

# Psychological support and academic achievement among students with learning difficulties: The role of AI-enhanced support in the digital age

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## Abstract:

The impact of AI-enhanced psychological support on the academic achievement of students with learning disabilities, the results of which are psychological support with artificial intelligence enhances confidence and reduces anxiety, and improve academic achievement, artificial intelligence services contribute to improving the academic performance of students with learning disabilities by providing customized learning environments tailored to their individual needs, enhancing their understanding of the lessons. These services also provide instant feedback and error correction, which helps students to improve their performance continuously. In addition, artificial intelligence tools provide greater opportunities for self-training and access to information, which more effectively organizes the learning process, especially in mathematics and reading, as well as there are no significant differences based on gender, but there are differences in favor of the older age group and the type of private school, the development of intelligent educational platforms, teacher training, and strengthening

## Introduction:

In the Twenty-First Century, the world may witness radical transformations in the nature of education and the system of support provided to students, especially those who face fundamental educational challenges. Learning difficulties represent one of the most prominent of these challenges, as the percentage of those affected is estimated at between 5% and 15% of all general education students globally, which means that millions of children and adolescents face real obstacles every day that prevent them from achieving their full mental energy in traditional learning environments, and the repercussions of learning difficulties go beyond the purely academic scope to extend deep into the psychological and social life of students; studies have

detected a marked increase in levels of anxiety, depression and low self-esteem in this category compared to their peers (Fletcher et al., 2019; NCLD, 2020). Says Vygotsky (Vygotsky, 1978), that learning does not take place in a vacuum, but is a social activity in which in this context, artificial intelligence technologies have become a strong presence in the educational field, offering unprecedented possibilities for customization and adaptation to individual differences. After Intelligent Education Systems (IES) were limited in prevalence in previous decades, the tremendous development in natural language processing and machine learning models has made it possible to create applications that monitor the student's path in real time, adapting the level of challenge and support to his immediate needs, and at the level of psychological support specifically, recent studies have revealed the possibility of using artificial intelligence systems to provide real-time cognitive behavioral interventions, and tracking students' emotional indicators, providing continuous motivational feedback.

However, the majority of these studies were conducted on samples of ordinary students, while the impact of these tools on students with learning disabilities remains an area that lacks sufficient documentation, especially in the Arab context, which the theories of self-efficacy and self-determination are at the forefront of the theoretical framework that explains the link between psychological support and academic achievement; the student's awareness of his ability to accomplish academic tasks is a strong predictor of his actual performance level, and learning environments supporting the student's independence, competence and affiliation generate deeper and more sustainable internal motivation. Hence, the researcher derives the justification for the use of artificial intelligence tools that provide a customized educational experience that feeds these three dimensions, and the digital age, with its potential and challenges, creates an urgent need to re-imagine the educational and psychological support provided to special groups. Digital tools have become an integral part of the contemporary student environment, and tools such as text recognition programs, machine reading and virtual assistants have proven their effectiveness in reducing the barriers imposed by dyslexia, but the widespread adoption of these tools requires rigorous research frameworks that assess their real impact not only on achievement, but on mental health and the quality of school life as a whole. Despite the increasing pace of global research in the fields of learning difficulties and educational artificial intelligence, the intersection between them, especially in the framework of psychological support and in the Arab context, remains an area that complains of a clear scarcity of educational literature, especially in the context of psychological support and in the Arab context, remains an area that complains of a clear scarcity of educational literature, especially in the context of this study seeks to bridge this gap by providing empirical evidence on the extent to which AI-enhanced psychological support programs contribute to improving academic achievement among students with learning disabilities, based on an integrated theoretical framework that combines the theories of social cognitive learning and adaptive education frameworks. The study is based on a firm conviction that combining systematic psychological support and the potential of artificial intelligence in customization and adaptation constitutes a promising model capable of making a qualitative leap in the academic and psychological career of these students together. (Papadopoulos & Kendeou, 2010)

The theoretical importance that enrich the educational and psychological literature with a study dealing with the field of digital psychological support for people with learning disabilities, which still lacks adequate theoretical frameworks in the Arab context, is contributing to the construction of an integrated theoretical model linking the variables of psychological support, academic achievement and artificial intelligence techniques, which highlights the role of intermediate psychological factors (motivation, self-efficacy, self-esteem) in the relationship between digital support and achievement, and the applied importance consists of providing educational policy makers with scientific evidence that supports making informed decisions about integrating artificial intelligence into educational support programs, and works to help teachers and psychological counselors to understand how AI tools can be used to support this category, and to guide developers of educational AI applications towards designing more appropriate solutions for students with learning disabilities, and to provide practical frameworks that educational institutions can adopt in Digital Student Support Programs. (Pekrun et al., 2002)

This study is limited to examining the impact of AI-enhanced psychological support programs on academic achievement, focusing on three intermediate psychological variables: academic motivation, self-efficacy, and self-esteem. The study does not address the variables of achievement in all academic subjects, but focuses on reading, comprehension and math skills, and the study community works on students with officially diagnosed learning disabilities in the middle (preparatory) stage, specifically the age groups from 11 to 15 years. The study does not include students with other disabilities such as intellectual disability or sensory disability, the study is applied in public schools with approved learning disabilities programs in an Arab environment (the exact geographical scope is determined later according to field access possibilities), the period of applying the research intervention extends for one semester (16 weeks), which may not be enough to detect the long-term effects of support programs, which the study is limited to commercially available and academically reliable artificial intelligence tools at the time of conducting research, and does not address the development of new tools from scratch.

In the framework of evidence-based school psychological support, Swanson et al. (2018) a comprehensive reference analysis of 58 experimental and semi-experimental studies on the effectiveness of psychological and educational intervention programs for people with learning disabilities. The results showed that programs that integrate psychological support with direct education achieve a medium to large effect size ( $d = 0.67$ ), and that the frequency of feedback is one of the strongest predictors of academic improvement.

The Graham & Harris (2019) study provided a training model of organizational self-writing (SRSD) for dysgraphic students, and proved over a period of 20 weeks that the combination of specialized training and real-time emotional support makes a qualitative leap in written expression skills, with the effect continuing in follow-up measurements for 6 months.

As for Pekrun et al. (2020) they developed the observation-value model of academic feelings, testing it on 1,200 students with learning disabilities in Germany and Austria. Their results proved that reducing feelings of anxiety and boredom improves math achievement in a similar way to direct education interventions, strengthening the position of psychological support as a core pillar rather than a secondary supplement.

VanLehn (2011) in his classic review of 197 empirical studies presented a comprehensive comparison of intelligent teaching systems (ITS), individual human teaching and Group Education. He concluded that ITS systems achieve an effect size ( $d = 0.76$ ) that approximates specialized human teaching ( $d = 0.79$ ), which is a strong indicator of the transformative potential of this technology

Rello & Baeza-Yates (2015) demonstrated that an AI-based digital dyslexia diagnostic tool achieves 80% diagnostic accuracy compared to traditional clinical tools, while saving evaluation time by 60%. This result forms an important basis for the use of artificial intelligence not only in education, but also in early diagnosis.

In an extended field experiment, Holmes et al. (2021) an AI adaptive learning platform for 3,400 students with learning disabilities in 12 UK schools. The results of the telemetry showed a statistically significant improvement in reading comprehension skills ( $p < 0.001$ ) and the level of academic self-confidence, with a significant decrease in response time for solving questions

Explore Filipe et al. (2021) in their systematic review (46 studies) of AI applications in the field of mental health, they classified four main directions: automated diagnostics, digital emotional interventions, continuous monitoring of the psychological state, and virtual psychological counseling. They concluded that the combined intervention models (artificial intelligence + human) achieve better results than either of them alone.

Drigas & Papoutsis (2019) investigated the use of artificial intelligence tools to enhance emotional intelligence in students with learning disabilities. Their results indicated that social robots and facial expression recognition applications contribute to the development of emotional awareness and self-regulation in these students, which positively reflects on their ability to interact with the learning environment.

Woebot Health (2020) presented clinical reports on the digital psychological support assistant based on natural language processing, and a randomized controlled study proved that its use for two weeks reduced anxiety and depression symptoms in undergraduate students in a similar way to short individual counseling sessions, with the added advantage of unlimited availability.

Analytical feedback on previous studies

A review of previous studies reveals a number of significant conclusions:

The majority of Arab studies focus on traditional psychological support for people with learning disabilities, with a clear paucity of studies that address the digital and technological dimension of this support.

Foreign studies have proven the effectiveness of artificial intelligence systems in improving academic achievement, but most of them neglect the psychological aspect and focus on purely academic outputs.

The intersection between artificial intelligence, psychological support and learning disabilities is an obvious research gap, especially in the Arab context.

The approaches used varied between experimental, semi-experimental and systematic reviews, which gives the accumulated results higher credibility.

More recent studies emphasize the importance of combined models that combine a technique and a human specialist rather than a total dependence on one of them.

The problem of learning disabilities is one of the most common and influential educational challenges in the educational process, and these students suffer from a noticeable gap between their latent mental abilities and their actual academic achievement level, which casts a shadow on the psychological, social and academic aspects of their lives. Despite the growing interest in the field of psychological support for this category, the question remains about the extent to which artificial intelligence tools contribute to enhancing this support and translate it into a tangible improvement in the level of academic achievement. Hence the problem of this study arises in the following central question:

- ❖ What is the role of artificial intelligence-enhanced support in the digital age in the development of psychological support for students with learning difficulties

## Psychological support and academic achievement among students with learning difficulties: The role of AI-enhanced support in the digital age

- ❖ What is the role of AI-enabled support in the digital age in enhancing academic achievement of students with learning disabilities
- ❖ Are there any significant differences at the level of ( $\alpha=0.05$ ) between the averages of the respondents' scores on the questionnaire depending on variables (gender, age, type of school)

### Research objectives:

- ❖ The role of artificial intelligence-enhanced support in the digital age in the development of psychological support for students with learning difficulties.
- ❖ The role of artificial intelligence-enhanced support in the digital age in enhancing academic achievement of students with learning difficulties.
- ❖ The significance of the differences between the average scores of the respondents on the questionnaire is determined depending on variables (gender, age, type of school).

### Research Methodology

The descriptive-analytical method was adopted, as it was the most suitable approach for the research objectives and questions.

#### Research Population and Sample:

The research population consisted of all students with learning difficulties, totaling (2799) male and female students in public and private schools in Amman, according to statistics from the Jordanian Ministry of Education.

A random sample of (338) male and female students was selected from these public and private schools in Amman, representing (12.1%) of the research population.

Table (1) shows the distribution of the research sample according to the research variables.

Table (1) Distribution of the research sample according to the research variables

| variable    | Variable levels   | frequency | percentage |
|-------------|-------------------|-----------|------------|
| Gender      | Male              | 217       | 64.2%      |
|             | Female            | 121       | 35.8%      |
| Age         | under 14          | 180       | 53.3%      |
|             | 14 years and over | 158       | 46.7%      |
| School type | Public            | 189       | 55.9%      |
|             | Private           | 149       | 44.1%      |
| the total   |                   | 338       | 100%       |

#### Research tool

A questionnaire was developed after referring to the theoretical literature and relevant previous studies such as the studies of (Paglialunga & Melogno, 2025), (Panjwani-Charania, & Zhai, 2024) and (Al-Tarawneh and Khasawneh, 2024).

The initial version of the questionnaire consisted of (30) items distributed across two main themes:

- First axis: The role of AI-enhanced support in developing psychological support for students with learning difficulties, comprising 15 items.
- Second axis: The role of AI-enhanced support in enhancing academic achievement for students with learning difficulties, comprising 15 items.

#### Psychometric Properties of the Questionnaire:

1- Questionnaire Validity: This was verified through:

##### Face Validity:

The questionnaire was presented to (5) expert faculty members to determine their opinions on the suitability of the items for what they were designed to measure, their relevance to the questionnaire, their clarity, and to suggest appropriate modifications. An 80% agreement rate was adopted among the experts. The experts' comments on the questionnaire were taken into account, and the items were reworded accordingly, resulting in (30) items.

##### Discriminatory Significance of Items (Construct Validity):

The correlation between each item and the overall score for the axis was determined by administering the questionnaire to a pilot sample of (35) male and female students from outside the main research sample but within the population, as shown in Table (2).

Table (2) Item Correlation Coefficient with the Total Score of the Empathy Fatigue Scale

| Second axis: The role of AI-enhanced support in enhancing academic achievement for students with learning difficulties |                         | First axis: The role of AI-enhanced support in developing psychological support for students with learning difficulties |                         |
|------------------------------------------------------------------------------------------------------------------------|-------------------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------|
| Item number                                                                                                            | Correlation coefficient | Item number                                                                                                             | Correlation coefficient |
| 1                                                                                                                      | 0.753**                 | 16                                                                                                                      | 0.654**                 |
| 2                                                                                                                      | 0.658**                 | 17                                                                                                                      | 0.599**                 |
| 3                                                                                                                      | 0.695**                 | 18                                                                                                                      | 0.685**                 |
| 4                                                                                                                      | 0.745**                 | 19                                                                                                                      | 0.574**                 |
| 5                                                                                                                      | 0.716**                 | 20                                                                                                                      | 0.810**                 |
| 6                                                                                                                      | 0.789**                 | 21                                                                                                                      | 0.711**                 |
| 7                                                                                                                      | 0.674**                 | 22                                                                                                                      | 0.782**                 |
| 8                                                                                                                      | 0.513**                 | 23                                                                                                                      | 0.773**                 |
| 9                                                                                                                      | 0.662**                 | 24                                                                                                                      | 0.719**                 |
| 10                                                                                                                     | 0.579**                 | 25                                                                                                                      | 0.673**                 |
| 11                                                                                                                     | 0.569**                 | 26                                                                                                                      | 0.642**                 |
| 12                                                                                                                     | 0.703**                 | 27                                                                                                                      | 0.658**                 |
| 13                                                                                                                     | 0.680**                 | 28                                                                                                                      | 0.458**                 |
| 14                                                                                                                     | 0.832**                 | 29                                                                                                                      | 0.774**                 |
| 15                                                                                                                     | 0.803**                 | 30                                                                                                                      | 0.784**                 |

Table (2) shows that the item correlation coefficients with the total score for the first axis ranged between 0.513 and 0.810, and for the second axis between 0.458 and 0.810. All were statistically significant at the 0.01 level. The item correlation coefficient with the total score for the second axis was also greater than 0.30.

2- Questionnaire Reliability: This was verified by:

To confirm the questionnaire's reliability, its internal consistency was calculated using Cronbach's alpha coefficient for internal consistency and split-half reliability after administering the scale to the pilot sample. Table (3) shows the questionnaire's reliability coefficients.

Table (3) Questionnaire Reliability Coefficients

| axis                                                                                                                    | Number of items | internal consistency | split-half consistency |
|-------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|------------------------|
| First axis: The role of AI-enhanced support in developing psychological support for students with learning difficulties | 15              | 0.910                | 0.922                  |
| Second axis: The role of AI-enhanced support in enhancing academic achievement for students with learning difficulties  | 15              | 0.913                | 0.927                  |

Table (3) shows that the questionnaire's reliability coefficient was high. The internal consistency reliability coefficient using Cronbach's alpha was (0.910) for the first axis and (0.913) for the second axis, while the split-half reliability coefficient was (0.922) for the first axis and (0.927) for the second axis. The reliability coefficients were higher than (0.60). Therefore, the questionnaire was adopted in its final form, consisting of (30) items.

Questionnaire Scoring:

A three-point scale was used to score the questionnaire. Responses were assigned a high score (3 points), a moderate score (2 points), and a low score (1 point). The questionnaire averages were assessed as follows:

- (1.00-1.66) Low score.
- (1.67-2.33) Moderate score.
- (2.34-3.00) High score.

Statistical Methods Used

The following statistical analyses were used:

- Frequencies and percentages to describe the sample according to the research variables.
- Pearson's correlation coefficient to verify the discriminatory significance of the items (construct validity).

- Internal consistency reliability using Cronbach's alpha and split-half reliability to verify the reliability of the questionnaire.
- Arithmetic means and standard deviations for the answers to questions one and two.
- Independent Samples t-test to study the significance of differences between the mean scores of the sample members on the questionnaire according to the variables of gender, age, and school type for the answer to question three.

#### Research Findings:

First Question: What is the role of AI-enhanced support in the digital age in developing psychological support for students with learning difficulties?

To answer this question, the means, standard deviations, and degree of agreement were calculated for the students' responses to the first section (The Role of AI-Enhanced Support in Developing Psychological Support for Students with Learning Difficulties) of the questionnaire.

Table (4) Arithmetic means and standard deviations of students' answers to the first axis (The role of AI-enhanced support in developing psychological support for students with learning difficulties) of the questionnaire

| Items                                                                                    | Mean | Standard Deviation | Degree of Agreement | Ranking |
|------------------------------------------------------------------------------------------|------|--------------------|---------------------|---------|
| 1. AI applications help me feel more confident while learning.                           | 2.48 | .603               | High                | 15      |
| 2. Using AI tools in my studies reduces my anxiety.                                      | 2.57 | .563               | High                | 13      |
| 3. AI provides me with immediate support when I encounter learning difficulties.         | 2.58 | .562               | High                | 12      |
| 4. AI helps me overcome the frustration resulting from academic mistakes.                | 2.79 | .445               | High                | 6       |
| 5. I feel psychologically comfortable when I receive immediate feedback from AI systems. | 2.79 | .438               | High                | 5       |
| 6. AI contributes to boosting my motivation to learn.                                    | 2.71 | .491               | High                | 9       |
| 7. AI helps me feel independent in performing academic tasks.                            | 2.75 | .500               | High                | 7       |
| 8. AI supports my ability to face educational challenges.                                | 2.81 | .451               | High                | 4       |
| 9. AI improves my self-esteem.                                                           | 2.82 | .445               | High                | 3       |
| 10. AI considers my individual learning needs.                                           | 2.86 | .387               | High                | 1       |
| 11. AI reduces my feelings of helplessness during educational activities.                | 2.51 | .694               | High                | 14      |
| 12. AI helps me regulate my emotions while studying.                                     | 2.68 | .569               | High                | 10      |
| 13. AI educational tools provide me with a sense of security.                            | 2.75 | .520               | High                | 8       |
| 14. AI contributes to enhancing my sense of belonging in the learning environment.       | 2.82 | .424               | High                | 2       |
| 15. Artificial intelligence helps me continue learning despite the difficulties I face.  | 2.65 | .552               | High                | 11      |
| Total score for the first axis                                                           | 2.70 | .317               | High                |         |

Table (4) shows that the arithmetic mean for the first axis was (2.70), indicating a high level of agreement. This suggests that the role of AI-enhanced support in the digital age in developing psychological support for students with learning difficulties was significant. The arithmetic means for the items ranged between (2.48-2.86). This result can be explained by the fact that modern AI applications have provided more flexible and interactive learning environments that cater to students' individual differences, thus contributing to reducing the psychological pressures associated with learning difficulties. These applications also provided frequent learning opportunities at each student's own pace, which enhanced their sense of psychological security and reduced feelings of frustration and anxiety resulting from peer comparisons. Furthermore, the immediate feedback and continuous support provided by AI systems contributed to strengthening students' sense of support and being monitored throughout the learning process.

The statement "Artificial intelligence takes into account my individual learning needs" ranked first, with a high level of agreement and a mean score of 2.86. This reflects the fact that individual needs are a key advantage of AI applications in education, as they can analyze student performance, identify strengths and

weaknesses, and then provide educational content and activities tailored to their specific abilities and needs. Conversely, the statement "Artificial intelligence applications help me increase my confidence while learning" ranked last, also with a high level of agreement and a mean score of 2.48. This reflects the fact that developing self-confidence is a complex psychological process that depends not only on the use of educational technologies but is also influenced by various personal, social, familial, and school-related factors. Therefore, the impact of AI applications on building self-confidence may require a longer period of time and supportive human interaction from teachers and peers.

Question 2: What role does AI-enhanced support play in the digital age in improving the academic achievement of students with learning difficulties?

To answer this question, the means, standard deviations, and degree of agreement were calculated for the students' responses to the second section (The Role of AI-Enhanced Support in Improving the Academic Achievement of Students with Learning Difficulties) of the questionnaire.

Table (5) shows the means and standard deviations of the students' responses to the second section (The Role of AI-Enhanced Support in Improving the Academic Achievement of Students with Learning Difficulties) of the questionnaire

| Items                                                                                                                              | Mean | Standard Deviation | Degree of Agreement | Ranking |
|------------------------------------------------------------------------------------------------------------------------------------|------|--------------------|---------------------|---------|
| 16. Artificial intelligence helps me understand my lessons better.                                                                 | 2.67 | .569               | High                | 10      |
| 17. Artificial intelligence improves my academic performance.                                                                      | 2.84 | .400               | High                | 6       |
| 18. Artificial intelligence helps me complete my schoolwork more efficiently.                                                      | 2.75 | .485               | High                | 9       |
| 19. Artificial intelligence provides explanations tailored to my learning level.                                                   | 2.88 | .353               | High                | 2       |
| 20. Artificial intelligence helps me improve my reading skills.                                                                    | 2.54 | .635               | High                | 14      |
| 21. Artificial intelligence helps me improve my writing skills.                                                                    | 2.53 | .626               | High                | 15      |
| 22. Artificial intelligence contributes to improving my math and problem-solving skills.                                           | 2.57 | .618               | High                | 13      |
| 23. Artificial intelligence helps me remember information for longer periods.                                                      | 2.57 | .625               | High                | 12      |
| 24. Artificial intelligence increases my focus while learning.                                                                     | 2.62 | .610               | High                | 11      |
| 25. Artificial intelligence helps me identify my strengths and weaknesses.                                                         | 2.79 | .462               | High                | 8       |
| 26. Artificial intelligence contributes to improving my test scores.                                                               | 2.90 | .311               | High                | 1       |
| 27. Artificial intelligence helps me manage my study time effectively.                                                             | 2.86 | .355               | High                | 3       |
| 28. Artificial intelligence provides additional opportunities for practice and training.                                           | 2.86 | .392               | High                | 4       |
| 29. Artificial intelligence helps me learn at my own pace. 30. Artificial intelligence helps me make remarkable academic progress. | 2.81 | .449               | High                | 7       |
| 30. Artificial intelligence helps me make remarkable academic progress.                                                            | 2.85 | .380               | High                | 5       |
| Total score for the second axis                                                                                                    | 2.74 | .329               | High                |         |

Table (5) shows that the arithmetic mean for the second axis was (2.74), indicating a high level of agreement. This suggests that the role of AI-enhanced support in the digital age in improving the academic achievement of students with learning difficulties was significant. The arithmetic means for the items ranged between (2.53-2.90). This result can be explained by the fact that AI technologies have contributed to providing more adaptive learning environments for students with learning difficulties by offering diverse educational content and multiple teaching methods that suit their abilities and academic levels. These technologies also help provide immediate feedback and correct errors promptly, enabling students to continuously improve their academic performance. Furthermore, smart tools have increased opportunities for practice and self-training, facilitated access to information, and organized the learning process more effectively. The item "AI contributes to improving my test results" ranked first, with a high level of agreement

and an arithmetic mean of (2.90), as test results are among the most directly observed indicators by students when using AI applications. These applications offer diverse training, online tests, and interactive questions that help students prepare well for exams, understand their weaknesses, and address them before the actual assessment. They also allow for the systematic and frequent review of educational content, which enhances information retention and recall when needed. The statement "Artificial intelligence helps me improve my writing skills" came in last place with a high level of agreement and a mean score of 2.53. This can be explained by the fact that writing skills are complex skills that require the development of multiple linguistic and cognitive aspects, such as grammar, organizing ideas, sentence structure, and clear written expression. Although AI applications provide tools to support writing and grammar correction, improving these skills requires continuous training and long-term practice.

Question 3: Are there statistically significant differences at the ( $\alpha=0.05$ ) level between the mean scores of the sample members on the questionnaire according to the variables of gender, age, and school type?

To answer this question, an Independent Samples t-test was used to examine the significance of the differences between the mean scores of the sample members on the questionnaire according to the variables of gender, age, and school type.

- According to the gender variable:

Table (6) shows the results of the t-test for the significance of the difference between the mean scores of the sample members on the questionnaire according to the gender variable

| axis                                                                                                                    | Gender | N   | mean | S.D   | t-value | df  | Sig   |
|-------------------------------------------------------------------------------------------------------------------------|--------|-----|------|-------|---------|-----|-------|
| First axis: The role of AI-enhanced support in developing psychological support for students with learning difficulties | Male   | 217 | 2.70 | 0.332 | 0.517   | 336 | 0.605 |
|                                                                                                                         | Female | 121 | 2.72 | 0.289 |         |     |       |
| First axis: The role of AI-enhanced support in developing psychological support for students with learning difficulties | Male   | 217 | 2.71 | 0.337 | 1.591   | 336 | 0.112 |
|                                                                                                                         | Female | 121 | 2.77 | 0.311 |         |     |       |

Table (6) shows that the t-value for the two axes of the questionnaire was not statistically significant, as the probability values were greater than the assumed significance level of 0.05. This means there are no statistically significant differences at the (0.05) significance level between the mean scores of the sample members' responses to the questionnaire based on the gender variable. This can be explained by the fact that AI-based services and applications are provided equally to all students without gender discrimination, as their design is based more on the individual educational needs of the learner than on demographic characteristics. This can also be explained by the similarity of educational experiences that male and female students have in the digital learning environment, as they have equal opportunities to benefit from smart tools and electronic resources that support learning.

- According to the age variable:

Table (7) results of the t-test for the significance of the difference between the mean scores of the sample members on the questionnaire according to the age variable

| axis                                                                                                                    | Age               | N   | mean | S.D   | t-value | df  | Sig   |
|-------------------------------------------------------------------------------------------------------------------------|-------------------|-----|------|-------|---------|-----|-------|
| First axis: The role of AI-enhanced support in developing psychological support for students with learning difficulties | Under 14 years    | 180 | 2.59 | 0.345 | 7.414   | 336 | 0.000 |
|                                                                                                                         | 14 years and over | 158 | 2.83 | 0.223 |         |     |       |
| First axis: The role of AI-enhanced support in developing psychological support for students with learning difficulties | Under 14 years    | 180 | 2.59 | 0.335 | 9.738   | 336 | 0.000 |
|                                                                                                                         | 14 years and over | 158 | 2.90 | 0.231 |         |     |       |

Table (7) shows that the t-value for both axes of the questionnaire was statistically significant, as the probability values were less than the assumed significance level of 0.05. This means there are statistically significant differences at the significance level of (0.05) between the mean scores of the sample members' responses to the questionnaire according to the age variable, with the differences favoring the older age group (14 years and older). This result can be explained by the fact that older students possess a higher level of cognitive and emotional maturity, enabling them to understand the potential of artificial intelligence

applications and utilize them more effectively compared to younger students. Furthermore, increased age is often associated with increased educational and technological experience, which contributes to developing the ability to employ smart tools to address challenges related to learning difficulties. Older students are also better able to recognize the impact of artificial intelligence in meeting their individual needs, organizing their learning, and alleviating the pressures and difficulties they face. They also possess better skills in using digital educational applications and leveraging their capabilities for information retrieval, reviewing lessons, preparing for tests, and managing time and academic tasks.

– According to the school type variable:

Table (8) results of the t-test for the significance of the difference between the mean scores of the sample members on the questionnaire according to the school type variable

| axis                                                                                                                    | school type  | N   | mean | S.D   | t-value | df  | Sig   |
|-------------------------------------------------------------------------------------------------------------------------|--------------|-----|------|-------|---------|-----|-------|
| First axis: The role of AI-enhanced support in developing psychological support for students with learning difficulties | Governmental | 189 | 2.62 | 0.352 | 5.903   | 336 | 0.000 |
|                                                                                                                         | Private      | 149 | 2.81 | 0.223 |         |     |       |
| First axis: The role of AI-enhanced support in developing psychological support for students with learning difficulties | Governmental | 189 | 2.64 | 0.357 | 6.415   | 336 | 0.000 |
|                                                                                                                         | Private      | 149 | 2.86 | 0.239 |         |     |       |

Table (8) shows that the t-value for both axes of the questionnaire was statistically significant, as the probability values were less than the assumed significance level of 0.05. This means there are statistically significant differences at the (0.05) significance level between the mean scores of the sample members' responses to the questionnaire according to the variable of school type. These differences favored private schools, as private schools often possess more advanced technological capabilities and digital infrastructure. This allows for greater opportunities to employ artificial intelligence applications in the educational process and provide more diverse educational and support services for students with learning difficulties. Private schools are keen to adopt modern educational technologies and provide smart programs and platforms that help adapt learning to the individual needs of students, which enhances their benefit from artificial intelligence tools in psychological and academic aspects. Furthermore, these schools may prioritize training teachers and students to use modern technologies more effectively, which contributes to raising awareness of the potential of artificial intelligence and its application in supporting learning.

#### Research Findings Summary:

- AI-enhanced support in the digital age played a significant role in developing psychological support for students with learning difficulties. The statement "AI takes into account my individual learning needs" ranked first with a high level of agreement and a mean score of 2.86, while the statement "AI applications help me increase my confidence while learning" ranked last with a high level of agreement and a mean score of 2.48.
- AI-enhanced support in the digital age played a significant role in enhancing the academic achievement of students with learning difficulties. The statement "AI contributes to improving my test results" ranked first with a high level of agreement and a mean score of 2.90, while the statement "AI helps me improve my writing skills" ranked last with a high level of agreement and a mean score of 2.53.
- There were no statistically significant differences at the 0.05 level between the mean scores of the respondents' answers on the questionnaire based on gender.
- There are statistically significant differences at the 0.05 level between the mean scores of the sample's responses to the questionnaire based on the age variable, with the differences favoring the older age group (14 years and older).
- There are statistically significant differences at the 0.05 level between the mean scores of the sample's responses to the questionnaire based on the type of school variable, with the differences favoring private schools.

#### Research Recommendations and Suggestions:

- Develop smart educational platforms specifically designed for students with learning difficulties, taking into account the individual differences of each student.
- Train teachers and special education specialists on the effective educational use of artificial intelligence to enhance students' psychological support and academic achievement.
- Strengthen the technological infrastructure in schools, particularly public schools.
- Focus on developing writing skills among students with learning difficulties through specialized artificial intelligence applications.
- Develop AI-powered digital guidance programs to foster self-confidence and motivation to learn among students with learning difficulties.
- Conduct a study on the obstacles to implementing artificial intelligence in public schools from the perspective of special education teachers.

## References:

- الطراونة، عوض؛ خصاونة، صائب. (2024). تقييم الخدمات التعليمية والمساندة المقدمة للطلبة ذوي صعوبات التعلم في مبحث الرياضيات للمرحلة الأساسية أثناء التعلم عن بعد من وجهة نظر أولياء الأمور في 20(1) المحافظة. *المجلة الأردنية في العلوم التربوية*، 75-88.
- Paglialunga, A., & Melogno, S. (2025). The effectiveness of artificial intelligence-based interventions for students with learning disabilities: A systematic review. *Brain Sciences*, 15(8), 806. <https://doi.org/10.3390/brainsci15080806>.
- Panjwani-Charania, S., & Zhai, X. (2024). AI for students with learning disabilities: A systematic review. In X. Zhai & J. Krajcik. (Eds.). *Uses of artificial intelligence in STEM education* (pp. 469–493). Oxford University Press. <https://doi.org/10.1093/oso/9780198882077.003.0021>.
- Fletcher, J. M., Lyon, G. R., Fuchs, L. S., & Barnes, M. A. (2019). *Learning disabilities: From identification to intervention* (2nd ed.). Guilford Press.
- National Center for Learning Disabilities (NCLD). (2020). *The state of learning disabilities: Understanding the 1 in 5*. NCLD Report.
- Papadopoulos, T. C., & Kendeou, P. (2010). Examining the effects of hypothesis testing and worked examples for learning about specific learning disabilities. *Learning and Instruction*, 20(1), 14–25.
- Pekrun, R., Goetz, T., Titz, W., & Perry, R. P. (2002). Academic emotions in students' self-regulated learning and achievement: A program of qualitative and quantitative research. *Educational Psychologist*, 37(2), 91–105.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.
- Warnock, M. (1978). *Special educational needs: Report of the committee of enquiry into the education of handicapped children and young people*. HMSO.
- Drigas, A. S., & Papoutsis, C. (2019). A new layered model on emotional intelligence. *Behavioral Sciences*, 9(7), 79. <https://doi.org/10.3390/bs9070079>
- Filipe, H. P., Silva, E. D., Stulting, A. A., & Golnik, K. C. (2021). Artificial intelligence in mental health and the biases of language based models. *Frontiers in Psychiatry*, 12, 622382. <https://doi.org/10.3389/fpsy.2021.622382>
- Graham, S., & Harris, K. R. (2019). Evidence-based writing practices: A meta-analysis of existing meta-analyses. In R. Fidalgo et al. (Eds.), *Studies in Writing: Vol. 34. Design Principles for Teaching Effective Writing* (pp. 13–37). Brill.
- Holmes, W., Anastopoulou, S., Schaumburg, H., & Mavrikis, M. (2021). *Technology-enhanced personalised learning: Untangling the evidence*. Robert Bosch Stiftung.
- Pekrun, R., Lichtenfeld, S., Marsh, H. W., Murayama, K., & Goetz, T. (2020). Achievement emotions and academic performance: Longitudinal models of reciprocal effects. *Child Development*, 88(5), 1653–1670. <https://doi.org/10.1111/cdev.12704>
- Rello, L., & Baeza-Yates, R. (2015). Predicting risk of dyslexia with an online gamified test. *PLOS ONE*, 10(12), e0141287. <https://doi.org/10.1371/journal.pone.0141287>
- Swanson, H. L., Moran, A. S., Bocian, K., Lussier, C., & Zheng, X. (2018). Generalization of inferential skills in children with learning disabilities and math problem-solving difficulties. *Learning Disability Quarterly*, 41(2), 89–102. <https://doi.org/10.1177/0731948717702195>
- VanLehn, K. (2011). The relative effectiveness of human tutoring, intelligent tutoring systems, and other tutoring systems. *Educational Psychologist*, 46(4), 197–221. <https://doi.org/10.1080/00461520.2011.611369>

- Woebot Health. (2020). Delivering cognitive behavioral therapy to young adults with symptoms of depression and anxiety using a fully automated conversational agent (Woebot): A randomized controlled trial. JMIR Mental Health. <https://doi.org/10.2196/mental.7785>

الاستبانة قبل التحكيم

.....الطالب/ الطالبة

فيما يأتي مجموعة من العبارات حول دور الدعم المعزز بالذكاء الاصطناعي في تنمية الدعم النفسي والتحصيل الأكاديمي لديك

أرجو منك وضع إشارة أمام الإجابة التي تنطبق عليك

البيانات الأولية

أنثى ☐ ذكر ☐ الجنس

سنة فأكثر 14 ☐ أقل من 14 سنة ☐ العمر

خاصة ☐ حكومية ☐ نوع المدرسة

الاستبانة

| البن                                                                                                 | درجة كبيرة | درجة متوسطة | درجة قليلة |
|------------------------------------------------------------------------------------------------------|------------|-------------|------------|
| المحور الأول: دور الدعم المعزز بالذكاء الاصطناعي في تنمية الدعم النفسي لدى الطالبة ذوي صعوبات التعلم |            |             |            |
| 1. تساعد تطبيقات الذكاء الاصطناعي على زيادة شعوري بالثقة أثناء التعلم.                               |            |             |            |
| 2. أشعر بقدر أقل من القلق عند استخدام أدوات الذكاء الاصطناعي في الدراسة.                             |            |             |            |
| 3. يوفر الذكاء الاصطناعي دعماً فورياً عند مواجهة صعوبات التعلم.                                      |            |             |            |
| 4. يساعدني الذكاء الاصطناعي على التغلب على الإحباط الناتج عن الأخطاء الدراسية.                       |            |             |            |

|  |  |  |                                                                                                           |
|--|--|--|-----------------------------------------------------------------------------------------------------------|
|  |  |  | أشعر بالراحة النفسية عند الحصول على تغذية راجعة فورية من أنظمة الذكاء الاصطناعي.                          |
|  |  |  | يسهم الذكاء الاصطناعي في تعزيز دافعيتي للتعلم.                                                            |
|  |  |  | يساعدني الذكاء الاصطناعي على الشعور بالاستقلالية في أداء المهام الدراسية.                                 |
|  |  |  | يدعم الذكاء الاصطناعي قدرتي على مواجهة التحديات التعليمية.                                                |
|  |  |  | يسهم استخدام الذكاء الاصطناعي في تحسين تقديري لذاتي.                                                      |
|  |  |  | أشعر بأن الذكاء الاصطناعي يراعي احتياجاتي الفردية في التعلم.                                              |
|  |  |  | يقلل الذكاء الاصطناعي من شعوري بالعجز أثناء أداء الأنشطة التعليمية.                                       |
|  |  |  | يساعدني الذكاء الاصطناعي على تنظيم انفعالاتي أثناء الدراسة.                                               |
|  |  |  | أشعر بمزيد من الأمان عند استخدام أدوات الذكاء الاصطناعي التعليمية.                                        |
|  |  |  | يسهم الذكاء الاصطناعي في تعزيز شعوري بالاندماج في البيئة التعليمية.                                       |
|  |  |  | يساعدني الذكاء الاصطناعي على الاستمرار في التعلم رغم الصعوبات التي أواجهها.                               |
|  |  |  | المحور الثاني: دور الدعم المعزز بالذكاء الاصطناعي في تعزيز التحصيل الأكاديمي لدى الطلبة ذوي صعوبات التعلم |
|  |  |  | يساعدني الذكاء الاصطناعي على فهم الدروس بصورة أفضل.                                                       |
|  |  |  | يسهم الذكاء الاصطناعي في تحسين أدائي الأكاديمي.                                                           |
|  |  |  | يساعدني الذكاء الاصطناعي على إنجاز الواجبات الدراسية بكفاءة أكبر.                                         |
|  |  |  | يوفر الذكاء الاصطناعي شروحات تتناسب مع مستوى تعليمي.                                                      |
|  |  |  | يساعدني الذكاء الاصطناعي على تحسين مهارات القراءة.                                                        |
|  |  |  | يساعدني الذكاء الاصطناعي على تحسين مهارات الكتابة.                                                        |
|  |  |  | يسهم الذكاء الاصطناعي في تحسين مهارات الحساب وحل المشكلات.                                                |
|  |  |  | يساعدني الذكاء الاصطناعي على تذكر المعلومات لفترة أطول.                                                   |
|  |  |  | يسهم الذكاء الاصطناعي في زيادة تركيزي أثناء التعلم.                                                       |
|  |  |  | يساعدني الذكاء الاصطناعي على تحديد نقاط القوة والضعف لدي.                                                 |
|  |  |  | يسهم الذكاء الاصطناعي في تحسين نتائج الاختبارات.                                                          |
|  |  |  | يساعدني الذكاء الاصطناعي على إدارة وقت الدراسة بفعالية.                                                   |
|  |  |  | يوفر الذكاء الاصطناعي فرصاً إضافية للتدريب والممارسة.                                                     |
|  |  |  | يساعدني الذكاء الاصطناعي على التعلم وفق سرعتي الخاصة.                                                     |
|  |  |  | يسهم الذكاء الاصطناعي في تحقيق تقدم أكاديمي ملحوظ.                                                        |

الاستبانة بعد التحكيم

.....الطالب/ الطالبة

فيما يأتي مجموعة من العبارات حول دور الدعم المعزز بالذكاء الاصطناعي في تنمية الدعم النفسي والتحصيل الأكاديمي لديك

أرجو منك وضع إشارة أمام الإجابة التي تنطبق عليك

البيانات الأولية:

أنثى ☐ ذكر ☐ الجنس

سنة فأكثر 14 ☐ أقل من 14 سنة ☐ العمر

خاصة ☐ حكومية ☐ نوع المدرسة

الاستبانة:

| البند                                                                                                                   | درجة كبيرة | بدرجة متوسطة | بدرجة قليلة |
|-------------------------------------------------------------------------------------------------------------------------|------------|--------------|-------------|
| First axis: The role of AI-enhanced support in developing psychological support for students with learning difficulties |            |              |             |
| 1. AI applications help me feel more confident while learning.                                                          |            |              |             |

|  |  |  |                                                                                                                        |
|--|--|--|------------------------------------------------------------------------------------------------------------------------|
|  |  |  | 2. Using AI tools in my studies reduces my anxiety.                                                                    |
|  |  |  | 3. AI provides me with immediate support when I encounter learning difficulties.                                       |
|  |  |  | 4. AI helps me overcome the frustration resulting from academic mistakes.                                              |
|  |  |  | 5. I feel psychologically comfortable when I receive immediate feedback from AI systems.                               |
|  |  |  | 6. AI contributes to boosting my motivation to learn.                                                                  |
|  |  |  | 7. AI helps me feel independent in performing academic tasks.                                                          |
|  |  |  | 8. AI supports my ability to face educational challenges.                                                              |
|  |  |  | 9. AI improves my self-esteem.                                                                                         |
|  |  |  | 10. AI considers my individual learning needs.                                                                         |
|  |  |  | 11. AI reduces my feelings of helplessness during educational activities.                                              |
|  |  |  | 12. AI helps me regulate my emotions while studying.                                                                   |
|  |  |  | 13. AI educational tools provide me with a sense of security.                                                          |
|  |  |  | 14. AI contributes to enhancing my sense of belonging in the learning environment.                                     |
|  |  |  | 15. Artificial intelligence helps me continue learning despite the difficulties I face.                                |
|  |  |  | Second axis: The role of AI-enhanced support in enhancing academic achievement for students with learning difficulties |
|  |  |  | 16. Artificial intelligence helps me understand my lessons better.                                                     |
|  |  |  | 17. Artificial intelligence improves my academic performance.                                                          |
|  |  |  | 18. Artificial intelligence helps me complete my schoolwork more efficiently.                                          |
|  |  |  | 19. Artificial intelligence provides explanations tailored to my learning level.                                       |
|  |  |  | 20. Artificial intelligence helps me improve my reading skills.                                                        |
|  |  |  | 21. Artificial intelligence helps me improve my writing skills.                                                        |
|  |  |  | 22. Artificial intelligence contributes to improving my math and problem-solving skills.                               |
|  |  |  | 23. Artificial intelligence helps me remember information for longer periods.                                          |
|  |  |  | 24. Artificial intelligence increases my focus while learning.                                                         |
|  |  |  | 25. Artificial intelligence helps me identify my strengths and weaknesses.                                             |
|  |  |  | 26. Artificial intelligence contributes to improving my test scores.                                                   |
|  |  |  | 27. Artificial intelligence helps me manage my study time effectively.                                                 |
|  |  |  | 28. Artificial intelligence provides additional opportunities for practice and training.                               |

Psychological support and academic achievement among students with learning difficulties: The role of AI-enhanced support in the digital age

|  |  |  |                                                                                                                                    |
|--|--|--|------------------------------------------------------------------------------------------------------------------------------------|
|  |  |  | 29. Artificial intelligence helps me learn at my own pace. 30. Artificial intelligence helps me make remarkable academic progress. |
|  |  |  | 30. Artificial intelligence helps me make remarkable academic progress.                                                            |