.1.2.The importance of using artificial intelligence

Artificial intelligence (AI) has the potential to revolutionize the way high school history is taught, offering a wealth of benefits that can enhance student learning and engagement. By leveraging AI-powered tools and techniques, educators can create more personalized, interactive, and effective learning experiences (Jamal, 2023).

One of the most significant advantages of using AI in history education is the ability to personalize learning paths for each student. AI-powered algorithms can analyze student data, such as test scores, assignments, and engagement metrics, to identify individual strengths and weaknesses. This information can then be used to create tailored lesson plans, activities, and assessments that cater to the specific needs and learning styles of each student.

Moreover, AI can enhance student engagement through interactive and immersive learning experiences. Virtual reality (VR) and augmented reality (AR) technologies, powered by AI, can transport students to historical events and places, allowing them to experience history firsthand. AI-powered chatbots and intelligent tutoring systems can also provide personalized support and guidance, answering questions and offering explanations in a way that is both informative and engaging.

1.1.3.Dimensions of using artificial intelligence (Igbokwe, 2023):

1.Personalized Learning:

AI can tailor learning experiences to individual students' needs, paces, and interests, providing personalized content and feedback.

2.Interactive Learning:

AI-powered tools can create engaging and interactive learning environments, such as simulations, games, and virtual field trips.

3.Adaptive Assessment:

AI can continuously assess student understanding and adjust instruction accordingly, ensuring that students are challenged and supported at the right level.

1.2. the brain-based learning strategy

1.2.1. The concept of the brain-based learning strategy

Brain-based learning (BBL) is a pedagogical approach that leverages our understanding of brain function to enhance learning. By incorporating principles of neuroscience into the classroom, teachers can create more effective and engaging learning experiences (Bektas, 2021).

Brain-based learning, which leverages neuroscience principles to enhance teaching, is particularly effective in high school history. By fostering emotional engagement through relatable stories and multimedia, encouraging active learning through hands-on activities and collaboration, and promoting effective memory strategies like chunking and spacing, teachers can create a more engaging and effective learning environment.

Additionally, incorporating mindfulness techniques and emphasizing a growth mindset can help students reduce stress, improve focus, and develop a positive **attitude towards learning.**

1.2.2. The importance of the brain-based learning strategy

Brain-based learning (BBL) is a powerful pedagogical approach that can significantly enhance the teaching and learning of high school history. By understanding and applying principles of neuroscience, educators can create more effective and engaging learning experiences that cater to how the human brain naturally processes information.

Key benefits of using BBL in high school history include:

- **Improved memory and retention:** BBL strategies such as chunking, spacing, and active recall help students to better encode and retrieve historical information (Dharma, 2022).
- **Enhanced engagement and motivation:** By tapping into students' emotions and creating a positive learning environment, BBL can increase their interest and motivation in the subject.
- **Enhanced critical thinking skills:** BBL strategies that promote active learning and problem-solving can help students develop the ability to analyze and evaluate historical evidence**.**
- **Increased cultural sensitivity and understanding:** BBL approaches that emphasize empathy and perspective-taking can help students to better understand and appreciate diverse historical perspectives.
- **Improved academic outcomes:** Studies have shown that BBL can lead to higher test scores and improved academic performance in history.

By incorporating BBL strategies into their teaching, high school history teachers can create a more meaningful, effective, and engaging learning experience for their students.

1.2.3. Dimensions of the brain-based learning strategy (Baghdadi, 2021):

1.Storytelling:

Incorporate captivating historical narratives to evoke emotional responses and create meaningful connections.

2.Experiential Learning

Use role-playing, simulations, or field trips to immerse students in historical contexts.

3.Personal Relevance

Connect historical events to students' lives and interests to make learning more meaningful.

1.3. The role of using artificial intelligence in enhancing the brain-based learning strategy in teaching high school history

Artificial intelligence (AI) can play a significant role in enhancing brain-based learning (BBL) strategies in teaching high school history. By leveraging AI's capabilities, educators can create more personalized, engaging, and effective learning experiences that cater to students' individual needs and learning styles (Ahmad, 2021).

Here are some ways AI can enhance BBL:

- **Personalized learning paths**: AI can analyze student data to identify their strengths, weaknesses, and learning styles. This information can be used to create personalized learning paths that cater to each student's unique needs.
- **Adaptive assessments:** AI-powered assessments can continuously monitor students' progress and adjust the difficulty level of questions accordingly. This can help to keep students engaged and motivated.
- **Interactive content:** AI can generate interactive content, such as simulations, games, and virtual field trips, that can help to make history more engaging and memorable (Frankenfield, 2023).
- **Intelligent tutoring systems:** AI-powered tutoring systems can provide students with personalized feedback and support, helping them to overcome challenges and achieve their learning goals.
- **Data analysis and insights:** AI can analyze large datasets of student performance data to identify patterns and trends. This information can be used to improve teaching practices and ensure that students are getting the support they need.

By incorporating AI into BBL strategies, high school history teachers can create more effective, engaging, and personalized learning experiences for their students. This can lead to improved student outcomes and a deeper understanding of history.

3.Chapter Three: Field study

Introduction:

Preface This research aims to review and analyze the most important statistical tests that are used in scientific research. In this research, the researcher provides precise details about the frequency analysis and descriptive statistics used in the research. Then, hypothesis tests are applied to reach clear and robust results of the study. In short, this research attempts to review, interpret, and test a range of different statistical tests to arrive at robust and reliable results for the study. The use of frequency analysis and descriptive statistics provides a solid framework for understanding and interpreting the data, while hypothesis testing helps in reaching strong scientific conclusions.

3.1.iterations of the research

Frequency- Table No. (1)					
Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	113	90.4	90.4	90.4
	Female	12	9.6	9.6	100.0
	Total	125	100.0	100.0	

The table presents a frequency distribution of gender among a sample of 125 individuals. Below is a detailed explanation of each component of the table:

Table Overview

The table is structured to show the distribution of genders (Male and Female) within the sample, along with their respective frequencies, percentages, and cumulative percentages.

Components of the Table

1 .Gender: This column indicates the categories being analyzed—in this case, Male and Female.

2 .Frequency: This column shows the number of individuals in each gender category:

- Male: 113 individuals (90.4% of the total sample)
- Female: 12 individuals (9.6% of the total sample)

3 .Percent: This column represents the percentage of the total sample that each gender category accounts for:

- Male: 90.4% (113 out of 125 individuals)
- Female: 9.6% (12 out of 125 individuals)

4 .Valid Percent: This column provides the percentage of valid responses (excluding any missing or invalid responses). In this case, the valid percentages are the same as the percentages since all responses are valid:

- Male: 90.4%
- Female: 9.6%

5 .Cumulative Percent: This column indicates the running total of the valid percentages. It shows how the percentages add up as you progress through the categories:

- For Male, the cumulative percentage is 90.4%, meaning that 90.4% of the sample are male.
- For Female, the cumulative percentage reaches 100%, indicating that when you include females, you account for the entire sample of 125 individuals.

From this table, it can be observed that the majority of the sample consists of males, accounting for 90.4% of the total. In contrast, females represent a significantly smaller portion at 9.6%. This data could be useful for understanding gender distribution within the sampled population, which may have implications for various analyses, such as gender representation in studies or surveys .

Coefficient of stability and reliability

Table (2): Coefficient of Stability and Reliability (Cronbach's Alpha)

Coefficient of stability and reliability -Table No. (2)		
Variable name	Number of phrases	The value of stability and reliability (Cronbach's alpha)
Independent variable: using artificial intelligence	15	0.866
Personalized Learning	5	0.891
Interactive Learning	5	0.879
Adaptive Assessment	5	0.779
Dependent variable: the brain-based learning strategy	15	0.853
Storytelling	5	0.825
Experiential Learning	5	0.866
Personal Relevance	5	0.809

This table presents the coefficient of stability and reliability for various variables using Cronbach's alpha. It measures the internal consistency of different constructs related to the use of artificial intelligence (AI) and brain-based learning strategies. A higher Cronbach's alpha indicates greater reliability of the data collection instrument.

- Independent Variable: Using Artificial Intelligence
  - Number of Items: 15
  - Cronbach's Alpha: 0.866
  - Interpretation: This variable measures the reliability of items related to the use of AI in education. A Cronbach's alpha of 0.866 suggests a high level of internal consistency, indicating that the items used to measure this construct are closely related.
- Personalized Learning
  - Number of Items: 5
  - Cronbach's Alpha: 0.891
  - Interpretation: This variable reflects the consistency of items related to personalized learning practices. A value of 0.891 indicates very high reliability, meaning the items consistently measure the concept of personalized learning.
- Interactive Learning
  - Number of Items: 5

- Cronbach's Alpha: 0.879
- Interpretation: The reliability of items measuring interactive learning is 0.879, showing a high degree of consistency in how these items relate to each other.

- Adaptive Assessment
  - Number of Items: 5
  - Cronbach's Alpha: 0.779
  - Interpretation: With a Cronbach's alpha of 0.779, the items related to adaptive assessment have good reliability, although slightly lower than other constructs. This still indicates acceptable internal consistency.
- Dependent Variable: Brain-Based Learning Strategy
  - Number of Items: 15
  - Cronbach's Alpha: 0.853
  - Interpretation: This variable measures the reliability of items focused on the brain-based learning strategy. A value of 0.853 indicates high reliability, showing that the items are well-correlated.
- Storytelling
  - Number of Items: 5
  - Cronbach's Alpha: 0.825
  - Interpretation: Storytelling as a method within brain-based learning has a Cronbach's alpha of 0.825, indicating a strong level of reliability among the items.
- Experiential Learning
  - Number of Items: 5
  - Cronbach's Alpha: 0.866
  - Interpretation: The items measuring experiential learning have a Cronbach's alpha of 0.866, demonstrating high internal consistency and reliability.
- Personal Relevance
  - Number of Items: 5
  - Cronbach's Alpha: 0.809
  - Interpretation: This construct, which focuses on the personal relevance of learning experiences, has a Cronbach's alpha of 0.809, indicating good reliability.

In summary, all variables show acceptable to high levels of reliability, with Cronbach's alpha values above 0.7, which is generally considered the threshold for acceptable internal consistency. This suggests that the measurement tools used for each variable are consistent and reliable for the study.

3.2. Testing research hypotheses

.1.1. There is a role for personalized learning in a brain-based learning strategy.

Table No. (3) There is a role for personalized learning in a brain-based learning strategy.

Variable name	R	R Square	df	F	B	t	Sig.
role for personalized learning in a brain-based learning strategy.	0.361	0.130	124	18.436	0.389	4.294	0.000

The table provides statistical analysis of the role of personalized learning within a brain-based learning strategy. Here is a detailed explanation of each term in the table:

1. R (Correlation Coefficient):
   - Value: 0.361
   - This indicates a positive correlation between personalized learning and the brain-based learning strategy. The value suggests a moderate relationship, where an increase in personalized learning aligns with an enhancement in brain-based learning strategy outcomes.
2. R Square (Coefficient of Determination):
   - Value: 0.130
   - R Square represents the proportion of the variance in the dependent variable (brain-based learning strategy) that is explained by the independent variable (personalized learning). Here, about 13% of the variation in the brain-based learning strategy can be attributed to personalized learning.
3. df (Degrees of Freedom):
   - Value: 124
   - Degrees of freedom refers to the number of values that are free to vary in the data set when calculating a statistic. For this analysis, it indicates the number of observations minus the number of parameters being estimated.
4. F (F-statistic):
   - Value: 18.436
   - The F-statistic is used to determine whether there is a significant relationship between the independent variable and the dependent variable. In this case, it suggests that personalized learning significantly predicts the outcomes in the brain-based learning strategy.
5. B (Regression Coefficient):
   - Value: 0.389
   - The regression coefficient indicates the extent to which the dependent variable changes with a one-unit change in the independent variable. Here, a unit increase in personalized learning corresponds to a 0.389 increase in the outcome measure of the brain-based learning strategy.
6. t (t-value):
   - Value: 4.294
   - The t-value assesses whether the regression coefficient is significantly different from zero. A higher absolute value of the t-value suggests a more significant contribution of the independent variable (personalized learning) to the dependent variable (brain-based learning strategy).
7. Sig. (Significance Level / p-value):
   - Value: 0.000
   - This p-value indicates the probability of observing the data if the null hypothesis is true. A significance level of 0.000 means the results are highly

statistically significant, suggesting that the role of personalized learning in the brain-based learning strategy is not due to random chance.

The analysis indicates that personalized learning plays a significant role in enhancing a brain-based learning strategy. The positive correlation and high statistical significance suggest that incorporating personalized learning can meaningfully improve the outcomes of brain-based learning methods.

1.2.There is a role for interactive learning in a brain-based learning strategy.

Table No. (4)There is a role for interactive learning in a brain-based learning strategy.

Variable name	R	R Square	df	F	B	t	Sig.
role for interactive learning in a brain-based learning strategy	0.274	0.075	124	10.022	0.266	3.166	0.002

Detailed Explanation of Table No. (4):

The table presents the results of a regression analysis examining the role of interactive learning within a brain-based learning strategy.

1. Variable Name: The variable being analyzed is "the role of interactive learning in a brain-based learning strategy."
2. R (Correlation Coefficient): The value of R is 0.274. This indicates a positive, but moderate correlation between interactive learning and the brain-based learning strategy. This means that as the role of interactive learning increases, its contribution to the brain-based learning strategy also increases, albeit to a moderate extent.
3. R Square (Coefficient of Determination): The R Square value is 0.075, which means that approximately 7.5% of the variance in the brain-based learning strategy can be explained by the role of interactive learning. While this percentage is not very high, it suggests that interactive learning plays a small but significant role.
4. df (Degrees of Freedom): The degrees of freedom are 124. This value represents the number of observations or data points minus the number of estimated parameters in the model.
5. F (F-Statistic): The F-value is 10.022, which tests the overall significance of the regression model. A higher F-value indicates a significant relationship between the dependent and independent variables.
6. B (Regression Coefficient): The B value is 0.266. This represents the slope of the regression line, indicating that for every one-unit increase in the role of interactive learning, there is an expected increase of 0.266 units in the brain-based learning strategy.
7. t (t-Statistic): The t-value is 3.166. This measures the statistical significance of the regression coefficient (B). A higher absolute value indicates that the coefficient is significantly different from zero.
8. Sig. (Significance Level): The significance level is 0.002. Since this value is less than the typical threshold of 0.05, it indicates that the relationship between

interactive learning and brain-based learning strategy is statistically significant. Thus, we can reject the null hypothesis and conclude that interactive learning significantly contributes to the brain-based learning strategy.

In summary, the table indicates that interactive learning has a positive, moderate, and statistically significant role in enhancing a brain-based learning strategy, even though the amount of variance it explains is relatively small.

1.3There is a role for adaptive assessment in a brain-based learning strategy.

Table No. (5) There is a role for adaptive assessment in a brain-based learning strategy.

Variable name	R	R Square	df	F	B	t	Sig.
role for adaptive assessment in a brain-based learning strategy.	0.312	0.098	124	13.304	0.335	3.647	0.000

The table shows the results of a statistical analysis examining the role of adaptive assessment in a brain-based learning strategy. Here's a detailed explanation of each element in the table**:**

1 **.**Variable Name: "Role for adaptive assessment in a brain-based learning strategy." This is the variable being analyzed, indicating how adaptive assessments contribute to or influence the effectiveness of brain-based learning**.**

2 **.**R (Correlation Coefficient): 0.312. This value indicates the strength and direction of the linear relationship between adaptive assessment and brain-based learning. A positive value (0.312) suggests a moderate positive correlation, meaning that as adaptive assessment improves, the effectiveness of brain-based learning also tends to improve, though the relationship is not very strong**.**

3 **.**R Square (Coefficient of Determination): 0.098. This indicates that approximately 9.8% of the variability in the brain-based learning strategy can be explained by the adaptive assessment. The remaining 90.2% of variability is due to other factors not accounted for in this analysis**.**

4 **.**df (Degrees of Freedom): 124. This value represents the number of observations minus the number of parameters estimated, which affects the precision of the statistical estimates**.**

5 **.**F (F-statistic): 13.304. This value tests the overall significance of the regression model. A higher F-statistic suggests that the model explains a significant portion of the variability in the dependent variable (brain-based learning strategy)**.**

6 **.**B (Regression Coefficient): 0.335. This coefficient indicates the expected change in the dependent variable (brain-based learning strategy) for each one-unit change in the adaptive assessment. A positive value (0.335) means that as adaptive assessment increases by one unit, the brain-based learning strategy is expected to increase by 0.335 units**.**

7 **.**t (t-value): 3.647. The t-value tests the significance of the individual predictor (adaptive assessment). A higher absolute t-value indicates that the predictor is more significant in explaining the variability in the dependent variable**.**

8 **.**Sig. (Significance Value or p-value): 0.000. This value indicates the probability that the observed results could occur by chance. A p-value of 0.000 (less than 0.05)

suggests that the role of adaptive assessment in brain-based learning is statistically significant, meaning that the relationship between the two is unlikely to be due to random chance**.**

In summary, the table suggests that there is a statistically significant but moderate positive relationship between adaptive assessment and the effectiveness of brain-based learning strategies. The model explains about 9.8% of the variation in the brain-based learning strategy, and the role of adaptive assessment is significant in this context.

Results:

Brain-based learning emphasizes how teaching methods can align with the way the brain naturally learns, using principles derived from neuroscience. Here’s how personalized learning, interactive learning, and adaptive assessment play roles in this approach:

1 .Personalized Learning :

Personalized learning tailors educational experiences to individual students' needs, interests, and pace of learning. In brain-based learning, this is crucial as it recognizes that each student’s brain processes information differently. It helps to create a learning environment that matches the individual cognitive style, which can improve engagement, retention, and motivation.

2 .Interactive Learning :

Interactive learning involves active participation through discussions, group work, and hands-on activities. It is vital in a brain-based learning strategy because active engagement has been shown to improve neural connections. When students interact with content and collaborate with peers, they stimulate different parts of their brain, enhancing understanding and memory retention.

3 .Adaptive Assessment :

Adaptive assessment adjusts the difficulty of questions based on a student’s responses. This is aligned with brain-based learning as it provides immediate feedback and challenges the student at an appropriate level of difficulty, keeping them in a state of "flow." This strategy can help avoid frustration from tasks that are too difficult or boredom from those that are too easy, ensuring continuous cognitive development.

These components integrate well into a brain-based learning approach, making learning more effective by aligning with the brain's natural learning processes.

4.Recommendations

The three recommendations you've mentioned—personalized learning, interactive learning, and adaptive assessment—are integral components of a brain-based learning strategy. Let's explore each in detail:

1 .Personalized Learning

Why it's important: The brain is wired for novelty and relevance. Personalized learning tailors instruction to individual students' needs, interests, and learning styles. This helps to capture attention, increase motivation, and make learning more meaningful.

How to implement:

Differentiated instruction: Provide various learning activities and resources to cater to different learning styles and abilities.

Choice-based learning: Offer students choices in their learning tasks to foster autonomy and intrinsic motivation.

Adaptive technology: Utilize tools that can adjust the difficulty level of content based on a student's performance.

2 .Interactive Learning

Why it's important: The brain thrives on active engagement. Interactive learning strategies involve students in the learning process, allowing them to construct their own understanding. This helps to strengthen neural connections and improve memory retention.

How to implement:

Cooperative learning: Group students together to work on tasks and learn from each other.

Hands-on activities: Provide opportunities for students to explore and experiment with concepts.

Simulations and games: Use technology to create engaging and immersive learning experiences.

3 .Adaptive Assessment

Why it's important: The brain is constantly adapting and growing. Adaptive assessment provides real-time feedback on student progress, allowing teachers to adjust instruction accordingly. This ensures that students are always challenged at the appropriate level.

How to implement:

Formative assessment: Use frequent assessments to monitor student learning and provide timely feedback.

Diagnostic assessment: Identify students' strengths and weaknesses to tailor instruction.

Adaptive testing: Employ technology that can adjust the difficulty level of test questions based on a student's performance.

In conclusion, these three recommendations — personalized learning, interactive learning, and adaptive assessment—are essential for creating a brain-based learning environment. By implementing these strategies, educators can foster a more engaging, effective, and meaningful learning experience for their students.

5.references:

1.Abdulaziz Al-Shammari, Role of Artificial Intelligence in Enhancing Learning Outcomes of Pre-Service Social Studies Teachers, Journal of Social Studies Education Research, 2024:15 (4), 163-196

2.Shifflet, R., & Hunt, C. S. (2019). “All teaching should be integration”: Social studies and literacy integration in preservice teacher education. The Social Studies, 110(6), 237-250.

3.Yetişensoy, O. (2024). Tomorrow's Teachers and Artificial Intelligence: Exploring Attitudes and Perceptions of Turkish Prospective Social Studies Teachers. Eurasian Journal of Teacherb
Education, 5(1), 1-31.

4.Kartal, A. (2020). An overview of social studies in primary education: A meta-synthesis study. Egitim ve Bilim, 45(203), 1-29.

5.Ahmad, S.F., Rahmat, M.K., Mubarak, M.S., Alam, M.M., & Hyder, S.I. (2021). Artificial intelligence and its role in education. Sustainability, 13(22), 1-11.

6.Baghdadi, A. (2021). Students’ learning and outcomes as indicators of quality teaching in higher education. In Proceedings of the 3rd International Conference on Research in Education (pp. 1-7), Italy.

7.Bektas, Ö. (2021). Activity-Based Teaching with Social Studies Pre-Service Teachers for Developing the Thinking Skills of Learners. International Journal of Progressive Education, 17(3), 49-69.

8.Dharma, I. M. A., & Lestari, N. A. P. (2022). The Impact of Problem-based Learning Models on Social Studies Learning Outcomes and Critical Thinking Skills for Fifth Grade Elementary School Students. Jurnal Ilmiah Sekolah Dasar, 6(2), 263-269.

9.Frankenfield, J. (2023). Artificial intelligence: What it is and how it is used. Investopedia.

10.Igbokwe, I. C. (2023). Application of AI in educational management. International Journal of Scientific and Research Publications, 13(3).

11.Jamal, A. (2023). The role of AI in teacher education: Opportunities and challenges. International Journal of Research and Analytical Reviews, 10(1), 140-146.

12.Mabungela, M. (2023). Artificial Intelligence (AI) and Automation in the World of Work: A Threat to Employees?. Research in Social Sciences and Technology, 8(4), 135-146.

13.Vargas, E.G., Chiappe, A. & Durand, J. (2024). Reshaping education in the era of artificial intelligence: insights from Situated Learning related literature. Journal of Social Studies Education Research, 15(2), 1-28