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| "دور الذكاء الاصطناعي في إعادة تشكيل النماذج التربوية التقليدية: دراسة تحليلية للتحولات الرقمية في مجالات العملية التعليمية المختلفة" | اسم الباحث الأول باللغتين العربية والإنجليزية |
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الملخص:

تهدف الدراسة الحالية إلى البحث في مجالات الإفادة من الذكاء الاصطناعي في العملية التعليمية، وكيفية الاستفادة من تطبيقاته وتقنياته في مجالات العملية التعليمية. تم اتباع المنهج النوعي، واستخدمت أسلوب المراجعة الأدبية، المتمثل في مراجعة الأوراق البحثية والدراسات والرسائل العلمية التي بحثت في موضوع الذكاء الاصطناعي في العملية التعليمية في الفترة الزمنية الواقعة بين 2020 وحتى9/ 2023. أظهرت النتائج توظيف الذكاء الاصطناعي في أربعة مجالات رئيسة وهي: المحتوى، طرق التدريس، التقييم، والتواصل. وأنه يوفر محتوى افتراضيا ضخما يشمل مؤتمرات الفيديو والمواقف التعليمية، والدورات التدريبية والوثائق السمعية والبصرية، والعديد من الإمكانيات التي تتلاءم احتياجات الطلبة، وفي مجال طرق التدريس توصلت الدراسة إلى أن الذكاء الاصطناعي يوفر طرق تدريس مبتكرة، وتقدم طرقا جديدة للتفاعل مع المعلومة بالاعتماد على التكنولوجيا الحديثة، والتي تتمركز حول الطالب، مثل: طرق التعلم الآلي والإلكتروني، استخدام الصفوف الذكية والروبوتات بأنواعها. وفي مجال التقييم تستخدم تقنيات الذكاء الاصطناعي في أتمتة الواجبات الإدارية وتصميم الاختبارات وأوراق العمل وتعديل المحتوى التعليمي بناء على أداء الطلبة، كما تعمل التقنيات على تقديم تغذية راجعة فورية للطلبة تمكنهم من تحسين أداءهم. وأما في مجال التواصل فتوصلت الدراسة إلى أن الذكاء الاصطناعي يساهم في تعزيز طرق الاتصال والتواصل بين الطلبة أنفسهم، وبين المعلمين والطلبة لتحسين مهاراتهم ومعارفهم وتطوير قدراتهم، ولمعالجة القضايا التعليمية سواء من خلال التعلم المباشر أو غير المباشر ممن خلال منصات تعليم ذكية للتعلم عن بعد بما يوفر المشاركة المحسنة. وأوصت الباحثة بتنفيذ ورشات عمل تدريبية للمعلمين والإدارات المدرسية باستخدام تقنيات الذكاء الاصطناعي في مجالات العملية التعليمية: المحتوى، طرق التدريس، التقييم، والتواصل. كما أوصت بتطوير المناهج الدراسية والبنى التحتية في المدارس؛ لتوظيف تقنيات الذكاء الاصطناعي.



**كلمات مفتاحية: (الذكاء الاصطناعي،، التحولات الرقمية، منهجيات التدريس، أنظمة التقييم الذكية)**



## Abstract:

The current study aims to explore the applications of artificial intelligence (AI) in education and how its technologies can be utilized to enhance the educational process. A qualitative methodology was adopted, employing a literature review of research papers, studies, and theses published between 2020 and September 2023. The findings reveal that AI is applied in four main areas: content, teaching methods, assessment, and communication. AI provides vast virtual content, including video conferences, educational scenarios, training courses, and audiovisual materials tailored to students' needs. In teaching, AI offers innovative, student-centered methods such as machine learning, e-learning, smart classrooms, and robotics. For assessment, AI automates administrative tasks, designs tests, adjusts educational content based on student performance, and provides instant feedback to improve learning outcomes. In communication, AI enhances interaction among students and between teachers and students, improving skills and knowledge through direct and indirect learning via smart platforms. The study recommends organizing training workshops for teachers and school administrators on AI applications in education and calls for curriculum and infrastructure development to effectively integrate AI technologies.



**Keywords: (Artificial Intelligence, Digital Transformations, Teaching Methodologies, Smart Assessment Systems)**

## Introduction

Artificial Intelligence, abbreviated as (AI), is one of the computer sciences born out of the contemporary technological revolution. It aims to simulate human intelligence capabilities through machines by understanding the complex mental processes the human mind undertakes during thinking and information processing. These mental processes are then translated into equivalent computational operations that enhance a computer's ability to solve complex problems (Turah, 2021, pp. 14-15). Due to the importance of AI in the education sector, recent interest has grown in leveraging its potential to address various educational challenges.

Although AI carries certain risks, its educational benefits are significant, including personalized learning, improved assessment, reduced planning time for teachers, and mitigating cheating risks (Pazmiño, 2023). It also greatly enhances competitiveness and produces generations capable of facing the challenges of their time, as confirmed by numerous studies. Among the advantages of AI in education are: improving decision-making, enhancing education quality, developing life skills, and boosting students' cognitive achievement (Khalida, 2023). Its applications are used in many areas of the teaching-learning process, such as research, design, creating educational content, writing articles and research papers, storytelling, generating tests, and preparing presentations (Shaltout, 2023).

AI is also employed as student-centered teaching methods, providing learners with new educational experiences where teachers facilitate, guide, and monitor student performance, identifying and addressing weaknesses. AI applications can also play a role in instant student assessment, tracking responses to help improve academic performance, and providing immediate and continuous feedback. This enhances learning quality by identifying learner difficulties through exercises and tests (Shahata, 2022, p. 208).

Given the importance of AI and its technologies in education, this research explores the areas of AI utilization in the teaching-learning process in detail, aligning with modern global and local trends. The findings may reflect on educational practices and answer questions that could serve as a reference for educational policymakers and curriculum developers.

## Research Problem and Questions

Many educational studies have addressed the use of technology and AI in education, highlighting their positive impact. These include Chassignol et al. (2018), which showed that AI applications improve education quality, and Lawan et al. (2023), which found that AI enhances student engagement and retention by transforming the traditional role of teachers.

Through her practical experience in education and direct supervision of the teaching process as a school principal, the researcher observed a lack of AI integration in education despite its proven benefits. Additionally, teachers' awareness of AI applications and their positive effects on student learning appears limited. This justifies the need to explore AI's potential in education to enhance its quality. Hence, this study seeks to answer the following questions:

1. What are the areas of AI utilization in the teaching-learning process?
2. How can AI applications be effectively leveraged in educational contexts?

## Research Objectives

The study aims to:

1. Identify the areas of AI utilization in the teaching-learning process.
2. Explore how AI applications can be effectively used in education.

**Significance of the Study**

This study responds to modern global and local trends by examining AI's role in education. It may enrich scientific knowledge, open new research avenues, and influence educational practices. Additionally, it could provide insights for educational policymakers and curriculum developers.

**Study Limitations**

The study is confined to:

- **Thematic Scope:** Areas of AI utilization in education and how to leverage its applications.
- **Time Frame:** Research published between 2020 and September 2023.
- **Geographical Scope:** Studies available on **Semantic Scholar** and **Google Scholar**.

**Key Terms**

- **Artificial Intelligence (AI):** Technically, it refers to building machines capable of performing tasks that require human-like intelligence. It can be defined as a technology enabling logical reasoning, inference, and explanation by machines, mimicking human capabilities in a given field (Mohamed, 1999, p. 230).
- Khalida (2023) defines AI as a relatively new computer science field aimed at designing intelligent systems that emulate human intelligence to perform tasks autonomously, using qualitative and logical-computational properties.
- Shahata (2022, p. 207) describes AI as the science of enabling electronic systems to exhibit human-like intelligence, allowing them to think, make decisions, and act accordingly based on assigned tasks.

**Research Methodology**

This study adopts a **literature review** approach, analyzing research papers, studies, theses, books, and journals addressing AI in education.

**Research Procedures**

To achieve the study's objectives, the researcher:

1. Identified relevant keywords: *AI in education, Artificial Intelligence in Education: A Review*.
2. Selected peer-reviewed studies published between 2020–2023 on **Semantic Scholar** and **Google Scholar**.
3. Categorized findings based on Chassignol et al.'s (2018) four domains: **content, teaching methods, assessment, and communication**.
4. Discussed results and formulated recommendations.

**Study questions**

**First Question:**

**"What are the areas of utilizing artificial intelligence in the educational process?"**

To answer this question, the researcher referred to the study by Chassignol et al. (2018), which identified the results related to the applications of AI in education. The findings showed that AI tools and techniques are applied in several areas of the educational process, as illustrated in **Figure (1)**:

***(Figure 1: Areas of AI Applications in the Educational Process)***

Figure (1) represents the educational domains where AI can be employed: **content development, teaching methods, assessment, and communication**. Chassignol et al. (2018) defined these areas, explaining that:

- **"Content"** refers to the knowledge, information, and skills taught by teachers and expected to be learned by students in a specific subject. It includes both educational content and its personalization.
- **"Teaching methods"** represent the principles and techniques teachers use to facilitate learning, influenced by both the subject matter and learners' nature. This field is particularly significant as teaching strategies are increasingly shaped by new technologies. AI can be integrated into content and teaching methods to achieve **personalized learning, adaptive instruction, and educational robotics**.
- **"Assessment"** includes various methods and tools teachers use to evaluate students' academic progress, skill acquisition, and learning needs. The importance of technology-enhanced assessment has grown with the rise of online learning platforms and MOOCs (Massive Open Online Courses), necessitating automated tools to streamline evaluation and identify learning gaps.
- **"Communication"** is essential for interaction between students and teachers, as well as among students themselves. Examples include **intelligent tutoring systems**.

Additionally, two more areas can be included beyond Chassignol et al.'s (2018) framework: **planning** and **curriculum development**. AI tools can assist in designing daily lesson plans, semester-wide instructional strategies, and school-level developmental plans. They can also contribute to **enhancing curricula, teaching methods, and assessment techniques** to improve learning outcomes.

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**Second Question:**

**"How can AI applications be utilized in the educational process?"**

To answer this question, the researcher reviewed studies and scientific papers on AI in education, categorizing the findings according to Chassignol et al.'s (2018) four domains. The results are as follows:

**1. Educational Content:**

AI provides **virtual content**, including video conferences, lectures, online educational scenarios, and digitized textbooks converted into interactive online courses (Abu Al-Majd, 2023). It also helps tailor content to students' needs (Chen et al., 2020), offers **individualized support**, and enhances learning flexibility by integrating real-life applications. AI facilitates **multimedia learning** (audio-visual aids, simulations) for complex concepts (Al-Mahdi, 2021, p. 137). Applications like **STEM-based systems** (Zafari et al., 2022) and tools for **content creation** (e.g., writing articles, research papers, stories, and presentations) are also prominent (Shaltout, 2023). **Figure (2)** illustrates AI's role in educational content.

***(Figure 2: AI Applications in Educational Content)***

The figure highlights AI's contributions to **content creation, summarization, organization, and format conversion**. The researcher notes that advancements like **ChatGPT, Copilot, and Gemini** aid learners in research, idea generation, and text analysis, but their effective use requires **teacher training and technological literacy**.

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**2. Teaching Methods:**

AI promotes **innovative teaching strategies** (Middle East PLI, 2023), enabling **personalized,**

**learner-centered education** (Abu Al-Majd, 2023; Ouyang & Jiao, 2021). It provides **new interactive experiences**, where teachers guide students while monitoring their progress and addressing weaknesses (Shaltout, 2023). Common AI-driven methods include:

- **Machine learning** and **intelligent tutoring systems** (Zafari et al., 2022).
- **E-learning platforms** (Abu Al-Majd, 2023).
- **Collaborative and independent learning technologies** (Al-Mahdi, 2021, p. 137).
- **AI teachers, smart classrooms, and individualized instruction** (Lewis & Al-Azab, 2023, p. 6).
- **Flipped learning** via tools like ChatGPT (Lawan et al., 2023).
- **Virtual Reality (VR)** for immersive, self-directed learning (Shaheen, 2023).
- **Augmented Reality (AR)**, blending virtual and real environments for engaging lessons (Al-Khaibari, 2020, p. 139).

***(Figure 3: AI Applications in Teaching Methods)***

The figure showcases AI's role in **technology-enhanced, student-focused teaching**. However, the researcher emphasizes that these methods require **infrastructure, training, and curricular adjustments** for effective implementation.

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**3. Assessment:**

AI **automates administrative tasks**, designs and evaluates tests (Abu Al-Majd, 2023), and modifies courses via platforms like **Coursera** and **MOOCs** by flagging common student errors (Turah, 2020). It enhances **primary and secondary education assessments** through:

- **Neural networks** and **natural language processing** for objective grading.
- **Educational robots** to analyze learning processes (Comesaña et al., 2023).
- **Instant feedback** to identify learning gaps (Shahata, 2022, p. 208).

***(Figure 4: AI Applications in Assessment)***

The figure highlights AI's use in **automating tasks, test design, performance prediction, and feedback**. The researcher notes its growing role in **e-learning and blended education**, particularly for remote student evaluation.

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**4. Communication:**

AI enhances **student-teacher and peer interactions** (Ouyang & Jiao, 2021), supports **distance learning platforms** (Turah, 2020), and improves **collaboration** (Middle East PLI, 2023). Studies show the effectiveness of:

- **Chatbots** in aiding students with mild intellectual disabilities (Matar & Saleh, 2021).
- **AI-driven language learning** (Ahmed, 2023).

***(Figure 5: AI Applications in Communication)***

The figure demonstrates AI's role in **facilitating communication among students, teachers, and parents**. However, the researcher notes **underutilization in schools** due to implementation challenges.

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**Discussion of Findings:**

The results of the **first question** confirm that AI can be applied in **four key areas** (Chassignol et al., 2018), with potential additions of **planning and curriculum development**.

For the **second question**, AI's applications include:

- **Content**: Virtual lectures, multimedia resources, and automated content creation.
- **Teaching methods**: Personalized learning, VR/AR, and flipped classrooms.
- **Assessment**: Automated grading and adaptive feedback.
- **Communication**: Intelligent tutoring and collaborative platforms.

The researcher highlights **emerging AI advancements** and calls for **collaborative efforts** to integrate these technologies into schools.

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**Palestinian Context:**

The **Ministry of Education** has initiated steps to integrate AI, focusing on **content and teaching methods** through:

- **Summer tech camps**.
- **National AI and Robotics Olympiads**.
- **Teacher training programs**.
- **Awards for AI research** (e.g., Dr. Fathia Nassar Award).
- **Projects promoting creativity and programming** in schools.

To sustain progress, the researcher recommends **infrastructure development, curriculum modernization, and teacher training**.

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**Recommendations:**

Based on the findings, the researcher recommends:

1. **Workshops** for teachers and administrators on AI applications in **content, teaching, assessment, and communication**.
2. **Upgrading school infrastructure** to support AI technologies.
3. **Curriculum reforms** to align with AI advancements.

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