RESEARCH ARTICLE
№ SEI8804-ALG4

Enhancing E-Learning Quality in Higher Education: A Moodle-Based Evaluation from Students' Perspective at the University Centre of Maghnia (Algeria)

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Doi Serial https://doi.org/10.56334/sei/8.8.4

Keywords E-learning quality, Moodle platform, Content design, Academic interaction, Administrative support

JEL Classification Codes: I23, I29, 033, M15

Abstract:
This study investigates the quality of e-learning through the Moodle platform from the viewpoint of students enrolled at the Institute of Economic Sciences, University Centre of Maghnia. It specifically examines the influence of three key factors: administrative support, course content quality, and student–instructor interaction. The findings reveal that administrative support exerts a statistically significant and positive influence on e-learning quality ($\beta = 0.301$, $p = 0.001$), while both content quality ($\beta = 0.153$, $p = 0.090$) and student–instructor interaction ($\beta = 0.156$, $p = 0.104$) do not show a significant effect. Based on these results, the study recommends strengthening institutional support structures, redesigning content to promote interactivity and engagement, and integrating collaborative teaching practices to enhance the overall effectiveness and quality of the e-learning experience.

Received: 14.03.2025 | Accepted: 16.05.02025 | Published (availaible online): 02.07.2025

1.Introduction:

Higher education is undergoing a radical transformation in light of rapid technological advancements, as e-learning has become an essential component of the global educational system. The COVID-19 pandemic posed unprecedented challenges to universities, prompting the adoption of distance learning systems as an alternative solution to ensure the continuity of education. In this context, e-learning through Learning Management Systems (LMS) such as Moodle represents a pivotal tool for providing a flexible and interactive learning environment (Alqahtani & Rajkhan, 2020). However, the effectiveness of this mode of education is influenced by several factors, most notably digital infrastructure, the technological skills of teachers and learners, the quality of digital content, and institutional support mechanisms (Martin et al., 2022).

In Algeria, the higher education sector has witnessed significant transformations in the adoption of e-learning, especially following the regulatory decisions issued by the Ministry of Higher Education and Scientific Research, which aimed to promote digital learning in national universities. Nevertheless, there are still qualitative challenges facing the implementation of this system, particularly in newly established academic institutions such as the University Centre of Maghnia, where the levels of digital readiness among students and faculty vary, affecting the quality of the educational process.

Despite the efforts made to strengthen e-learning in Algeria, the quality of this system remains questionable, especially regarding the efficiency of the Moodle platform in meeting the needs of students in the fields of economics, business, and management sciences. The lack of effective technical support, inconsistencies in digital course design, and weak interaction between students and teachers may constitute obstacles to achieving a comprehensive learning experience (Benlahcene & Bousbia, 2023). Based on this, the main research question is: What are the key factors influencing the quality of e-learning via the Moodle platform from the perspective of students at the Institute of Economics, Business, and Management Sciences at the University Centre of Maghnia?

Based on the stated problem, this study hypothesizes that: there is a positive impact of administrative support on the quality of e-learning via the Moodle platform from the perspective of students at the Institute of Economics. Furthermore, the quality of digital course content design directly affects the e-learning experience through the platform from the students' point of view. Additionally, student–teacher interaction plays a crucial role in enhancing the quality of e-learning.

This study aims to analyze the factors affecting the quality of e-learning in Algerian higher education institutions, with a focus on the students' experience at the University Centre of Maghnia. It also seeks to assess the impact of the quality of digital courses on student satisfaction, thereby contributing to the formulation of recommendations to improve the e-learning environment. The significance of this research lies in its contribution to the development of e-learning policies in Algeria, from which university decision-makers can benefit to improve digital infrastructure and enhance the effectiveness of distance learning systems.

Recent studies indicate that the quality of e-learning depends on the interaction of several factors, including institutional support, technological infrastructure, and the level of interaction between students and faculty. For example, the study by Means et al. (2021) found that the effectiveness of e-learning requires advanced educational strategies based on continuous interaction and effective technical support. Similarly, Almahasees et al. (2022) confirmed that students in emerging academic environments face technical and pedagogical challenges that hinder their full benefit from e-learning. As for Algerian universities, the findings of some local studies (Zaher & Al-Hussein 2022) indicate that e-learning is still in its early stages and suffers from weak pedagogical design of courses and the absence of effective assessment strategies. Nevertheless, the research literature lacks studies that focus on students' experiences in emerging universities such as the University Centre of Maghnia, which constitutes a research gap that this study seeks to address. Accordingly, this research aims to make a scientific contribution through an in-depth analysis of the factors affecting the quality of e-learning in the Algerian context, while providing practical proposals that could help in developing the digital learning system in national universities.

The theoretical part addresses the institutional and technical factors that influence the implementation of e-learning, such as administrative support and digital infrastructure, while the applied part focuses on the pedagogical aspects affecting content quality and interaction between students and instructors within digital platforms, specifically at the Institute of Economic, Commercial, and Management Sciences at the University Centre of Maghnia.

2-Litterature Review

1.2 E-Learning and LMS Management

E-learning is an educational system that relies on digital technologies to deliver learning content and enable interaction between teachers and students online. This mode of education has undergone notable evolution over the decades:

1.2.1 Correspondence-based learning: In the early 20th century, mail was used to exchange educational materials between instructors and students, enabling distance learning (Moore & Kearsley, 2018).

1.2.2 Machine-based learning: In 1924, Sidney Pressey developed a testing machine, and later, in 1954, B. F. Skinner created a teaching machine, paving the way for the use of technology in education (Schunk, 2020).

1.2.3 Computer-based learning: With the appearance of computers in the 1960s, systems like PLATO were developed, offering interactive educational programs and reinforcing the concept of computer-assisted learning (Meyer, 2021).

1.2.4 Online learning: As the Internet spread in the 1990s, web-based educational platforms emerged, enabling the delivery of diverse and interactive learning content to learners worldwide (Kop & Hill 2008)

1.2.5 Advanced e-learning: In the first decade of the 21st century, various technologies such as smartphones and social networks were integrated into education, leading to concepts like participatory and collaborative learning (Garrison, 2022). Learning Management Systems (LMS) are vital tools for organizing and delivering content online, offering integrated

environments to manage courses and facilitate teacher-student interaction. Moodle, in particular, stands out for its features:

- Open-source and customizable: Moodle can be modified to suit different institutional needs, offering design and implementation flexibility . (Hussain et al., 2018)
- Variety of interactive tools: It includes discussion forums, live chat rooms, and assessment tools such as quizzes to enhance student-teacher engagement (Al-Samarraie, 2019).
- Support for educational standards: Moodle supports standards like SCORM, simplifying integration of learning materials from various sources (Wang et al., 2020).

A study at University of Mohamed Boudiaf in M'sila (Algeria) found that using Moodle significantly improved faculty performance by providing effective tools for content management and student interaction, positively impacting teaching quality . (Al-Fraihat et al., 2020)

2.2 Success Factors in Higher Education E-Learning

We can summarize success factors in e-learning as follows:

2.2.1 Digital infrastructure: Digital infrastructure is the cornerstone of successful e-learning in higher education. It includes Internet connectivity, modern devices, advanced software, and robust server systems. According to Smith et al. (2021), high-speed Internet on and off campus is among the most important factors enhancing the stability of platforms like Moodle and Blackboard. Also, availability of modern devices (e.g. laptops, tablets) contributes to an improved e-learning experience (Jones & Brown, 2020). A case study at the National University of Singapore showed that investment in advanced cloud servers improved the efficiency of e-learning systems by 30% (Lee & Tan, 2019).

2.2.2 Institutional support: Institutional support is essential for the success of e-learning, requiring administrative and technical backing to ensure educational continuity. It includes continuous faculty training, clear technology-use policies, and round-the-clock technical support for students and instructors (Anderson & Johnson, 2022). A study at University of California showed that universities with specialized technical support teams achieved 25% higher student satisfaction rates than those without sufficient support (Miller et al., 2020). Positive administrative support also reduces resistance to change and promotes the adoption of modern e-learning approaches (Davis, 2019).

2.2.3 Educational interaction: Interaction between students and faculty plays a central role in improving e-learning quality. This includes synchronous interaction via virtual classrooms and asynchronous interaction through discussion forums and emails. According to Wang et al. (2021), using strategies like group discussions, educational games, and continuous feedback systems enhances student engagement and motivation. Additionally, applying artificial intelligence in e-learning platforms—such as predictive analytics of student participation—helps improve interaction levels and reduce academic dropout rates (Chen & Zhao, 2020).

2.2.4 Digital content design: Success in e-learning depends on the quality of digital course design, which should align with principles of effective instructional design. Researchers recommend using models like ADDIE, which consists of Analysis, Design, Development, Implementation, and Evaluation (Rosenberg, 2021). Integrating multimedia elements—such as educational videos, interactive simulations, and e-quizzes—enhances students' understanding of course materials (Clark & Mayer, 2019). A study at Oxford University found that using interactive videos increased online course completion rates by 40% (Harrison et al., 2022).

3.2 Theoretical Models for Studying E-Learning Quality

E-learning is a growing field requiring a deep understanding of theories and models that improve its quality. Here, we review four main theoretical models, emphasizing their practical applications and recommendations for enhancing the learning experience:

3.2.1 Interactive Learning Theory: This theory emphasizes the importance of interaction in e-learning environments, considering student–instructor, student–content, and student–student interactions as crucial to effective learning (Anderson, 2018). Such interaction increases engagement, improves understanding, and develops critical thinking. For example, student–instructor interaction can be fostered through live video sessions and online forums, providing personalized guidance and instant feedback, improving learning outcomes (Garrison & Anderson, 2003). Interactive content (e.g., videos and quizzes) captures student attention and enhances comprehension. Studies show effective use of interactive content boosts student motivation (Kay & LeSage 2009). Encouraging collaborative work through group projects and discussion forums is also essential, promoting cooperative learning and communication skills (Johnson & Johnson, 2009). To support these interactions, integrating effective communication tools like live chat and interactive apps into LMS is necessary. Institutions should also provide adequate training for instructors on digital interaction strategies to ensure continuous, effective student support and enhance educational quality.

3.2.2 Technology Acceptance Model (TAM): TAM explains how individuals adopt new technologies like e-learning platforms. It focuses on two main factors: perceived ease of use and perceived usefulness, which directly affect a user's intention to adopt the technology (Davis, 1989). For Moodle, ease of use can be enhanced through a simple, organized user interface and clear instructions to support efficient navigation. Perceived usefulness should be highlighted by demonstrating how the platform improves academic performance and provides advanced learning tools to increase student willingness to use it. Regular surveys of student perceptions on ease and usefulness can guide improvements.

Providing training for students to strengthen their platform skills also boosts satisfaction and confidence in using educational technology.

3.2.3 Constructivist Learning Theory: This theory focuses on the learner's role in constructing knowledge through experience and content interaction. In e-learning, this requires designing digital content that enables exploration, interaction, and problem-solving (Mayer, 2020). Effective multimedia integration—text, images, videos, and simulations—enhances understanding of complex concepts. Interactive challenges—such as case studies, simulations, and quizzes—encourage critical thinking and problem-solving, fostering knowledge application in new contexts. Designing content that gives learners control over their own learning paths promotes autonomy and effective knowledge construction. Periodic assessments should evaluate the effectiveness of interactive content and adjust it based on student feedback and performance to ensure educational outcomes are met.

3.2.4 E-Learning Quality Model: To evaluate and enhance e-learning quality, global academic standards such as ISO and the Sloan-C Quality Framework are used. The International Organization for Standardization (ISO) provides standards to ensure quality in e-learning systems, focusing on content design, process management, and performance evaluation (ISO, 2018). The Sloan-C framework offers quality assessment criteria—such as learning effectiveness, technology availability, student support, and continuous evaluation (Al-Adwan & Smedley 2012). Applying ISO standards ensures high-quality design and delivery of digital content, while using the Sloan-C framework helps evaluate and improve specific elements of e-learning programs, focusing on a comprehensive, effective educational experience.

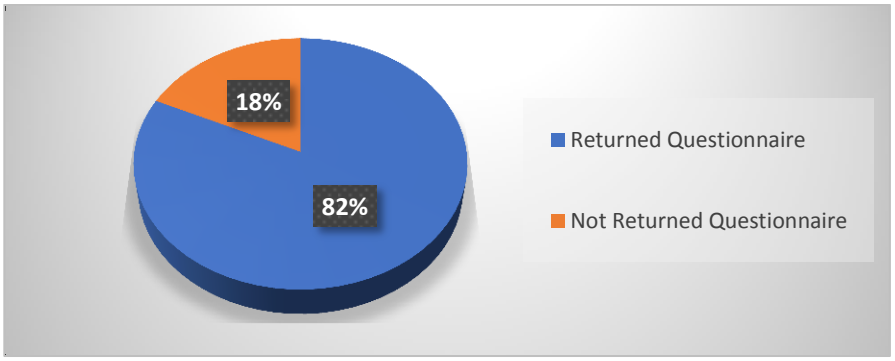
Applying these standards and frameworks helps educational institutions improve e-learning quality, contributing to better student outcomes.

3.Methodology

3.1 Study Population and Sample

The statistical population for this study consisted of all students enrolled at the Institute of Economic, Commercial, and Management Sciences at the University Centre of Maghnia during the 2023–2024 academic year, totaling 1,042 students. A purposive sampling method was adopted, targeting primarily students from undergraduate (Bachelor), graduate (Master), and doctoral levels within the institute. The rationale behind this selection lies in the relevance of the research topic to students of this particular institute, as well as the researchers' affiliation with the same academic discipline. A total of 100 questionnaires were distributed among students at the university center, as illustrated in the figure below:

Figure 01: Questionnaire Distribution



Source: Prepared by the researchers using Microsoft Excel 2020

From the figure above, it is observed that 82 valid and analyzable questionnaires were retrieved, representing a response rate of 88%. Meanwhile, 18 questionnaires were not returned, accounting for 11% of the total distributed.

3.2 Research Variables and Their Corresponding Items

In addition to demographic variables (gender, educational level, and age), the study utilized a questionnaire (both electronic and paper-based) adopting a five-point Likert scale to measure the core variables, as detailed in the table below:

Table 1: Research Variables and Corresponding Items

Research Variable	No items	Item Code
Administrative Support	5	AD
Quality of Education Content Design	5	Cont
Interaction Between Students and Faculty	5	Tea & Std
Quality of E-Learning	5	Qua

Source: Prepared by authors

3.3 Demographic Analysis of the Study Sample

Frequencies and percentages were calculated to identify the demographic characteristics of the study sample. The following table presents a detailed analysis:

Table 2 : Demographic Characteristics of the Study Sample

Variable	*Category*	*Frequency*	*Percentage (%)*
Gender	*Male*	33	40,7
	Female	48	59,3
Education	*Bachelor's*	28	34,6
	Master,s	33	40,7
	Doctorate	20	24,7
Age	*>20 years*	09	11,1
	20-25 years	35	43,2
	25-30 years	26	32,1
	<30 years	11	13,6

Source: SPSS v26 Output

This table can be analyzed as follows:

Gender: Males represent 40.7% of the sample, while females constitute 59.3%, indicating a relatively balanced gender distribution in line with the inclusive nature of the field.

Educational Level: The majority of respondents were Bachelor's and Master's students, representing 34.6% and 40.7% respectively. Doctoral students comprised 24.7%.

Age: Most respondents were aged between 20 and 25 years, reflecting a strong interest in e-learning among this age group.

3.4 Descriptive Statistical Analysis of Research Variables

Descriptive statistics were used to present a general overview of participants' responses, aiding in identifying common trends.

Table 3: Descriptive Statistics of Study Variables

Study Variables	Mean	Standard Deviation
AD	3.85	0.76
Cont	4.12	0.68
Tea & Std	3.97	0.81
Qua	4.05	0.74

Source: SPSS v26 Output

The results show a generally positive evaluation of the study variables. The highest mean score (4.12) was for the quality of content design, reflecting high student satisfaction with course design. The quality of e-learning also scored positively (4.05), indicating a good experience using the Moodle platform. Interaction with faculty scored 3.97, though it had the highest standard deviation (0.81), suggesting variability in student responses. Administrative support had a mean of 3.85, indicating a moderately positive perception. Based on these findings, it is recommended to strengthen administrative support through responsive technical services and to enhance student-faculty interaction using live sessions and discussion forums to ensure a more integrated and effective e-learning experience.

3.5 Reliability of the Questionnaire

Reliability was assessed using Cronbach's Alpha, which measures internal consistency. A value above 0.60 is deemed acceptable, with higher values indicating stronger reliability. The results are shown below:

Table 4: Cronbach's Alpha Reliability Test

Variables	No of items	Cronbch's Alpha
AD	*5*	0.877
Cont	*5*	0.853
Tea & Std	*5*	0.891
Qua	*5*	0.884
All items combined	20	0.835

Source: SPSS v26 Output

All constructs exhibited high reliability, with alpha coefficients exceeding 0.85, confirming the internal consistency of the questionnaire.

3.6 Normality Test

Normality of data distribution was examined using Shapiro-Wilk and Kolmogorov-Smirnov tests, as summarized below:

Table 5: Normality Tests

Variables	*Kolmogorov-smirnov Z (Sig)*	*Sahpiro –Wilk Sig*
AD	0.083	0.091
Cont	0.075	0.087
Tea & Std	0.092	0.095
Qua	0.067	0.072

Source: SPSS v26 Output

Since all significance values are greater than 0.05, the data can be assumed to follow a normal distribution.

3.7 Hypothesis Testing

Hypotheses were tested using multiple regression path modeling and bootstrapping with a 5% significance level. The results are displayed below:

Table 7: Path Coefficients and Hypothesis Testing (Bootstrapping Method)

Hypothesis	*Paths*	*Beta*	*Mean (M)*	*T*	*P*	*Dicision*
H1	*AD->Qua*	0.301	0.309	3.371	0.001	*Supported*
H2	*CONT->Qua*	0.153	0.162	1.697	0.090	*Not supported*
H3	*TEA & STD->Qua*	0.156	0.151	1.624	0.104	*Not supported*

Source: PLS-Smart Output

The table above indicates that the path linking administrative support to e-learning quality reveals a positive and statistically significant relationship, with a path coefficient of 0.301 at a significance level of P = 0.001 < 5%, which supports the acceptance of hypothesis H1. This reflects the pivotal role of administration in providing the necessary infrastructure and technical tools to transition from traditional education to an electronic model aligned with approved standards. However, there are challenges that require attention, such as the quality of audio and video, and the insufficient training of administrative and academic staff in the effective use of these technologies. Therefore, it is essential for educational institutions to strengthen administrative support through innovative strategies that contribute to improving the quality of e-learning and enhancing the student experience. As for the path linking course content to e-learning quality, the results showed no statistically significant relationship, with a path coefficient of 0.153 and a significance level of P = 0.090 > 5%, leading to the rejection of hypothesis H2. This indicates that, despite its importance, the course content was not a decisive factor in improving the quality of e-learning from the perspective of students at the University Centre of Maghnia. This may be attributed to the short duration of the course and its failure to cover the entire educational content, in addition to its reliance on pre-recorded videos and non-interactive methods, which limited the effectiveness of the learning experience. Also noted was the absence of instant communication mechanisms with instructors, where email was the primary method of contact, leading to delayed responses and reduced the efficiency of the educational process. Furthermore, students lacked sufficient resources within the e-learning system, prompting them to seek external sources. Despite these challenges, the surveys revealed a low level of student engagement in following lessons and participating in online activities, which confirms that students' awareness of the importance of e-learning plays a crucial role in enhancing the quality of the learning experience. Therefore, it is necessary to improve the design of electronic content to make it more interactive and comprehensive, while also providing a digital environment that encourages students to participate actively and engage in the educational process. Meanwhile, the path linking student–faculty interaction and e-learning quality showed a moderate path coefficient of 0.156 with a significance level of P = 0.104 > 5%, indicating the rejection of hypothesis H3, i.e., no statistically significant relationship between instructor characteristics and the quality of e-learning from the perspective of students at the University Centre of Maghnia. This means that students at the University Centre of Maghnia do not perceive interaction with instructors as directly affecting the quality of e-learning. This result can be interpreted within the Algerian context through several factors, most notably the technical and pedagogical challenges that may affect the effectiveness of electronic interaction, such as weak digital infrastructure, limited training on interactive teaching strategies, and poor use of collaborative technological tools. Interaction may also be limited due to traditional teaching methods that do not rely on continuous engagement, or because of the lack of adoption of modern educational models that promote effective communication through digital platforms.

4. Conclusion

E-learning has gained increasing importance amid rapid technological developments, emerging as a strategic and indispensable option—especially following the COVID-19 crisis, which prompted educational institutions to widely adopt it. In order to keep pace with this shift, it has become essential to adapt to its requirements and leverage its potential to improve mechanisms and enhance effectiveness. E-learning is now considered a modern alternative to traditional models in higher education, contributing to the enhancement of academic training quality and the improvement of university performance. This calls for the development of integrated strategies and effective educational models that ensure the achievement of desired pedagogical and learning outcomes. With growing global interest in integrating technology into

educational systems, most universities are moving towards the adoption of modern digital tools and expanding the scope of e-learning, thereby enhancing its efficiency and quality both locally and internationally.

1.4 Research Findings

The field study conducted on a sample of students from the University Centre of Maghnia yielded a set of significant findings, which can be summarized as follows:

- Administrative support plays a vital role in enhancing the quality of e-learning, as it contributes to providing the infrastructure and technologies necessary to transform face-to-face learning into a comprehensive digital learning experience. It is considered one of the most influential factors in developing the quality of e-learning, through the provision of resources and facilities for both students and instructors.
- In contrast, the design of course content did not sufficiently contribute to improving e-learning quality, due to the discontinuity of some courses and the lack of adoption of the latest digital educational programs.
- The interaction between students and instructors via the Moodle platform was found to be insufficiently effective in enhancing e-learning quality. This was attributed to the absence of clear training plans for instructors in the field of electronic assessment, as well as the weak training provided to students on how to effectively use digital pedagogical tools.

2.4 Recommendations and Suggestions

Based on the study findings, a set of recommendations can be proposed to improve the quality and effectiveness of e-learning in higher education. The most notable are:

- Enhance training programs to promote a culture of e-learning by raising awareness among students and instructors on how to use technology effectively in the educational process.
- Expand awareness initiatives within universities regarding the importance of e-learning by offering regular workshops and seminars that address the latest developments in the field.
- Establish clear quality assurance standards to evaluate electronic educational programs and assess their alignment with contemporary scientific and intellectual progress, while considering differences among universities and unifying objectives in line with the Ministry of Higher Education's directives.
- Forge partnerships with internationally accredited virtual universities to exchange technical expertise and benefit from successful experiences in e-learning implementation.
- Develop mechanisms to monitor the quality of e-learning programs to ensure their alignment with global standards and regularly update their content.
- Improve technical infrastructure by providing modern devices, ensuring high-speed internet access, and creating an integrated educational platform that supports effective interaction between all elements of the learning process.
- Establish a specialized digital library offering a wide range of academic digital resources across various disciplines to support self-learning and enhance students' educational experience.

This study confirms that e-learning is a fundamental pillar in the development of the higher education sector. However, its success depends on the availability of key enablers, most notably institutional support, quality digital content, and effective interaction between students and instructors. By implementing the proposed recommendations, it is possible to achieve a higher-quality educational experience that meets the demands of the digital age, thereby contributing to the enhancement of higher education quality in Algeria.

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