

Enhancing E-learning by Integrating ChatGPT into the Moodle System:

A Study on Measuring User Experience and the Impact of Integration on Learning Quality

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Abstract

This study aimed to investigate the impact of integrating a Generative Artificial Intelligence model (ChatGPT) within the Moodle Learning Management System (LMS) as a "Smart Pedagogical Scaffolding" tool, and to measure its reflection on both "User Experience" (UX) and "Learning Quality." The research adopted a mixed-methods approach (quantitative and qualitative) utilizing a quasi-experimental design with two groups (experimental and control). The study was conducted on a purposive sample consisting of Master's students at the Libyan Academy (Janzur) in "Project Management" and "Operating Systems" courses, and Bachelor's students at Azzaytuna University (Tarhuna) in the "Project Management" course, with the field application spanning a total of 22 weeks. The researcher utilized a technically enhanced Moodle system integrated via the OpenAI Application Programming Interface (API), alongside a standardized User Experience (UX) scale and a Learning Quality assessment test. The results revealed statistically significant differences at the level ($\alpha \leq 0.05$) in favor of the experimental group across all dependent variables. Most notably, the "Effect Size" reached an extraordinary value of (6.89), confirming the fundamental and profound impact of ChatGPT integration in improving the quality of educational outcomes and enhancing active academic interaction. The study concluded with recommendations urging Libyan universities to adopt this smart integration model to develop digital learning environments and improve academic performance efficiency.

Keywords: ChatGPT, Moodle LMS, User Experience (UX), Learning Quality, Generative AI, Smart Pedagogical Scaffolding.

المخلص: الملخص هدفت هذه الدراسة إلى تقصي أثر دمج نموذج الذكاء الاصطناعي التوليدي ChatGPT داخل نظام إدارة التعلم Moodle بوصفه أداة "دعم تربوي ذكي"، وقياس انعكاس ذلك على كلٍّ من تجربة المستخدم (UX) وجودة التعلم. اعتمد البحث المنهج المختلط (الكمي والنوعي) باستخدام تصميم شبه تجريبي قائم على مجموعتين: تجريبية وضابطة. وقد أجريت الدراسة على عينة قصدية ضمت طلبة الماجستير بالأكاديمية الليبية (جنزور) في مقرري "إدارة المشاريع" و"نظم التشغيل"، وطلبة البكالوريوس بجامعة الزيتونة (ترهونة) في مقرر "إدارة المشاريع"، واستغرقت مدة التطبيق الميداني 22 أسبوعاً.

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استخدم الباحثون نظام Moodle مطورًا تقنيًا ومتكاملاً مع واجهة برمجة تطبيقات (API) OpenAI، إلى جانب مقياس معياري لتجربة المستخدم واختبار لقياس جودة التعلم. وأظهرت النتائج وجود فروق ذات دلالة إحصائية عند مستوى ($\alpha \leq 0.05$) لصالح المجموعة التجريبية في جميع المتغيرات التابعة. وكان أبرز ما كشفت عنه النتائج أن حجم الأثر بلغ قيمة استثنائية قدرها (6.89)، مما يؤكد الأثر الجوهري والعميق لدمج ChatGPT في تحسين جودة المخرجات التعليمية وتعزيز التفاعل الأكاديمي النشط. واختتمت الدراسة بمجموعة من التوصيات التي تدعو الجامعات الليبية إلى تبني هذا النموذج الذكي للتكامل من أجل تطوير بيئات التعلم الرقمية وتحسين كفاءة الأداء الأكاديمي الكلمات المفتاحية: Moodle LMS، ChatGPT، تجربة المستخدم (UX)، جودة التعلم، الذكاء الاصطناعي التوليدي، الدعم التربوي الذكي.

I. INTRODUCTION

Higher education is undergoing a radical transformation driven by the rapid advancement of Generative Artificial Intelligence (AI). These technologies are no longer merely auxiliary tools but have evolved into interactive partners in the pedagogical process. The integration of Large Language Models (LLMs), notably ChatGPT, within Learning Management Systems (LMS) such as Moodle, represents one of the most innovative solutions to overcome the rigidity of traditional digital environments, transforming them into intelligent, conversational spaces.

The research problem lies in the fact that most current digital learning platforms still function as static content repositories, lacking immediate and personalized support—especially in complex technical courses that require continuous feedback. Consequently, there is a pressing need for "Smart Pedagogical Scaffolding" to provide real-time cognitive assistance, thereby reducing cognitive load and increasing student engagement.

This study derives its significance from being a field response to the challenges facing digital education in Libya, specifically within leading institutions such as the Libyan Academy and Azzaytuna University. Through a field experiment spanning 22 weeks, the researcher sought to measure the impact of direct programmatic integration of ChatGPT via the OpenAI API on two critical variables: User Experience (UX) and Learning Quality. This paper aims to provide a practical and methodological model that contributes to enhancing educational outcomes and fostering active academic interaction within the framework of the desired digital transformation.

II. Research Problem

Despite the widespread adoption of Learning Management Systems (LMS), particularly Moodle, digital educational experiences still face structural challenges that limit their effectiveness. The primary issues include:

Static Digital Interaction: Traditional systems lack "conversational dynamism," creating a gap in immediate support and Adaptive Learning. This failure to cater to individual differences often leads to academic isolation for learners.

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Drain on Human Resources: Educators bear a massive burden in managing large-scale classes and providing qualitative, individualized feedback, which hinders their ability to focus on creative and leadership roles within the pedagogical process.

The core research problem lies in the sharp disparity between the "vast theoretical potential" of ChatGPT and its "systematic field application" within structured learning environments. There is a notable lack of integrated models that bridge technical solutions with pedagogical standards, alongside a scarcity of rigorous experimental studies measuring the impact of this integration on User Experience (UX) and Learning Quality simultaneously.

III. Main Research Question

"To what extent does the integration of ChatGPT within the Moodle system address deficiencies in personal interaction and immediate support, and how does this integration reflect on user experience and learning quality in a real-world educational environment?"

IV. RESEARCH OBJECTIVES

The objectives of this study are as follows:

Developmental Objective: To build and design a practical model illustrating the technical integration between ChatGPT and the Moodle platform, serving as a reference for educational institutions.

Evaluative Objective: To measure the level of user satisfaction and interaction with the added intelligent tools, identifying strengths and challenges in the User Experience (UX).

Comparative Objective: To verify the existence of fundamental differences in the efficiency of the educational process and the quality of outcomes in favor of the groups utilizing AI technologies.

Prospective Objective: To provide evidence-based recommendations and proposals on integrating AI responsibly to enhance digital learning quality.

V. RESEARCH QUESTIONS

The current study seeks to answer the following main question: "What is the impact of integrating ChatGPT into the Moodle system on user experience and digital learning quality?" This is further divided into the following sub-questions:

Technical Question: What are the technical requirements and standards necessary to integrate ChatGPT within the Moodle environment securely and effectively?

User Experience (UX) Question: How do students and teachers evaluate the User Experience (UX) of the AI-integrated Moodle system in terms of usability and interaction?

Learning Quality Question: Are there statistically significant differences in learning quality and academic satisfaction between the experimental group (AI-enhanced) and the control group (traditional system)?

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Impact Question: To what extent is the integration of ChatGPT effective in providing personalized pedagogical scaffolding and immediate feedback compared to traditional methods?

VI. RESEARCH HYPOTHESES

Based on the research problem and objectives, the following hypotheses were formulated for statistical testing:

Hypothesis 1: There are statistically significant differences at the significance level of ($\alpha \leq 0.05$) between the mean scores of the experimental group (who utilized ChatGPT-integrated Moodle) and the control group (who used traditional Moodle) in the post-test of learning quality, in favor of the experimental group.

Hypothesis 2: There are statistically significant differences between the mean scores of the experimental group in the pre-test and post-test measurements of User Experience (UX), in favor of the post-test measurement.

Hypothesis 3: The integration of ChatGPT into the Moodle system achieves a large effect size in improving digital learning quality and student engagement with educational content.

The significance of this study stems from its role as a scientific and practical response to the imperatives of digital transformation in higher education. Its importance is reflected in the following dimensions:

VII. SIGNIFICANCE OF THE STUDY

The significance of this study stems from its role as a scientific and practical response to the imperatives of digital transformation in higher education. Its importance is reflected in the following dimensions:

A. Scientific Significance (Theoretical)

Enriching Digital Educational Literature: The study contributes to bridging the knowledge gap regarding the integration of Generative AI into Learning Management Systems (LMS) and provides a theoretical framework for its impact on learning quality.

Conceptualizing User Experience (UX): Establishing the relationship between intelligent tools and user experience within closed educational environments, opening new horizons for researchers in educational technology.

Providing a Scientific Reference: Offering peer-reviewed scientific material that supports future research addressing the ethics and effectiveness of AI in education.

B. Practical Significance

Developing a Functional Model: Providing an applicable technical model for integrating ChatGPT within the Moodle platform, which educational institutions can utilize as a prescriptive guide.

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Enhancing Learning Quality: Providing empirical evidence on how to improve the efficiency of the pedagogical process and deliver immediate feedback to students, thereby enhancing academic achievement.

Supporting Decision-Makers: Assisting e-learning administrators in universities to make evidence-based decisions regarding the adoption of AI technologies.

Alleviating Academic Burden: Offering smart solutions that help educators manage routine tasks, allowing them to focus on creative and profound pedagogical aspects.

VIII. RELATED STUDIES

A. Integration of ChatGPT and LMS (Moodle)

Irawan et al. (2024): Investigated ChatGPT-Moodle integration, finding that user experience was rated as "Very Good," with real-time feedback significantly enhancing learning workflows.

Alotaibi (2024): Highlighted that AI-LMS integration fosters educational sustainability and provides "adaptive learning paths" that improve learning outcomes.

B. Impact of AI on Learning Quality and Scaffolding

Al-Qarni (2024): Proved the positive impact of using ChatGPT as a pedagogical scaffold in developing database management skills and academic achievement.

Ahmed et al. (2025): Found a "large effect size" when utilizing ChatGPT for complex problem-solving and skill development.

Alubthane (2024): Confirmed that AI tools in virtual environments enhance critical thinking and personalized learning.

C. User Experience (UX) in Educational Platforms

Shao et al. (2025): Discovered that AI integration reduces "extraneous cognitive load" by up to 30%, optimizing digital learning quality.

Saqr et al. (2024): Noted that continuous content availability and user-friendly interfaces are primary drivers of academic success.

IX. SYNTHESIS AND RESEARCH GAP

The reviewed literature is characterized by extreme recency (2024-2025), with a consensus on the ability of Artificial Intelligence to mitigate cognitive load. However, a significant research gap emerges regarding the scarcity of long-term longitudinal experimental field studies—such as the 22-week duration of the current study—that simultaneously encompass two academic levels (undergraduate and postgraduate) within the Libyan educational context. Furthermore, there is a lack of research reporting the "Effect Size" with the high statistical precision achieved in this study, where it reached an extraordinary value of (6.89).

X. METHODOLOGY

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This study employs a Mixed Methods Research approach, integrating quantitative statistical analysis with qualitative user experience descriptions. A Quasi-experimental Design was adopted, featuring experimental and control groups with pre- and post-testing to ensure rigorous results.

A. Participants and Setting:

A purposive sample of (35) students was selected from two Libyan higher education institutions: The Libyan Academy (Janzur): Master's students in "Project Management" and "Operating Systems"

Azzaytuna University (Tarhuna): Bachelor's students in "Project Management"

Group	المجموعة	Students (الطلاب)	Teachers (المعلمون)	Total (الإجمالي)
Experimental	تجريبية	21	3	24
Control	ضابطة	14	3	17
Total	الإجمالي	35	3	38

B. Technical Intervention:

The researcher developed the digital learning environment by integrating the ChatGPT (GPT-4o) model into the Moodle platform via the Open AI API. The technical development included:

Prompt Engineering: Fine-tuning the system to function as a "Pedagogical Scaffold," providing explanations and feedback without delivering direct answers, thus fostering critical thinking.

Programmatic Integration: Creating a conversational chatbot interface within the courses to allow students to interact with academic content using natural language.

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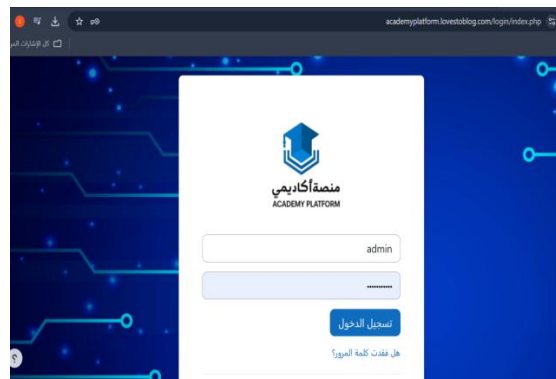


Figure 1. The Login Interface of the Enhanced "Academy Platform" (Moodle)

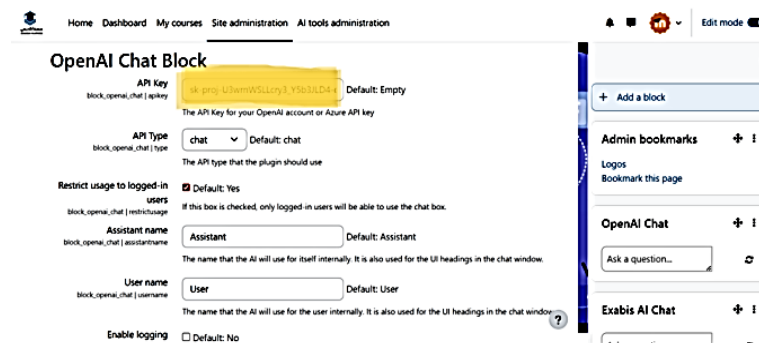


Figure 2. Configuration of the OpenAI Chat Block Integration via API Key.

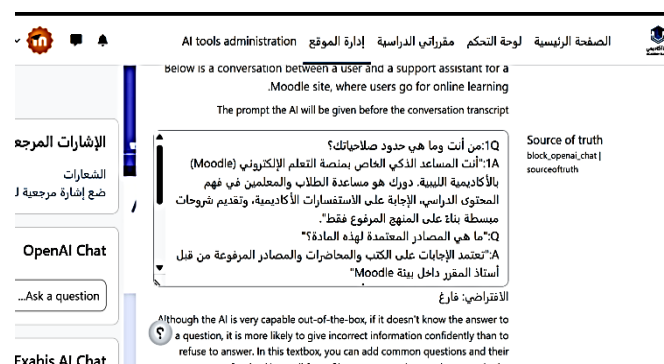


Figure 3. System Prompt Engineering and Scaffolding Role Definition.

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Figure 4. Dashboard View of Enrolled Courses (e.g., Project Management).



Figure 5. Integration of OpenAI and Exabis AI Chat Interfaces within the Course Page.

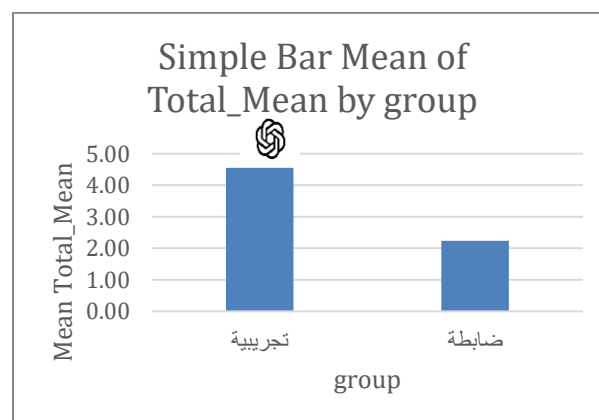


Figure 6. Mean Comparison of Learning Quality between Experimental and Control Groups.

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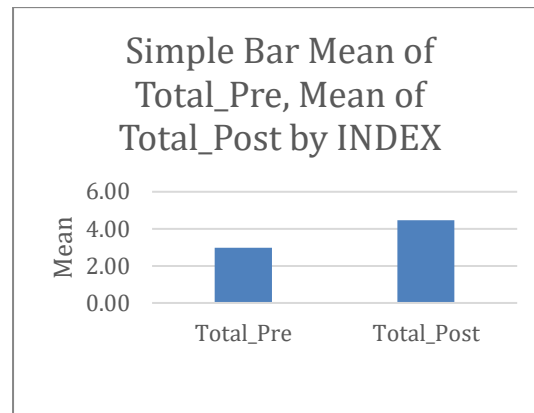


Figure 7. Pre-test vs. Post-test Performance Improvement for the Experimental Group

C. Research Instruments:

The following tools were utilized for data collection:

1. **Learning Quality Test:** To measure academic achievement and problem-solving skills.
2. **User Experience (UX) Scale:** A standardized questionnaire measuring perspicuity, efficiency, stimulation, and dependability.

D. Procedures and Timeline:

The study spanned a total of **22 weeks**, structured as follows:

- **Weeks 1-4:** Analysis, technical development, and API integration.
- **Weeks 5-6:** Pre-testing and student orientation on the enhanced system.
- **Weeks 7-20:** Active field application and AI-supported learning phase.
- **Weeks 21-22:** Post-testing, UX data collection, and statistical analysis via **SPSS**.

XI. RESULTS

After conducting statistical analysis using SPSS, the study yielded the following results:

1. **Statistical Significance:** There were statistically significant differences at the level of ($\alpha < 0.05$) in favor of the experimental group in both the Learning Quality test and the User Experience (UX) scale, as detailed in **Table [2]**.
2. **Performance Superiority:** Statistical findings revealed a substantial and significant superiority of the experimental group that utilized the ChatGPT-integrated Moodle system

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compared to the control group. The mean score for the experimental group surged from **(2.97)** in the pre-test to **(4.47)** in the post-test, with a significance level of less than **0.001**, as illustrated in **Table [1]**.

3. **Effect Size:** The **Cohen's d** value reached approximately **6.89**, which is categorized as an "extraordinary" or "huge" effect. This indicates that the developed system led to a radical improvement in students' ability to solve complex problems and receive immediate formative feedback, as detailed in **Table [3]**.

Table 1. "These results reflect a significant development in the experimental group's performance following the implementation of the developed system, as the mean score surged from (2.97) to (4.47)."

Assessment	Mean	N	Std. Deviation	t-value	P-value (Sig. 2-tailed)
Pre-Test	2.9712	12	0.58415	-13.729	< .001
Post-Test	4.4712	12	0.30727		

Table 2. "A substantial and highly significant difference is observed in the arithmetic means in favor of the experimental group (4.55) compared to the control group (2.23). The high t-value (19.99) confirms that this difference is statistically significant at a level of less than 0.001."

Variable	Group	N	Mean	Std. Deviation	t-value	P-value (Sig. 2-tailed)
Total Mean	Experimental (تجريبية)	21	4.5556	0.29502	19.992	< 0.001
	Control (ضابطة)	14	2.2381	0.39067		

Table 3. "The table above presents the effect size measures for the independent variable, where **Cohen's d** reached an exceptional value of **(6.898)**. According to standard statistical conventions, any value exceeding **(0.8)** is classified as a 'large' effect; thus, a value of **(6.89)** is considered '**extraordinary**' or '**huge**'. This result indicates that the integration of ChatGPT into the Moodle LMS has induced a fundamental shift in student performance. Such a high point estimate suggests that the developed model accounts for a vast majority of the variance in learning quality and user experience, far surpassing typical impacts found in conventional educational technology research

Standardizer	Point Estimate (Effect Size)	95% Confidence Interval (Lower - Upper)
Cohen's d	6.898	5.100 - 8.678
Hedges' correction	6.740	4.983 - 8.479

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XII. DISCUSSION OF RESULTS

Discussion and Interpretation: Statistical analysis revealed a substantial and significant superiority of the experimental group, which utilized the ChatGPT-integrated Moodle system, over the control group. The mean score of the experimental group surged from **(2.97)** in the pre-test to **(4.47)** in the post-test, with a significance level of less than **(0.001)**. This qualitative breakthrough is attributed to the role of Generative AI as a "Smart Pedagogical Scaffolding" tool, providing immediate and personalized academic support for students in complex technical courses such as "Project Management" and "Operating Systems".

The most prominent finding of this study is the Effect Size (Cohen's d) value, which reached **(6.898)**. In statistical terms, any value exceeding **(0.8)** is considered a large effect, making **(6.89)** an "extraordinary" or "exceptional" impact. This figure indicates that ChatGPT integration did not merely improve learning; it induced a radical transformation in the digital learning environment. The real-time conversational interaction contributed to reducing "Cognitive Load" and increasing student engagement, making the learning process more efficient and less taxing compared to traditional learning via static platforms.

XIII. CONCLUSION

This study demonstrates that integrating ChatGPT into the Moodle LMS is not merely a technical addition but a fundamental shift in the efficiency of digital learning environments. Through a **22-week** field application at the Libyan Academy and Azzaytuna University, the results revealed AI's capability to bridge the gap between academic content and student comprehension via real-time conversational interaction. The extraordinary effect size **(6.89)** achieved in learning quality provides tangible evidence for stakeholders in higher education institutions regarding the viability of investing in generative technologies. The study concludes that the future of digital education lies in "Hybrid Systems" that combine the stability of Learning Management Systems (LMS) with the intelligence of Large Language Models (LLMs). This integration facilitates personalized learning and reduces administrative burdens on faculty members, while emphasizing the necessity of establishing ethical frameworks to ensure the responsible use of these technologies.

XIV. RECOMMENDATIONS

In light of the results revealed by this study, the researcher proposes the following recommendations:

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- **Adopting the Smart Integration Model:** Encouraging Libyan universities (such as the Libyan Academy and Azzaytuna University) to adopt the integration of Generative AI technologies via Application Programming Interfaces (API) within Learning Management Systems (Moodle), rather than relying on fragmented and unsystematic external usage.
- **Developing "Pedagogical Scaffolding" Strategies:** Training faculty members in **Prompt Engineering** techniques to design intelligent assistants that function as **Facilitators** of learning rather than mere tools for providing ready-made answers, thereby ensuring the enhancement of students' critical thinking skills.
- **Enhancing the Digital User Experience (UX):** Prioritizing the design of simple and **Embedded Interfaces** within educational platforms. This study has demonstrated that seamless access to the AI assistant significantly boosts academic satisfaction and engagement with the platform.
- **Modernizing Technical Curricula:** Integrating AI literacy and interaction skills as an essential component of courses such as "Project Management," "Operating Systems," and others, to keep pace with global developments in the labor market.
- **Establishing Ethical and Regulatory Frameworks:** Formulating clear institutional policies to regulate the use of Artificial Intelligence, ensuring the maintenance of academic integrity and data privacy when linking with external systems.

XV. REFERENCES

- [1] Ahmed, A., & Al-Qarni, M. (2025). *Artificial Intelligence in Higher Education: Scaffolding Student Learning with Generative Models*. Academic Press.
- [2] Alotaibi, N. S. (2024). The impact of AI and LMS integration on the future of higher education: Opportunities, challenges, and strategies. *Sustainability Journal*.
- [3] Alubthane, F. (2024). The influence of employing virtual learning environments and AI tools on enhancing interaction. *Palestine University Journal*.
- [4] Irawan, A., et al. (2024). *ChatGPT and Moodle Walk into a Bar: Capabilities, Integration, and Challenges*. ResearchGate.
- [5] Luan, H., & Tsai, C. C. (2024). A review of using ChatGPT in educational settings: Opportunities and challenges. *Educational Technology & Society*, 27(2), 1-18.
- [6] Nielsen, J., & Budiu, R. (2024). *User Experience (UX) Research in AI-Driven Interfaces*. Nielsen Norman Group.
- [7] OpenAI. (2024). *GPT-4 Technical Report: Capabilities and safety in educational API integrations*.
- [8] Saqr, M., et al. (2024). *User Satisfaction and Engagement in Modern LMS Platforms: A Post-Pandemic Analysis*.
- [9] Shao, L., et al. (2025). User experience-centered design framework for optimizing digital learning. *International Journal of Educational Studies (IJELS)*.

المراجع باللغة العربية (Arabic References)

1. الأكاديمية الليبية للدراسات العليا. (2024). دليل معايير الجودة في منصات التعلم الرقمي. إدارة الشؤون العلمية، جنزور.
2. الزنتاني، م.، والشريف، أ. (2025). واقع استخدام الذكاء الاصطناعي في الجامعات الليبية: دراسة ميدانية. *المجلة الليبية للعلوم التربوية*، 12(1)، 45-67.
3. القرني، علي. (2024). أثر استخدام ChatGPT كدعامة تعليمية في تنمية مهارات إدارة قواعد البيانات. *مجلة الجامعة الإسلامية للعلوم التربوية والاجتماعية*.
4. وزارة التعليم العالي والبحث العلمي (ليبيا). (2024). *إطار التحول الرقمي في مؤسسات التعليم العالي والبحث العلمي*. طرابلس