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Artificial Intelligence as an Educational Tool: Challenges and Opportunities for Teaching

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Abstract

Artificial intelligence (AI) is gradually being integrated into education, transforming teaching practices by enabling the automation of corrections, real-time content adaptation, and the creation of interactive environments. AI offers vast opportunities to personalize learning paths, enhance student engagement, and address the diversity of learner profiles. However, its use raises questions about its impact on teaching quality and student engagement. This study focuses on the perceptions of teachers and students regarding AI integration, aiming to understand its effects on teaching effectiveness and student engagement. The results indicate that AI improves the quality of teaching as perceived by teachers and enhances student engagement, although this largely depends on teacher training and available infrastructure.

Keywords

Artificial Intelligence, Pedagogical Tools, Student Engagement, Teaching Effectiveness, Perception of Teaching Quality.

XXVI. INTRODUCTION

Artificial intelligence (AI) is today emerging as a major lever for transformation in many fields, and education is no exception to this dynamic. Once seen as a cutting-edge technology reserved for research or industry, AI is now progressively entering higher education institutions, online learning platforms, and everyday pedagogical tools. From automated grading to real-time content adaptation based on the learner's profile, and the creation of interactive environments, AI offers significant possibilities to rethink the act of teaching and learning.

This technological evolution occurs in a context where expectations from education are continually rising: personalized learning paths, teaching effectiveness, student engagement, and the management of heterogeneous classes, among others. In this framework, AI is often presented as an innovative solution capable of supporting the teacher while addressing the specific needs of learners.

However, the pedagogical use of artificial intelligence raises a significant question: How does the integration of AI into teaching practices influence the quality of teaching as perceived by teachers and student engagement in the learning process?

This study aims to explore the effects of artificial intelligence (AI) as a pedagogical tool on teaching practices and student learning, focusing on teachers' perceptions and learner engagement. More specifically, it seeks to:

Identify the extent to which AI usage influences teachers' perceptions of the quality and effectiveness of their teaching.

Measure the perceived impact of AI on student engagement, particularly in terms of attention, active participation, and motivation.

By addressing these objectives, this research aims to provide valuable insights for teachers, educational leaders, and technology developers, to support thoughtful, inclusive, and effective use of artificial intelligence in teaching.

XXVII. LITERATURE REVIEW

A. AI in the Educational Context

The integration of artificial intelligence (AI) into pedagogy is reshaping educational practices by offering personalized learning experiences and improving teaching effectiveness. AI technologies, such as intelligent tutoring systems and machine learning algorithms, facilitate adaptive learning and provide personalized feedback, which can significantly improve student engagement and outcomes (Liu et al., 2024; Solorzano et al., 2024).

However, challenges persist, including concerns about excessive dependence on technology, data protection, and the need for adequate teacher training (Talgatov et al., 2024; Taufikin et al., 2024). Research indicates that, while AI can enrich learning, it should complement, not replace, traditional

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teaching methods to promote critical thinking and student autonomy (Talgatov et al., 2024).

Moreover, a bibliometric analysis highlights a growing body of publications on AI's transformative potential in education, suggesting that continuous development and ethical considerations are essential for effective integration (Okagbue et al., 2023). Thus, a balanced approach is crucial to leverage the benefits of AI while addressing the challenges it presents in educational environments.

B. Perception of Teaching Quality

Recent studies explore the perception and impact of artificial intelligence (AI) in higher education. Both students and teachers generally have a positive view of AI, recognizing its potential to improve teaching effectiveness and personalize learning (Bustamante Morán et al., 2025; Puente-Aguilar, 2025). While 80% of teachers consider AI useful for improving teaching, only 55% have received specific training (Bustamante Morán et al., 2025). Students show a strong interest in learning about AI, with 44% of them considering it essential to their academic training (Puente-Aguilar, 2025). AI enables real-time data analysis for personalized teaching and more precise evaluation (Jardón Gallegos et al., 2024). Overall, a responsible and ethical integration of AI can significantly contribute to the teaching-learning process.

The effectiveness of AI strongly depends on teachers' perceptions of educational technologies and their confidence in using them (Ayanwale et al., 2022; Chou et al., 2022; Lin, 2022). To improve teaching effectiveness, it is deemed crucial to improve teachers' perceptions of educational technologies (ET). It is increasingly evident that universities must create a culturally favorable environment for shared intelligence, encouraging teachers to use more modern pedagogical technologies, thus achieving more significant educational outcomes (Lin, 2022).

This is explained by the fact that AI-assisted teaching represents both progress and a gradual process. With adequate organizational support or a favorable classroom culture, teachers better perceive the real need for AI-assisted teaching, which motivates them and strengthens their confidence in implementing these practices, leading to better pedagogical effectiveness (Lin, 2022). Ahmad et al., (2021) studied the role of AI applications in education and found that social communication robots, intelligent learning, and intelligent teaching systems played an important role in improving the repetition of skill practices in learners. AI-assisted teaching can clearly improve teaching effectiveness by allowing teachers to develop more personalized teaching plans. Du Boulay, (2016) demonstrated that combining AI with teaching allowed teachers to better understand the essence of learning and teaching, and helped learners acquire new skills or better understand concepts.

In this continuity, teachers evaluate the effectiveness of AI-based products based on criteria such as precision, content creativity, and readability. AI-assisted inquiry-based learning enables curriculum integration, cooperative teaching, and integrated teaching strategies with ICTs, thereby promoting the development of critical thinking among students (Chou et al., 2022).

Moreover, the results of Moran's study (2025) show that teachers have a generally positive perception of the integration of artificial intelligence (AI) in teaching and learning processes. However, they also identify barriers, such as the lack of specialized training and limited technological resources. This emphasizes the need to design institutional strategies promoting digital literacy and continuous AI training for teaching staff. Teachers recognize AI's transformative potential in education, but their in-depth understanding and practical application remain limited (Aghaziarati et al., 2023). Additionally, recent research indicates that teachers' attitudes toward AI are influenced by their familiarity with the technology and their perception of its relevance in the educational context (Mutanga et al., 2024). Various studies have investigated teachers' perceptions of AI in education. Infante (2023) conducted research at the Urdesa Higher Technological Institute in Guayaquil, revealing that a large percentage of teachers have a positive view of AI, recognizing its potential to enrich the educational process. However, a lack of adequate training was also identified, limiting its effective implementation. On the other hand, Basantes Ortega et al., (2025) highlighted multiple challenges in adopting AI in Ecuador, emphasizing the teacher training gap and the digital divide as major obstacles.

C. Student Engagement

Artificial intelligence (AI) significantly improves student engagement in educational environments by offering personalized learning experiences, real-time feedback, and interactive environments. AI-based technologies, such as personalized learning algorithms, intelligent tutoring systems, and educational chatbots, play a key role in adapting educational content to individual student needs, thus fostering deeper involvement and increased motivation (Singh et al., 2024; Zaharuddin et al., 2024).

Studies have shown that platforms like Knewton, GenAI, and Smart Sparrow effectively increase student engagement by providing instant feedback and adaptive learning pathways, which are essential for maintaining students' interest and improving educational outcomes (Gjermeni & Prodani, 2024). The integration of AI in education helps address the diversity of learning needs and promotes greater student interaction, as well as improved academic performance, as evidenced by comparisons before and after implementation, as well as surveys conducted with students and teachers (Zaharuddin et al., 2024).

However, challenges remain, particularly concerning data protection, ethical considerations, and the need to ensure equitable access to technology. These issues highlight the importance of addressing them to ensure an equitable learning experience for all students (Gjermeni & Prodani, 2024; Singh et al., 2024). Furthermore, the successful implementation of AI-based technologies in education requires adequate technological infrastructure and teacher training to optimize their use and maximize student engagement (Benayache & Mourad, 2024). Overall, while AI holds transformative potential for education, careful attention to ethical and practical challenges is essential for its effective integration(Iyer, 2024).

Recent studies underscore the transformative impact of artificial intelligence (AI) on student engagement in higher education. It has been shown that AI tools significantly improve student engagement levels, with the majority of students reporting extreme engagement (Ezeoguine & Eteng-Uket, 2024). Research indicates high awareness of AI and positive perceptions among students, with 96% recognizing its effective impact on learning (Karim et al., 2025). The integration of AI into education is redefining traditional roles, raising ethical, pedagogical, and legal questions while risking exacerbating access inequalities, particularly in African university systems. The design of AI-driven interfaces for intelligent tutoring systems has shown an improvement in student engagement factors of up to 25.13% (Kim et al., 2020). These results highlight AI's potential to create personalized and adaptive learning environments that enhance student engagement across different profiles. However, concerns about excessive dependence and ethical considerations persist, suggesting that AI should complement, not replace, teachers in the digital age (Karim et al., 2025).

D. Challenges and Opportunities of Using AI in Teaching

Artificial intelligence (AI) emerges as an innovative pedagogical tool in higher education, offering opportunities to personalize learning and improve teaching methods (Many et al., 2024; Silva et al., 2025). AI enables the adaptation of content to individual student needs, automates administrative tasks, and identifies struggling learners (Razouki et al., 2025). The integration of AI facilitates personalized learning experiences through intelligent tutoring systems and smart educational content, which enhance student engagement and adapt to their individual learning needs (Abdurohman, 2025; Tang, 2024). Additionally, AI automates administrative tasks, allowing teachers to focus on strategic pedagogical responsibilities (Erna Widyasari et al., 2024). However, its integration presents challenges, including the need for teacher training, ethical concerns, and resistance to change (Núñez-Michuy et al., 2023; Razouki et al., 2025).

The implementation of AI faces several challenges, including ethical concerns related to data protection, algorithmic bias, and the digital divide, which may exacerbate existing inequalities in access to technology (Abdurohman, 2025; Erna Widyasari et al., 2024). Furthermore, the successful adoption of AI requires comprehensive teacher training and a cultural shift within educational institutions to adopt new methodologies (Xuan Cu, 2024; Xuan Vu, 2024).

Addressing these challenges through collaboration between stakeholders is essential to harness the transformative potential of AI while ensuring equitable and ethical educational practices (Erna Widyasari et al., 2024; Xuan Vu, 2024). Although AI holds significant potential to enrich teaching, it is crucial to maintain a balance between its advantages and ethical and pedagogical considerations (Many et al., 2024; Razouki et al., 2025).

XXVIII. CONCEPTUAL MODEL AND HYPOTHESES

Fig.1 : CONCEPTUAL MODEL

Source: The authors

Perception of Teaching Quality

The integration of artificial intelligence (AI) into teaching practices comes with promises regarding teaching quality, particularly in terms of effectiveness, personalization of learning paths, and teachers' workload. According to Holmes et al., (2019), AI enables teachers to better tailor content to the specific needs of students, save time on administrative tasks (such as grading or planning), and benefit from more precise tracking of learner progress. These elements strengthen the perception of a more structured, targeted, and responsive teaching approach. However, this improvement is closely dependent on the level of teacher training, the technological and pedagogical support provided by institutions, and the degree of integration of tools. Taking these elements into account, the following hypothesis can be proposed:

H1: The use of artificial intelligence improves the quality of teaching as perceived by teachers.

Student Engagement

One of the most discussed effects of artificial intelligence in educational settings is its potential to stimulate student engagement. By offering interactive content, instant feedback, and differentiated learning paths, AI tools are designed to enhance participation, attention, and motivation among learners. Zawacki-Richter et al., (2019) note that AI promotes more active learning by allowing students to progress at their own pace and receive individualized support. This ability to adapt the learning environment to each profile helps maintain constant interest, particularly in digital or hybrid contexts. Despite these limitations, the following hypothesis is formulated:

H2: The use of artificial intelligence increases student engagement in the learning process.

XXIX. RESEARCH METHODOLOGY

A. Chosen Methodology

This study adopts a quantitative hypothetico-deductive approach, aiming to test the theoretical relationships between independent variables (perception of teaching quality, student engagement) and the dependent variable (the use of artificial intelligence). This methodology relies on the formulation of hypotheses based on a theoretical framework, followed by their empirical validation through data analysis collected via a structured questionnaire. Data was gathered from a representative sample of 100 teachers in the Fès-Meknès region and analyzed using SPSS software (version 26).

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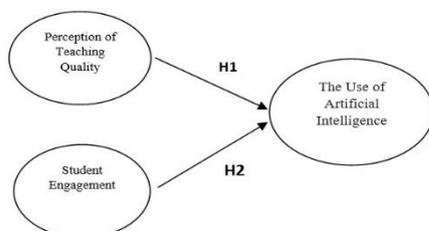
The choice of this methodology is justified by its ability to structure the study around defined concepts, empirically test causal relationships, and ensure the generalizability of the results. The use of SPSS allows for evaluating the reliability of the measures and precisely verifying the relationships between the variables of the conceptual model.

B. Population and Sample

The target population for this study consists of teachers working in higher education institutions. This population was selected due to its gradual exposure to digital tools and its central role in the integration of artificial intelligence (AI) in pedagogical practices. The study thus focuses on their perception of AI usage and its impact on teaching quality and student engagement.
A purposive sampling technique was used to select 100 teachers from different educational levels and backgrounds. This sampling method specifically targets professionals with direct or indirect experience with AI tools in their practice, thus ensuring the relevance of the data collected to analyze the relationships between the variables studied. This methodology also ensures homogeneity in the sample's characteristics, promoting a reliable interpretation of the results.

C. Operationalization of Variables

The operationalization of variables is a crucial step to ensure the validity and reliability of the measures used in this study. Theoretical concepts have been translated into measurable variables using scales adapted to the context of the study.

a. Dependent Variables:
Perception of Teaching Quality

This variable reflects how teachers assess the impact of AI on the quality of their teaching practices. It includes several dimensions, such as clarity of teaching, personalization of learning, reduction in workload, and the ability to track student progress. This approach is inspired by the works of Holmes et al., (2019) and Luckin (2018), who highlight the potential of AI to support teaching effectiveness.

Student Engagement

This variable measures the level of active student involvement in the learning process, as perceived by the teachers. It encompasses indicators such as attention, class participation, and motivation toward AI-assisted teaching activities. This approach is based on the research of Zawacki-Richter et al., (2019) on digital and interactive learning.

b. Independent Variables
Use of Artificial Intelligence

This independent variable is measured through the degree of integration of AI tools into teachers' pedagogical practices. It

takes into account the frequency of use, the diversity of tools employed, and the level of user expertise. It is classified on an ordinal scale ranging from low to intensive, inspired by the typologies proposed by Spector (2020) and Daniel et al. (2021).

c. Construction of Measurement Scales
The variables were measured using 5-point Likert-type scales (1 = "Strongly Disagree", 5 = "Strongly Agree"). The items used for each scale were adapted from well-established works in the literature and validated through a pre-test.

4. Reliability and Validity of the Measures:
In this study, the reliability and validity of the measurement instruments were examined through a pre-test of the questionnaire among a sample of 100 teachers randomly selected from the target population. The data collected were analyzed using SPSS software, version 26, to ensure the rigor of the results.

The internal consistency of the scales was assessed using Cronbach's Alpha coefficient. The results show high reliability for most of the measured dimensions, as presented in the following Table 1:

Table 1: Reliability Results of the Scales

Dimensions	Number of Items	Cronbach's Alpha	Key Observation
Perception of Teaching Quality	4	0,84	Very Good Internal Consistency
Student Engagement	3	0,79	Good Reliability
Use of AI	3	0,77	Good Consistency

Source: Results generated using SPSS (version 26) by the authors

All the scales have an Alpha coefficient greater than 0.75, indicating good internal consistency. No modification or removal of items was necessary. Convergent validity was verified through the analysis of corrected item-total correlations. The results obtained are summarized in the following table:

Table 2: Results of Item-Total Correlations

Dimensions	Range of Correlations with Total Scores	Key Observation
Perception of Teaching Quality	0,72 – 0,83	Very Good Convergent Validity
Student Engagement	0,68 – 0,80	Good Convergent Validity
Use of AI	0,67 – 0,79	Good Convergent Validity

Source: Results generated using SPSS (version 26) by the authors

These results confirm that the items within the same scale converge to measure the same concept. Additionally, the correlations between the dimensions are moderate, which validates the conceptual independence of the scales (discriminant validity).
The reliability and validity analyses demonstrate high internal consistency and satisfactory validity for the scales measuring the perception of teaching quality, student engagement, and the use of artificial intelligence.

XXX. RESULTS AND DISCUSSION

A. Presentation of Results
1.1. Overall Analysis of the Relationships Studied
a. Relationship between the use of AI and the pedagogical variables studied:
The multiple regression analysis shows that the overall model is statistically significant ($F_{(2,97)}=41.862$, $p<0.001$), indicating that the use of AI significantly contributes to explaining the variance observed in the two dependent variables.
The adjusted R^2 value is 0.464, meaning that 46.4% of the combined variance in the perception of teaching quality and student engagement is explained by the degree of AI integration in pedagogical practices.
The standard error of estimation (SEE = 0.538) indicates a good fit of the model.
b. Contributions of the predictors in the multiple model:
The standardized coefficients (β) indicate that both dependent variables are significantly influenced by the use of AI.

Table 3 : Table: Contributions of Predictors in the Multiple Model

Predictors	B	Standard Error	β	T	p		Tolérance	VIF
Perception of Teaching Quality	0,498	0,083	0,688	5,961	<0,001		0,71	1,406
Student Engagement	0,462	0,079	0,641	2,987	<0,001		0,709	1,412

Source: Results generated using SPSS (version 26) by the authors

The collinearity diagnostics confirm the robustness of the model, with tolerance indices greater than 0.6 and variance inflation factors (VIF) lower than 2.
c. Specific Effect of the Use of AI on Student Engagement:
A simple regression analysis was conducted to isolate the relationship between the use of AI and student engagement. The results show a strong and significant relationship between the two variables ($F_{(1,98)} = 79.328$, $p < 0.001$).
R: 0.684, indicating a strong and positive correlation between the use of AI and student engagement.

R^2: 0.468, showing that 46.8% of the variance in engagement is explained by the use of AI.

Standardized coefficient (β = 0.684): For each standard unit increase in the use of AI, student engagement increases by 0.684 standard units ($p < 0.001$).

Table 4 : Effect of the Use of AI on Student Engagement

Predictor	B	Standard Error	B	t	p	Tolerance	VIF
Use of AI	0,684	0,077	0,684	8,902	<0,001	1,000	1,000

d. Hypothesis Testing

The hypotheses formulated in this study were tested using multiple regression. The results of the tests are presented in Table 2 and discussed below:

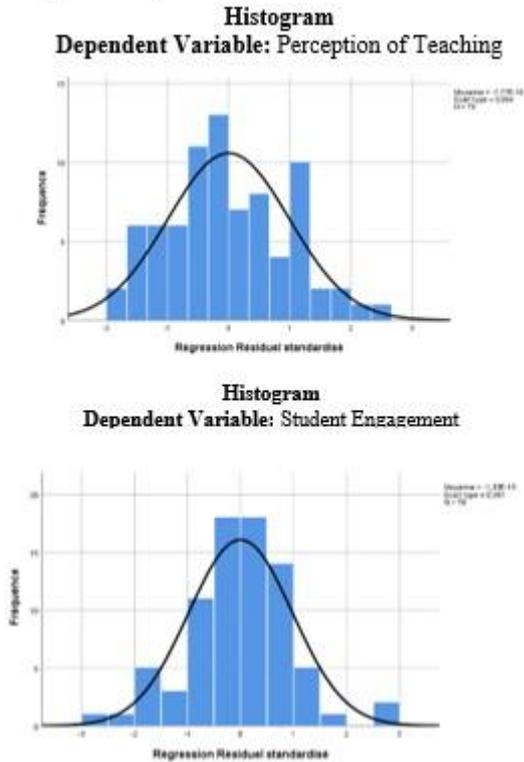**Table 5: Results of Hypothesis Testing**

| Hypotheses	β\beta	t	P	Result
H1: The use of AI improves the perceived quality of teaching	0,688	3,101	<0,001	Validated
H2: The use of AI increases student engagement	0,684	4,868	<0,001	Validated

1.2. Residuals and Model Validity

The residual diagnostics confirmed the validity of the model. The standardized residuals show a normal distribution, as

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shown in the histogram (Fig. 1), and the predicted values align with the observed values in the standardized residuals versus predicted values plot (Figure 2). No issues of heteroscedasticity or autocorrelation were detected.

Fig.2: Histogram of standardized residuals.

Histogram
Dependent Variable: Perception of Teaching

Histogram
Dependent Variable: Student Engagement

Fig 3: Scatter plot of standardized residuals versus predicted values.

Scatter Plot
Dependent Variable: Student Engagement

Scatter Plot
Dependent Variable: Perception of Teaching
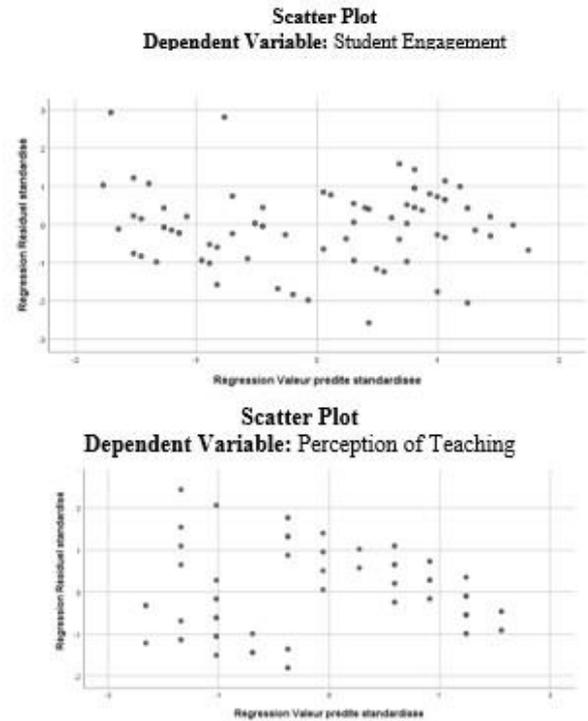
Source: Data extracted from SPSS (v26) by the authors

2. Discussion of the Results

H1: The use of AI improves the quality of teaching as perceived by teachers

The results obtained confirm that the integration of AI into teaching practices significantly improves the quality of teaching as perceived by teachers. Hypothesis H1 is validated, with a coefficient $\beta = 0.688$ ($p < 0.001$). This indicates that the use of AI, particularly tools that allow for personalized learning and the simplification of administrative tasks, is perceived as a factor that enhances teaching effectiveness. This finding aligns with the work of Holmes et al., (2019), who emphasize that AI allows for better responsiveness to students' individual needs while optimizing the time teachers spend on repetitive tasks. Teachers report that AI allows them to focus more on human interaction, an essential element in maintaining student engagement. However, it is important to note that this perceived improvement largely depends on teachers' familiarity with AI tools and the institutional support provided for successful integration.

H2: The use of AI increases student engagement in the learning process

The second hypothesis is also validated, with a coefficient $\beta = 0.684$ ($p < 0.001$), suggesting a strong positive correlation

between the use of AI and student engagement. The results show that AI tools, such as interactive platforms and real-time feedback systems, help maintain students' attention, stimulate their participation, and strengthen their motivation. In particular, students feel more involved when they can progress at their own pace, receive personalized feedback, and actively engage with the learning content. This phenomenon aligns with the work of Zawacki-Richter et al. (2019), who observed an improvement in student engagement in hybrid or digital learning environments. Indeed, the ability to receive instant feedback and track progress independently seems to meet the expectations of current students, particularly those from the "digital native" generations. However, it is important to emphasize that the accessibility of digital tools and teacher training play a key role in the success of this strategy.

VI. Conclusion and Implications

The results of this study highlight the positive impact of artificial intelligence on teaching effectiveness and student engagement, confirming that AI, when thoughtfully integrated and supported, can become a powerful tool in modern teaching. However, to maximize its benefits, it is essential to invest in teacher training and adequate infrastructure. A larger and more in-depth study would help confirm these results and identify best practices for optimal AI adoption in educational environments. The study presents some limitations, including the limited sample size and specific regional context, which may restrict the generalizability of the conclusions. Future research could adopt a comparative approach across different geographical contexts and incorporate longitudinal analyses to better understand the evolution of the identified relationships.

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