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**Professional Research Thesis**

**Titled**

# *The impact of using artificial intelligence technologies in developing curricula and teaching methods, improving students' self-learning skills*

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## *Dedication*

**To the soul of my beloved father,**

who was my support and the guiding light of my life, and who taught me that knowledge is elevation and that striving for it is an act of worship. To the one who departed this world in body but remains ever-present in my heart through prayers and cherished memories, I dedicate the fruit of my efforts in gratitude for his. I pray that God places it in the balance of his good deeds and grants him the vastness of Paradise.

***To my beloved mother,***

*who has always been, and continues to be, the source of my giving, the secret of my strength, and the wellspring of my compassion. To the one who instilled in my heart a love for knowledge and planted within me the values of patience and perseverance; who stayed awake and sacrificed so that I might reach this moment. I dedicate to her the fruit of my effort and years of hard work, in love and loyalty, praying that God preserves her for me and rewards her with the best of recompense.*

***To my beloved husband,***

*my life companion, my foremost supporter, and my pillar throughout my academic and professional journey. To the one who shared my hardships,*

*believed in my dreams, and, after God, was my greatest support at every step. I dedicate to him the fruit of my efforts and the toil of my days, as an expression of my love and gratitude, with a prayer that God may preserve him as an enduring blessing.*

*These words remain insufficient to fully express my gratitude and appreciation to you both for your unwavering support and encouragement throughout my journey in completing my postgraduate studies.*

## Introduction:

*The contemporary world has witnessed, in recent decades, rapid developments and a profound knowledge revolution in the field of digital technology. This accelerated progress in education, both quantitatively and qualitatively, has contributed to transforming the approaches adopted and the objectives pursued by educational institutions. Among the most prominent manifestations of this transformation is the emergence of artificial intelligence technologies, which have brought about a qualitative shift across various aspects of life, including the educational domain. Artificial intelligence has become a promising tool in reshaping curricula and teaching methods, enabling a more interactive and flexible learning environment and granting students a central role in the learning process.*

*In light of these transformations, education is no longer dependent solely on traditional methods; rather, it is increasingly required to capitalize on the intelligent capabilities offered by educational applications, recommendation systems, educational robots, and adaptive learning platforms. Such technologies enhance the efficiency of the educational process and respond to learners' diverse abilities and interests.*

*The integration of artificial intelligence in education is not limited to facilitating teaching processes; it extends to fostering interactive and*

*personalized learning experiences. One of the most significant areas in which artificial intelligence can contribute is the support and development of students' self-directed learning skills. It empowers learners to manage their own learning, set educational goals, and access knowledge resources with ease, thereby contributing to the preparation of a generation capable of lifelong learning and keeping pace with advances in knowledge and labor market demands.*

*Accordingly, this study seeks to shed light on the impact of employing artificial intelligence technologies in the development of curricula and teaching methods, with a particular focus on their role in enhancing students' self-directed learning skills. This skill has become a fundamental pillar for success in a dynamic and ever-evolving educational environment. The study aims to present a scientific perspective that may guide educational policymakers toward modern instructional strategies aligned with the requirements of the digital age.*

## The study Problem:

*Through the researcher's work as a teacher, it has been observed that the development of thinking skills is among the primary objectives that modern education seeks to achieve, in response to society's need for individuals who possess higher-order cognitive abilities and who can engage with the problems they encounter through a critical, innovative, and reflective approach. This has highlighted the importance of designing electronic programs aimed at developing such skills, enabling learners to understand how they learn and how they think, and facilitating their transition from dependent learners to creative, self-confident individuals. Mastery of thinking and problem-solving skills yields positive outcomes in terms of academic achievement, creativity, and the ability to establish meaningful connections between new and prior knowledge, thereby regulating thinking processes and supporting planning, problem solving at both personal and social levels, and conscious, rational decision-making.*

*Despite the significant advancement of artificial intelligence technologies and their integration into various aspects of life, their utilization in the development of curricula and teaching methods remains limited in many educational institutions. Traditional teaching approaches tend to focus primarily on the direct transmission of knowledge, which reduces*

*opportunities for students to develop self-directed learning skills and to rely on themselves in research, analysis, and problem solving.*

*Moreover, there is a clear gap between the capabilities offered by artificial intelligence technologies—such as adaptive learning systems, educational robots, big data analytics, and personalized learning—and the extent of their actual implementation in educational practice. This gap hinders the development of modern and flexible curricula capable of responding to students' individual needs and motivating them toward continuous learning.*

*The core of the problem lies in the fact that current curricula still lack effective integration with artificial intelligence applications, while traditional teaching methods often emphasize rote instruction and knowledge transmission rather than empowering students to engage in active interaction and independent learning. In addition, both teachers and students face challenges in employing these technologies in ways that achieve clear and sustainable educational objectives.*

*In response to the growing emphasis on critical thinking and problem solving—which foster learners' intellectual independence, free them from dependency, and coincide with the emergence of modern educational*

*strategies aimed at developing such capabilities—the present study seeks to employ e-learning technologies to enhance these skills among students.*

*Accordingly, the current study aims to examine the impact of e-learning technologies on the development of critical thinking and problem-solving skills, as well as the effect of using artificial intelligence technologies on the advancement of curricula and teaching methods and the improvement of students' self-directed learning skills.*

## The importance of studying:

*The significance of the present study stems from several key aspects, which* ***can be summarized as follows:***

- *Identifying a range of artificial intelligence applications that can be employed in the educational process, along with the mechanisms for their use and effective integration into teaching practices.*
- *Providing an overall picture of the use of artificial intelligence applications in education, in terms of their potential contributions to facilitating learning as well as the challenges teachers may encounter when using such applications.*
- *Enriching the educational field by addressing a contemporary topic related to the integration of artificial intelligence technologies in education, an area that still requires further studies and research.*
- *Highlighting the role that artificial intelligence technologies can play in developing curricula and teaching methods in line with the requirements of the Fourth Industrial Revolution and the knowledge society.*
- *Contributing to clarifying the relationship between the use of artificial intelligence and the development of self-directed learning*

*skills as one of the essential skills for students in the twenty-first century.*

- *Assisting those responsible for curriculum development in benefiting from the capabilities of artificial intelligence to update educational content and make it more interactive and responsive to students' needs.*
- *Guiding teachers toward adopting modern, AI-supported instructional approaches that help address individual differences among students and motivate them toward self-directed learning.*
- *Opening avenues for decision-makers to select the most appropriate artificial intelligence applications for implementation in basic education schools.*
- *Enabling the study's findings to contribute to overcoming challenges associated with the use of artificial intelligence applications in education, through increased attention by officials in the Ministry of Education to providing the necessary requirements and mitigating potential negative impacts.*
- *Creating new prospects for researchers to conduct further future studies on issues related to artificial intelligence in education.*

## Objectives of the study:

***General Objectives***

*This study aims to examine the impact of using artificial intelligence technologies on the development of curricula and teaching methods, as well as on enhancing students' self-directed learning skills. This is pursued* ***through the achievement of the following objectives:***

- *Identifying the impact of employing artificial intelligence technologies on the development of curricula and modern teaching methods.*
- *Exploring artificial intelligence applications that can be utilized in the educational process.*
- *Clarifying the most significant expected outcomes of using artificial intelligence applications in education.*
- *Identifying the main challenges that may hinder the use of artificial intelligence applications in the educational process.*
- *Analyzing the role of artificial intelligence technologies in promoting students' self-directed learning skills.*
- *Highlighting the effectiveness of artificial intelligence in improving the quality of the educational process and increasing the level of interaction between students and educational content.*

***Sub-Objectives / Specific Objectives***

- *Identifying the most prominent artificial intelligence applications used in the educational field.*
- *Measuring the extent to which artificial intelligence contributes to transforming traditional teaching methods into more innovative and interactive approaches.*
- *Determining the impact of artificial intelligence on motivating students toward self-directed learning and developing their research skills.*
- *Monitoring the influence of artificial intelligence use on the development of students' critical thinking and problem-solving abilities.*
- *Proposing a conceptual framework for integrating artificial intelligence technologies into curricula in a manner that supports the enhancement of self-directed learning.*

## Study hypotheses and questions:

***First: Research Questions***

*Based on the foregoing, the research questions and hypotheses of the study can be formulated around the following main question:*

*To what extent can e-learning tools and technologies in the course Educational Technology and Technological Innovations contribute to the development of students' critical thinking and problem-solving abilities?*

***From this main question, the following sub-questions are derived:***

- *What critical thinking skills should students acquire through the use of e-learning technologies in the content and activities of technological innovations within the Educational Technology course?*
- *What is the impact of using artificial intelligence technologies on the development of curricula and teaching methods?*
- *How do artificial intelligence technologies contribute to improving students' self-directed learning skills?*
- *What problem-solving skills should students possess through the use of e-learning technologies in the content and activities of*

*technological innovations within the Educational Technology course?*

- *To what extent are there statistically significant differences between the group taught using traditional methods and the group taught using e-learning tools, technologies, and artificial intelligence platforms in terms of critical thinking dimensions and overall scores?*
- *What challenges are associated with employing modern technologies and artificial intelligence in teaching?*
- *Which educational applications of artificial intelligence are the most effective in supporting the educational process?*
- *What is the effectiveness of an e-learning environment based on connectivism theory in developing students' skills in selected artificial intelligence applications for scientific research?*
- *To what extent does artificial intelligence enhance students' abilities in critical thinking and problem solving?*
- *What proposed framework can be developed for integrating artificial intelligence technologies into curricula in a manner that supports scientific advancement and self-development?*

***Second: Research Hypotheses***

*In light of the preceding questions, the study hypotheses can be formulated* ***as follows:***

- *There are statistically significant differences between traditional curricula and teaching methods and those that incorporate artificial intelligence technologies, in favor of the latter.*
- *The employment of artificial intelligence technologies significantly contributes to the development of students' self-directed learning skills.*
- *The use of educational artificial intelligence applications leads to higher levels of student interaction and motivation.*
- *Artificial intelligence contributes more effectively to the development of students' critical thinking and problem-solving skills compared to traditional teaching methods.*
- *An effective proposed framework can be developed for integrating artificial intelligence technologies into curricula in a way that supports the improvement of educational quality and self-directed learning.*

## Study Approach:

**Research Methodology**

*Given the nature of the study, the research adopts the* ***descriptive–analytical approach****, whereby the researcher collects theoretical data and information from various sources—such as books, previous studies, scholarly articles, and reports—related to artificial intelligence technologies and their application in education. This approach is employed to analyze the role of artificial intelligence in the development of curricula, modern teaching methods, and the support of students' self-directed learning skills.*

*In addition, the* ***experimental approach*** *is employed through the application of artificial intelligence technologies to a sample of students and comparing their results with those of another group that does not use artificial intelligence technologies, with the aim of measuring differences in academic achievement, motivation, and self-directed learning skills.*

*Accordingly, the present study relies on a* ***quasi-experimental design*** *based on dividing the study sample into two groups: an experimental group and a control group. The experimental group was taught using artificial*

*intelligence technologies, whereas the control group was taught using conventional and traditional teaching methods.*

*Furthermore, in light of the nature and objectives of the study, the research also adopts the* ***descriptive–analytical approach*** *as follows:*

**1. Descriptive Approach:**

- To describe the current state of using artificial intelligence technologies in curricula and existing teaching methods.
- To identify teachers' and students' perspectives regarding the role of these technologies in supporting the educational process.

**2. Analytical Approach:**

- To analyze the impact of employing artificial intelligence technologies on the development of curricula and teaching methods.
- To examine the extent to which these technologies contribute to the development of students' self-directed learning skills.

**3. Research Instruments:**

- ***Questionnaire:*** *Used to collect data from a sample of teachers, parents, and students regarding their opinions and experiences.*

- ***Interviews:*** *Conducted to obtain deeper insights from education specialists.*
- ***Content Analysis:*** *Applied to selected educational models or applications based on artificial intelligence.*

**Table (1): Quasi-Experimental Design of the Study**

| **Pre-test** | **Study Groups** | **Type of Treatment** | **Post-test** |
|---|---|---|---|
| **Academic achievement test** | Experimental group | Teaching using artificial intelligence technologies | Academic achievement test |
| | Control group | Teaching using traditional methods | |

**Equivalence of the Study Groups**

To ensure the equivalence of the experimental and control groups in terms of academic achievement, a pre-test was administered to students in both groups. The *t-test* was used to determine the statistical significance of

differences between the two groups and to verify the equivalence of multiple intelligences. The results are presented in the following table:

**Table (2): Results of the Pre-Achievement Test for Verifying the Equivalence of the Control and Experimental Groups**

| **Instrument** | **Control Group (n = 30)** | | **Experimental Group (n = 30)** | |
|---|---|---|---|---|
| | Mean | Std. Deviation | Mean | Std. Deviation |
| **Pre-achievement test** | 5.97 | 1.73 | 5.37 | 2.02 |

- *Significance level = 0.222*
- *Total score of the achievement test = 30*

The table indicates that the *t* value for the difference between the mean scores of the experimental and control groups in the pre-achievement test is not statistically significant, which suggests that the two groups are equivalent in terms of academic achievement.

***Population and Sample of the Study***

*The study population consisted of all sixth-grade female students enrolled in public and private schools affiliated with the General Directorate of Education in Al-Ahsa Governorate (Kingdom of Saudi Arabia) during the first semester of the academic year 2025/2026. In addition, a questionnaire was distributed to parents of some male and female students in public and private schools in Cairo Governorate, Arab Republic of Egypt.*

*The study sample comprised* ***60 sixth-grade female students*** *selected from two schools: Al-Kifah International Academy and Shabab Al-Mustaqbal Private Schools. The sample was divided into two groups: an experimental group consisting of* ***30 students****, and a control group consisting of* ***30 students****.*

## The limits of the study:

***The present study is limited to the following boundaries:***

***Spatial Boundaries***

*The study is based on examining the experience of the* ***Kingdom of Saudi Arabia****, as it is considered a pioneer in this field, for several reasons outlined below:*

1. *The establishment of the* ***Saudi Data and Artificial Intelligence Authority (SDAIA)*** *by Royal Decree, which is responsible for regulating the data and artificial intelligence sector and enabling innovation and digital transformation through three main pillars: the National Data Management Office, the National Information Center, and the National Center for Artificial Intelligence (SDAIA, 2022). This represents a national strategy for data and artificial intelligence aimed at accelerating data utilization across various sectors, including education, thereby providing a clear policy and methodological framework for research.*

   *In this context, the Ministry of Education, in collaboration with SDAIA, issued the* ***Guidelines for the Use of Generative Artificial Intelligence in General Education*** *as a qualitative step aimed at*

*enhancing educational quality and improving learning outcomes in an ethical and responsible manner. These guidelines ensure the preservation of the teacher's central role, support students' learning processes, and raise parents' awareness of the technologies being used, thereby contributing to the achievement of the educational objectives of* ***Saudi Vision 2030****.*

*The guidelines address key topics related to generative artificial intelligence in education and are directed toward students, teachers, and parents to increase awareness of how generative AI functions, provide ethical and responsible usage guidelines, propose appropriate applications and practical examples for prompting AI tools, highlight their various benefits, warn against potential risks, and outline appropriate principles for designing and constructing generative AI instructions.*

*The methodological framework of the guidelines was developed in alignment with directives issued by relevant governmental entities in the Kingdom, including SDAIA, the National eLearning Center, and the Ministry of Education's eLearning Policy. In addition, a comprehensive global benchmarking study was conducted, incorporating best international practices in generative AI guidance*

*for general education. This benchmark included organizations such as* ***UNESCO*** *and the* ***Organisation for Economic Co-operation and Development (OECD)****, as well as reference countries such as the United States, Australia, and New Zealand.*

*The guidelines consist of three main sections. The first introduces generative artificial intelligence, its outputs, operational mechanisms, benefits in education, and the principles upon which the generative AI guidelines for general education were developed. The second section is dedicated to usage guidelines, explaining how generative AI tools can be applied within the educational process to maximize benefits for students, teachers, and parents. The third section focuses on familiarizing students, teachers, and parents with the fundamentals of prompt engineering to guide generative AI tools effectively in order to obtain desired outcomes and enhance their overall effectiveness.*

*This collaboration between the Ministry of Education and SDAIA reflects joint efforts to maximize the use of data and artificial intelligence and to reinforce the Kingdom's leadership in this field, thereby contributing to the realization of* ***Saudi Vision 2030*** *and its aspirations for global competitiveness. Generative artificial*

*intelligence has emerged as one of the most prominent and advanced areas of technological innovation, representing a qualitative leap in the ability to generate creative and innovative content in various formats.*

2. *The Kingdom of Saudi Arabia ranked **first in the Arab world** and **22nd globally** in the Global Artificial Intelligence Index in 2020.*
3. *The value of the **big data and artificial intelligence market** in Saudi Arabia reached **USD 164.98 million** in 2020 and is projected to grow to **USD 891.74 million** by 2026.*
4. *The launch of the **National Strategy for Data and Artificial Intelligence** to develop and enhance the utilization of artificial intelligence across all sectors, such as energy, industry, education, and health, within the new data-driven era (Al-Mohammed et al., 2021).*
5. *A clear national transformation toward a **knowledge- and technology-based economy**: Saudi Vision 2030 places the development of digital skills and knowledge-based education at the core of national development, making the Kingdom an appropriate environment for studying the integration of artificial intelligence technologies in education.*

6. ***National training initiatives and capacity building****: Programs such as the "One Million Saudis in Artificial Intelligence" initiative and teacher training programs demonstrate substantial human capital investment and training infrastructure that can be examined and assessed in terms of their educational impact.*
7. ***Advanced digital infrastructure and high internet penetration****: Saudi Arabia enjoys very high levels of internet coverage and digital adoption, with internet penetration rates approaching **99%**, which facilitates the implementation of digital educational interventions and the measurement of their impact on self-directed learning.*
8. *A **rapidly growing e-learning market and applied opportunities**: The expansion of the **EdTech** market and related investments provides a favorable environment for practical experiments and educational and commercial models that can be evaluated for effectiveness.*
9. ***Research gaps and local data needs****: Despite ongoing initiatives, there remains a clear need for local research assessing the impact of artificial intelligence technologies on curricula and the effectiveness of self-directed learning within the Saudi cultural and educational context. This justifies selecting Saudi Arabia as the study population, as it can yield findings that are locally applicable.*

***Temporal Boundaries***

*The temporal scope of the study extends* ***from 2002 through the first semester of the academic year 2025***.

## Study plan:

***Preliminary Chapter: Theoretical Framework and Scientific Concepts***

*Scientific and technological advancements in the 21st century have brought profound and radical transformations, accelerating communication processes and enhancing overall performance. Today, the world is increasingly moving toward leveraging fifth-generation (5G) internet technology, connecting everything identifiable via internet protocols. Technical barriers no longer impede the rapid development of this service in the modern era.*

*The information revolution, with its enormous power and capabilities, has become the backbone of all potential changes across various aspects of life and technology-driven sectors. Technology has become a defining feature of civilizational, technological, and economic progress. Among the most notable applications of this revolution are virtual learning environments and artificial intelligence (AI).*

*Since this study focuses on evaluating the effectiveness of AI-based virtual learning environments in developing educational skills, advancing curricula, and enhancing students' motivation for self-directed learning, the research literature can be organized into several main axes:*

***Chapter One: The Concept of Artificial Intelligence***

***Section One: The Concept of Artificial Intelligence in Education***

1. ***Definition and Types of Artificial Intelligence***
2. ***Categories of Artificial Intelligence***
3. ***Curriculum Development Using Artificial Intelligence***

***Section Two: Applications of Artificial Intelligence to Support Teachers***

1. ***Predictive Analytics***
2. ***Enhancing Teacher Productivity***
3. ***Benefits of AI-Based Learning for Teachers and Students and Increasing Students' Motivation for Self-Directed Learning***

***Section Three: Global Experiences in Employing AI in Education***

1. ***The American Experience in Using AI in Education***
2. ***The Chinese and Japanese Experiences in Smart Education***
3. ***Experiences of Arab Countries (Saudi Arabia, UAE, Egypt) and Lessons Learned from Global Practices***

***Chapter Two: Future Trends in the Use of AI in Education***

***Section One: AI in Supporting Learners with Special Needs***

1. ***Needs of Students with Special Needs***
2. ***Classification and Development of Life Skills for Students with Special Needs***
3. ***Interactive Multimedia Smart Learning Programs Online and Future Perspectives on Using AI in Developing Life Skills for Special Needs Students***

***Section Two: Integrating AI with Virtual and Augmented Reality (AI + VR/AR)***

1. ***Understanding AI and Augmented Reality Fundamentals***
2. ***How AI and Augmented Reality Work Together***
3. ***Examples of AI and AR Integration in Educational Applications***

***Section Three: AI in Designing Immersive Learning Environments***

1. ***Technology-Supported Immersive Learning***
2. ***What Makes Student Information Systems Ideal for Immersive Learning***
3. ***Steps to Use SIS to Support Immersive Learning***

***Chapter Three: Advantages and Disadvantages of AI-Based Learning***

***Section One: Advantages of Artificial Intelligence***

1. ***Technical Advantages of AI***
2. ***Advantages of AI for Teachers***
3. ***Advantages of AI for Students***

***Section Two: Disadvantages of Artificial Intelligence***

1. ***Increase in Unemployment***
2. ***Reduction in Creativity and Lack of Improvement***
3. ***Security and Privacy Risks***

***Section Three: Challenges and Ethical Concerns***

1. ***Technical and Technological Challenges***
2. ***Educational and Pedagogical Challenges***
3. ***Ethical and Social Challenges***

## Conclusion:

*In conclusion, this study confirms that artificial intelligence (AI) has become one of the most significant achievements of the modern era, bringing a qualitative transformation across various fields of life. The advanced technical features of AI have enabled humans to achieve accomplishments that were previously unimaginable, such as analyzing massive amounts of data in mere seconds, accurately predicting future events, operating intelligent robots, and developing more efficient and intelligent educational and medical systems.*

*AI has proven that it is not merely a transient technology but a foundational pillar for building the future. Thanks to its capabilities in learning, reasoning, and decision-making, AI serves as a tool that helps humans innovate and solve complex problems more effectively. However, it remains crucial to use this technology with caution and responsibility to ensure it serves humanity and is directed toward good and progress rather than harm or control.*

*The future of AI presents numerous opportunities and challenges, but through knowledge and collaboration, we can ensure that this development becomes a source of strength and benefit for all humans, contributing to the creation of a smarter, more advanced, and humane world.*

### *Study Material and Tools*

### *A. Study Material*

- *Preparing professional development workshops for teachers to enhance their skills in AI-based teaching.*

- *Enriching learning activities, educational videos, and some evaluative vocabulary related to the school textbook, incorporating AI technologies.*
- *Developing daily lesson plans supplemented with enrichment and evaluation activities that include AI technologies.*
- *Designing an interactive booklet to support the teaching of English, included under the title "Knowledge Production for Experience Transfer."*

  *The interactive booklet will be appended at the end of the study for practical use.*

***B. Study Tool***

*The researcher prepared an achievement test covering levels of* ***recall, comprehension, analysis, synthesis, and evaluation*** *to measure the students' academic improvement before and after using AI technologies (pre-test and post-test). The test was multiple-choice, designed to assess the knowledge structure students acquired during the study period. It covered content from a unit of English grammar lessons (Simple Past Tense and Present Simple Tense) from the Top Goal textbook for sixth grade. This type of test was selected due to its* ***high objectivity****, as scoring does not vary between evaluators. It also covers a wide range of topics from the unit and assesses multiple learning outcomes at different levels, without requiring a lengthy time to record responses.*

*Additionally, the researcher prepared a* ***questionnaire*** *to measure students' attitudes toward self-directed learning using AI applications. The questionnaire included dimensions such as* ***motivation for self-learning, use of independent learning strategies, and problem-solving skills****.*

*Validity of the Questionnaire:*

- ***Face validity (expert validity):*** *The questionnaire was presented to a group of experts specialized in learning technologies, curricula, teaching methods, and educational psychology. Revisions were made based on their recommendations, including the deletion of two items from the first dimension and rewording some statements. The final questionnaire consisted of 15 items, approved by the experts for content validity.*

## *Internal Consistency Validity*

***Internal consistency validity*** *of the questionnaire was verified by calculating the correlation coefficients between each dimension and the total score of the questionnaire, obtained from the pilot study. The pilot study included* ***60 primary school students****, and the researcher used the* ***SPSS statistical package*** *to compute the correlation coefficients. The results are presented in the following table:*

**Table (2): Correlation Coefficients Between Each Dimension and the Total Questionnaire Score**

| Dimension | Correlation Coefficient |
|---|---|
| **Dimension 1: Importance of AI Technology in the Educational Process** | 0.877 |
| **Dimension 2: Challenges Facing the Use of AI Technology** | 0.625 |

| | |
|---|---|
| **Dimension 3: Impact of AI Technologies on Motivating Students for Self-Directed Learning and Academic Achievement** | 0.932 |

*It is evident from the table above that the correlation coefficients between each dimension and the total questionnaire score are high and statistically significant at* ***p ≤ 0.01****, ranging from* ***0.625 to 0.877****. This indicates good internal consistency and construct validity.*

**Questionnaire Reliability**

The reliability of the questionnaire was calculated using the **SPSS statistical package** by applying it to the pilot sample and determining the reliability coefficient.

**Statistical Analysis**

The collected data were entered into a computer and analyzed using the **SPSS software**, applying the following statistical procedures to answer the study questions:

- Frequencies (Frequency)
- Percentages (Percentage)
- Arithmetic Mean (Mean)
- Standard Deviation (SD)
- Test Procedures (Tests)
- One-Way ANOVA
- LSD Test

## Questionnaire Results and Discussion

*This section presents the results obtained from the questionnaire after statistical analysis. To answer the study questions, the responses of the study sample were statistically processed using **SPSS**, and arithmetic means and standard deviations for each question were calculated. Additionally, statistical significance of differences in responses was analyzed based on variables such as **gender** and **cumulative GPA**.*

*The following table shows the results for questions related to the **importance of AI technology in the educational process** from the perspectives of students, teachers, and parents. Percentages, means, and standard deviations of responses are presented:*

***Table (3): Means, Standard Deviations, and Percentages of Study Sample Responses Regarding the Importance of AI in the Educational Process***

| Question | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Mean | SD |
|---|---|---|---|---|---|---|---|
| **Considers individual differences among students** | 37.12 | 33.62 | 19.65 | 6.5 | 0.54 | 3.95 | 1.02 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Provides feedback to teachers and students** | 36.68 | 46.29 | 12.66 | 3.49 | 0.87 | 4.14 | 0.83 |
| **Offers flexibility in presenting educational content** | 39.04 | 44.29 | 13.16 | 2.19 | 0.88 | 4.17 | 0.85 |
| **Supports student personality development** | 28.51 | 44.74 | 18.42 | 7.46 | 0.88 | 3.91 | 0.95 |
| **Helps students break free from traditional learning** | 41.85 | 31.72 | 17.62 | 7.05 | 1.76 | 4.01 | 1.08 |
| **Reduces stress from trial and error in learning** | 37.72 | 34.21 | 19.30 | 8.03 | 0.44 | 3.99 | 1.01 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Meets the needs of students with special needs** | 46.26 | 33.04 | 17.18 | 2.64 | 0.88 | 4.17 | 0.96 |
| **Teacher becomes merely a guide** | 25.33 | 26.22 | 26.67 | 16.44 | 5.33 | 3.44 | 1.26 |
| **Helps students make appropriate educational decisions** | 35.96 | 39.04 | 17.54 | 6.57 | 0.88 | 4.01 | 0.97 |
| **Provides personalized learning according to student preferences** | 39.65 | 37.00 | 17.62 | 3.96 | 1.76 | 4.05 | 1.01 |
| **More accurate in assessing student levels** | 36.44 | 36.89 | 21.15 | 5.73 | 0.44 | 4.02 | 1.00 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **compared to traditional systems** | | | | | | | |
| **Provides educational decisions regarding the progress of the learning process** | 31.72 | 41.14 | 21.59 | 3.96 | 1.32 | 3.95 | 0.97 |
| **Increases student motivation for self-directed learning** | 33.77 | 42.54 | 17.11 | 5.70 | 0.88 | 4.01 | 0.94 |
| **Reduces learning hours for various subjects** | 28.82 | 39.30 | 23.14 | 7.42 | 1.31 | 3.87 | 0.96 |
| **AI-supported programs** | 42.65 | 37.55 | 14.41 | 5.24 | 0.44 | 4.16 | 0.89 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **help students acquire basic skills** | | | | | | | |

*It is evident from the table that **AI technology has significant importance in the educational process**, as it allows students to learn anytime and anywhere, providing flexibility in presenting educational content suitable for their abilities while considering individual differences. AI also plays a role in meeting the needs of students with special needs by offering appropriate programs.*

*AI-supported programs focus on equipping students with basic skills and providing feedback to both students and teachers. Previous studies have also confirmed the effectiveness of AI in achieving various educational objectives, including academic achievement, retention of learning, and correcting misconceptions (Jena, 2018; Abu Shalla, 2012).*

***Classroom Observations and Follow-up***

*Finally, **classroom interviews and observation checklists** were used to monitor students' behaviors while learning using AI applications, including: participation levels, self-reliance, use of diverse resources, problem-solving skills, and feedback on their experiences with AI-based learning tools.*

## Recommendations:

### *Future Recommendations*

1. ***Expanding the use of Artificial Intelligence (AI) in education*** *by integrating interactive learning tools and adaptive learning systems into curricula, which enhances students' motivation for self-directed learning and encourages active participation in the learning process.*
2. ***Training teachers to effectively utilize AI technologies*** *within classrooms to ensure optimal interaction between students and technology, while enhancing modern teaching skills.*
3. ***Developing flexible, digital, and personalized curricula*** *that consider students' individual differences and rely on the data and analyses provided by AI systems to guide the learning process.*
4. ***Creating intelligent learning environments*** *that continuously analyze students' performance and provide immediate feedback to help them improve independently, thus supporting autonomous and sustainable learning.*
5. ***Encouraging universities and educational research centers*** *to conduct further studies on the impact of AI on academic achievement and students' intrinsic motivation for learning.*
6. ***Revising national education policies*** *to incorporate AI principles and 21st-century skills into future educational goals, ensuring the development of advanced educational systems.*
7. ***Strengthening partnerships between Ministries of Education and technology companies*** *to develop innovative educational tools that support both learners and teachers, contributing to effective digital learning environments.*

8. ***Focusing on ethical values in smart education*** *to ensure the safe and responsible use of AI technologies, while promoting awareness of the balance between technological knowledge and human values.*

*In light of the results obtained from this study regarding the impact of AI technologies on the educational process and their role in enhancing students' motivation for self-directed learning, it is evident that AI is no longer merely a supportive technical tool, but a fundamental component in building advanced educational systems that respond to learners' needs in the digital era.*

*The study's findings demonstrated that integrating AI contributes to improving educational quality by activating the student's role as an active participant in learning, developing skills in research, analysis, and problem-solving, thereby enhancing their ability for continuous self-directed learning.*

*From this perspective, the study emphasizes the importance of redesigning curricula to be more flexible and adaptive to modern technologies, alongside preparing educational staff to employ AI innovatively to support active and sustainable learning. It also calls for leveraging these findings to shape a future educational vision that balances technical knowledge with human values, achieving a more inclusive and effective learning system.*

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دراسة ميدانية شملت طلاب كليات التربية في عدة بلدان، تبحث في العلاقة بين AI والدافعية الذاتية للتعلّم.

3-The Role of Artificial Intelligence in Shaping High School Students' " . Motivation" (2024). International Journal of Technology in Education and Science (IJTES), 8(2), 311-324. https://doi.org/10.46328/ijtes.553

تستهدف طلاب المرحلة الثانوية وتستعمل نظرية تحديد الذات (Self-Determination Theory) كإطار، وهو مناسب إذا كان بحثك يشمل التعليم قبل الجامعي.

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دراسة تجمع بين الكمي والنوعي تبحث التعلّم المنظَّم ذاتياً (SRL) في سياق استخدام أنظمة AI التكيّفية. يمكن أن تستفيد منها لبناء توصيف لمكونات "منهج المستقبل" الذي يتيح التعلّم الذاتي.

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مراجعة منهجية تتيح لك استخلاص اتجاهات البحث الرئيسة، الفجوات، والتوصيات