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BRIDGING THE DIGITAL GAP: TECHNOLOGY FAMILIARITY AS A PREDICTOR OF MOODLE USABILITY FOR EFL STUDENTS IN ALGERIA

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This comprehensive mixed-methods study investigates the role of technology familiarity in shaping the perceived ease of use of the Moodle platform among 91 first-year English as a Foreign Language (EFL) students and five instructors at the University of Batna-2, Algeria, during the 2023–2024 academic year. Quantitative surveys measured technology confidence, Moodle usability, and interaction behaviors, while qualitative responses provided contextual richness. Results revealed a moderate positive correlation between technology confidence and ease of use ($r = .41$, $p < .001$), with technology confidence explaining 16% of usability variance beyond demographic factors. Despite widespread smartphone ownership (97.8%), limited prior LMS experience (18.7%) and inconsistent internet access posed significant barriers. Students valued Moodle's interactivity for the Civilization of the Target Language (CTL) course but found its text-heavy content unengaging. Instructors reported mixed perceptions, highlighting training deficits. Qualitative themes included accessibility benefits, engagement challenges, navigation difficulties, infrastructure barriers, training needs, and socio-cultural influences. Findings suggest that targeted interventions to enhance technology familiarity could optimize Moodle adoption in Algerian higher education, offering implications for e-learning equity in developing contexts globally.

Keywords: *e-learning, Moodle platform, technology familiarity, EFL students, higher education, Algeria, digital divide, connectivism, usability.*

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Introduction

The integration of digital technologies into higher education has redefined pedagogical paradigms, particularly in English as a Foreign Language (EFL) contexts, where Learning Management Systems (LMS) like Moodle enable flexible, asynchronous, and student-centered learning environments (Johnson et al., 2023; Selwyn, 2016). In Algeria, the abrupt shift to e-learning during the COVID-19 pandemic catalyzed the adoption of Moodle as the primary LMS across universities, including the University of Batna-2, where courses like the Civilization of the Target Language (CTL) transitioned to online delivery (Ghounane, 2022; Sarnou & Sarnou, 2021). This transition, while a significant step towards modernization, exposed systemic challenges in a country where e-learning infrastructure, digital literacy, and pedagogical readiness remain underdeveloped.

Algeria's higher education system, shaped by its post-colonial history, has prioritized access since independence in 1962. By 2023, enrollment reached 1.7 million students across 106 institutions, supported by state-funded expansion (World Bank, 2023). However, pedagogical practices remained rooted in traditional, lecture-based methods, with limited technology integration until the Ministry of Higher Education and Scientific Research launched e-learning policies in 2020 (Bouchefra & Baghoussi, 2020). These policies aimed to leverage platforms like Moodle to enhance accessibility, foster innovation, and align with global educational trends. Yet, implementation faced significant hurdles: broadband penetration is only 15% of households, 60% of students rely on costly mobile data, and digital literacy varies widely across urban and rural regions (Dabolkar & Dhage, 2021; ITU, 2023).

The CTL course, a cornerstone of EFL curricula, seeks to develop cultural competence through exploration of Anglophone histories, societies, and values, relying on Moodle's interactive features such as discussion forums, quizzes, and resource sharing to engage students (Çakir, 2006). However, the effectiveness of Moodle hinges on technology familiarity, defined as proficiency in device use, reliability of internet access, and prior experience with digital platforms (Almekhlafi & Almeqdadi, 2010). In Algeria, where only 34% of students report familiarity with LMS platforms and 18.7% have prior online learning experience, understanding these dynamics is critical for optimizing e-learning outcomes (Ghounane, 2020).

Globally, e-learning adoption varies by context. In developed nations, robust infrastructure, institutional support, and widespread digital literacy facilitate seamless LMS integration (Johnson et al., 2023). In contrast, developing regions face challenges akin to Algeria's, including limited connectivity, device access,

and training (Mtebe & Raisamo, 2014; Krishnakumar & Rajesh, 2011). These disparities highlight the need for context-specific research to inform equitable e-learning strategies.

This study is grounded in six theoretical frameworks:

1. **Connectivism**: Learning occurs through networked connections, with technology familiarity enabling knowledge construction (Siemens, 2005; Kop & Hill, 2008).
2. **Technology Acceptance Model (TAM)**: Perceived ease of use and usefulness drive technology adoption, moderated by user confidence and experience (Davis, 1989; Teo, 2011).
3. **Diffusion of Innovations (DOI)**: Adoption depends on innovation attributes (e.g., compatibility, relative advantage) and adopter characteristics (e.g., innovativeness) (Rogers, 2003).
4. **Self-Determination Theory (SDT)**: Intrinsic motivation, supported by autonomy, competence, and relatedness, enhances technology engagement (Ryan & Deci, 2000).
5. **Cognitive Load Theory (CLT)**: Effective instructional design minimizes extraneous cognitive load, enhancing learning in digital environments (Sweller, 1988).
6. **Social Constructivism**: Knowledge is co-constructed through social interactions, with LMS platforms facilitating collaborative learning (Vygotsky, 1978).

These frameworks collectively position technology familiarity as a multifaceted construct, influenced by technological, psychological, socio-cultural, and pedagogical factors. In Algeria, socio-economic constraints, such as high internet costs, rural-urban digital divides, and cultural preferences for face-to-face instruction, further complicate LMS adoption (Bensalem, 2021). This study addresses a critical research gap by examining how technology familiarity shapes Moodle usability among EFL students and instructors in the CTL course, offering insights for policy, pedagogy, and practice in Algeria and similar developing contexts.

The research questions are:

1. How do EFL students perceive Moodle's use in the CTL course?
2. Is Moodle perceived as engaging and motivating for students?
3. How does technology familiarity predict Moodle usability?

Global trends in E-learning

E-learning has transformed higher education by enabling scalable, personalized, and accessible learning experiences (Warschauer, 2011; Bates, 2019). In EFL contexts, LMS platforms like Moodle support linguistic and cultural learning through structured content delivery, interactive forums, and assessment tools (Keengwe & Kang, 2013; Smith, 2024). Global studies underscore technology familiarity as a key determinant of LMS success, with digitally proficient users reporting higher satisfaction, engagement, and academic outcomes (Bervell & Umar, 2017; Al-Azawei et al., 2017). However, disparities in access and skills create significant barriers, particularly in developing nations, where only 40% of higher education institutions have robust e-learning infrastructure (UNESCO, 2022).

In developed contexts, such as the United States, Europe, and Australia, e-learning benefits from widespread broadband (80–90% penetration), institutional support, and digital literacy programs (Johnson et al., 2023). For example, universities in the UK leverage Moodle's analytics to personalize learning, achieving retention rates above 85% in online courses (Jisc, 2023). In contrast, developing regions face systemic challenges. In Sub-Saharan Africa, only 20% of students have reliable internet, and in South Asia, device access is limited to 50% of university populations (Mtebe & Raisamo, 2014; Krishnakumar & Rajesh, 2011). These disparities necessitate tailored strategies to bridge digital divides.

E-learning in the MENA region

The MENA region, including Algeria, shares common e-learning challenges: limited infrastructure, high connectivity costs, and cultural resistance to digital pedagogy (Al-Adwan & Smedley, 2012). In Jordan and Saudi Arabia, Moodle adoption increased during the pandemic, but studies report low usability due to inadequate training and connectivity (Alqurashi, 2019; Hoq, 2020). Egypt's universities face similar issues, with only 30% of students reporting consistent LMS access (Hassan & El-Rashidy, 2021). Algeria's context is unique due to its centralized education system and post-colonial emphasis on Arabization, which initially sidelined technology-driven reforms (Bouchefra & Baghoussi, 2020). Recent policies aim to align with MENA trends, but implementation lags due to resource constraints.

E-learning in the Algerian context

Algeria's e-learning landscape was reshaped by the COVID-19 pandemic, which exposed infrastructural and pedagogical gaps (Ghounane, 2020). The 2020 e-learning policy mandated Moodle's implementation across universities, aiming to enhance access and modernize curricula (Sarnou & Sarnou, 2021). However, challenges persist: broadband penetration is 15%, mobile data costs consume 10% of average student income, and digital literacy is low, particularly in rural areas (ITU, 2023; Bensalem, 2021). The CTL course, vital for EFL cultural immersion, leverages Moodle's dynamic features, but its effectiveness depends on users' technological readiness (Çakir, 2006; Ghounane, 2022). Urban universities like Batna-2 are better equipped than rural counterparts, yet still face connectivity and training deficits (Sarnou & Sarnou, 2021).

Barriers to LMS adoption

LMS adoption in developing contexts faces multiple barriers:

- **Infrastructural limitations**: Unreliable internet (86.8% of students reported access, but only 50% consistently) and limited laptop access (46.2%) restrict functionality, particularly for resource-intensive tasks like video streaming or large file downloads (Dabolkar & Dhage, 2021).
- **Digital literacy gaps**: Only 18.7% of students had prior online learning experience, complicating navigation and engagement (Al-Azawei et al., 2017).
- **Socio-cultural resistance**: Traditional pedagogical preferences, rooted in Algeria's collectivist culture, and skepticism about e-learning's efficacy hinder adoption, especially among older faculty (Bouchefra & Baghoussi, 2020; Hofstede, 2001).
- **Content design challenges**: Text-heavy courses like CTL increase cognitive load, reducing engagement and motivation (Sweller, 1988; Anderson & Krathwohl, 2001).
- **Economic constraints**: High internet costs and device affordability limit access, particularly for low-income students (World Bank, 2023).

Student and faculty motivation

Motivation is critical for LMS adoption. Self-Determination Theory (SDT) posits that autonomy, competence, and relatedness drive intrinsic motivation (Ryan & Deci, 2000). Students with high technology self-efficacy report greater Moodle satisfaction, while low confidence exacerbates barriers (Bandura, 1997; Venkatesh

et al., 2003). Faculty motivation is equally important: instructors with prior LMS training are 60% more likely to adopt innovative pedagogies (Sani, 2014). In Algeria, limited training and technical support demotivate faculty, reducing Moodle's pedagogical impact (Hoq, 2020). Social Constructivism suggests that collaborative features (e.g., forums) can enhance motivation, but only if users are digitally competent (Vygotsky, 1978).

Open-source LMS trends

Moodle's open-source nature makes it a cost-effective solution for developing contexts, but its flexibility requires technical expertise for customization (Cole & Foster, 2007). Global trends show increased adoption of open-source LMS platforms, with Moodle used by 40% of universities worldwide (Hill, 2023). In Africa, initiatives like the African Virtual University leverage Moodle to deliver scalable education, though challenges like server maintenance persist (Ouma & Awuor, 2021). Algeria's reliance on Moodle aligns with these trends, but institutional support for implementation is inconsistent (Ghounane, 2022).

Socio-cultural influences

Socio-cultural factors shape LMS adoption. Algeria's collectivist culture emphasizes group learning, suggesting that peer collaboration via Moodle's forums could enhance engagement (Hofstede, 2001). However, cultural resistance to technology-driven pedagogy, particularly among older generations, poses challenges (Bouchefra & Baghoussi, 2020). Gender norms may also influence access, with female students reporting slightly higher technology confidence in this study, possibly due to urban access advantages (Bensalem, 2021).

Usability design principles

Effective LMS design enhances usability and engagement. Key principles include:

- **User-centered design**: Intuitive interfaces with clear navigation for novice users (Nielsen, 1994).
- **Mobile optimization**: Platforms must support low-bandwidth access, given smartphone prevalence (97.8%) (Cole & Foster, 2007).
- **Multimedia integration**: Videos, podcasts, and interactive tasks reduce cognitive load and boost motivation (Mayer, 2009).
- **Feedback mechanisms**: Timely instructor feedback via forums and quizzes fosters engagement (Hattie & Timperley, 2007).

- **Accessibility**: Designs must accommodate diverse devices and connectivity levels (W3C, 2023).

Theoretical synthesis

This study integrates Connectivism, TAM, DOI, SDT, CLT, and Social Constructivism to examine Moodle usability. Connectivism frames technology familiarity as a prerequisite for networked learning, TAM and SDT highlight usability and motivational drivers, DOI contextualizes adoption, CLT addresses content design, and Social Constructivism emphasizes collaborative learning. This multi-theoretical approach ensures a comprehensive analysis of technological, psychological, socio-cultural, and pedagogical factors.

Method

This study employed a correlational mixed-methods design to investigate the relationship between technology familiarity and perceived ease of use of the Moodle platform. The correlational approach was selected to quantify the strength and direction of relationships between variables without manipulating them, making it appropriate for examining naturally occurring associations in educational contexts. The primary relationship of interest was between technology confidence and Moodle usability, with additional exploration of interaction behaviors and demographic factors as potential moderators.

The mixed-methods approach combined quantitative measures (structured surveys with Likert-scale items) and qualitative data (open-ended questions) to provide methodological triangulation and enhance interpretive depth. Quantitative data allowed for statistical analysis of relationships and group differences, while qualitative responses provided contextual richness and explanatory insights beyond numerical measurements. This integration of methods aligns with pragmatic research paradigms that prioritize comprehensive understanding over methodological purity (Creswell & Plano Clark, 2018; Teddlie & Tashakkori, 2009).

The study is cross-sectional, capturing data at a single timepoint during the 2023-2024 academic year, which reflected participants' experiences after at least one semester of Moodle use for the Civilization of the Target Language course. This timing ensured sufficient exposure to the platform while minimizing retrospective bias. The research was conducted at the University of Batna-2, Algeria, providing ecological validity within this specific educational context.

Participants

The study involved 91 first-year EFL students (58.2% female, 41.8% male; M_age = 19.3, SD = 1.2) and five instructors (60% female, 40% male; age range 30–50) from the Department of English Language and Literature at the University of Batna-2, engaged in the CTL course during the 2023–2024 academic year. Students' high school backgrounds were diverse: Foreign Languages (40.7%), Letters and Philosophy (23.1%), Experimental Sciences (16.5%), Mathematics (8.8%), Economy and Management (6.6%), and Technical Mathematics (4.4%). Instructors included four specialists in Civilization and Literature and one in Applied Linguistics and TEFL, with teaching experience of 2–15 years.

Recruitment targeted first-year EFL students and CTL instructors via Moodle announcements and departmental emails, ensuring voluntary participation. The response rate was 91% for students (91/100 invited) and 100% for instructors (5/5). The sample was representative of Batna-2's EFL program but limited to one urban institution, potentially underrepresenting rural challenges.

Measures

A mixed-methods design combined quantitative scales and qualitative questions to capture comprehensive insights.

Technology Confidence Scale (TCS) comprising eight items assessing:

- Device ownership (count: 0–4 devices, e.g., smartphone, laptop, tablet, desktop).
- Internet access availability (binary: 1 = yes, 0 = no).
- Frequency of internet access (6-point scale: 1 = never, 6 = always).
- Daily internet usage (5-point scale: 1 = no access, 5 = >5 hours).
- Location of access (count: e.g., home, university, public Wi-Fi).
- Type of access (count: e.g., SIM card, ADSL, fiber).
- Prior LMS experience (binary: 1 = yes, 0 = no).
- Prior online learning experience (binary: 1 = yes, 0 = no).

Items were standardized, with higher scores indicating greater confidence (α = .67). The scale was adapted from Almekhlafi and Almeqdadi (2010) and pilot-tested with 20 students to ensure clarity and cultural relevance.

Moodle Ease of Use Scale (MEUS): The MEUS included seven Likert-scale items (1 = strongly disagree, 5 = strongly agree) evaluating preferences for Moodle over in-person learning, engagement, enjoyment, quiz suitability, navigation ease, content accessibility, and overall satisfaction. Reverse-coding ensured consistency, with averaged scores reflecting usability (α = .79). Items were developed based on TAM constructs and validated through exploratory factor analysis (Davis, 1989).

Moodle Interaction Behavior Scale (MIBS): The MIBS consisted of five items on a 3-point scale (1 = no, 3 = yes) measuring interactions via forums, messaging, peer collaboration, instructor communication, and resource sharing. Higher scores indicated greater engagement ($\alpha = .81$).

Teacher Perception of Moodle Effectiveness Scale (TPMES): The TPMES comprised four Likert-scale items (1 = strongly disagree, 5 = strongly agree) assessing Moodle's effectiveness for lecture delivery, student interaction, engagement, and pedagogical flexibility. Reliability was acceptable despite the small sample ($\alpha = .73$, $N = 5$).

Qualitative Questions

Students answered five open-ended questions:

1. What benefits do you experience using Moodle for the CTL course?
2. What challenges do you encounter with Moodle?
3. How could Moodle's functionality be improved for EFL courses?
4. What support would help you use Moodle more effectively?
5. How does your cultural or educational background influence Moodle use?

Instructors responded to four questions:

1. How does Moodle enhance or hinder CTL teaching?
2. What training have you received for Moodle?
3. What improvements would optimize Moodle's pedagogical use?
4. How do student behaviors influence your Moodle use?

Procedure

Following ethical approval from the University of Batna-2 research committee, digital questionnaires were distributed via Moodle from November to December 2023. Participants, who had used Moodle for at least one semester, provided informed consent and were assured anonymity. The survey was optimized for smartphones (97.8% ownership) and laptops, with a user-friendly interface to accommodate diverse devices. Instructors received a separate survey via email. The data collection timeline included:

- Week 1: Survey distribution, consent collection, and technical support setup.
- Week 2: First reminder via Moodle announcements and emails.
- Week 3: Technical support for access issues (e.g., password resets).
- Week 4: Final reminder and survey closure.

Pilot testing with 20 students ensured survey clarity, with minor revisions to wording. Ethical protocols included data encryption, anonymous storage, and the right to withdraw. The response rate was maximized through reminders and accessibility accommodations.

Data analysis

Quantitative data were analyzed using SPSS 27.0. Descriptive statistics, reliability tests, and exploratory factor analyses validated scale structures. Pearson correlations and hierarchical multiple regression tested technology confidence's impact on Moodle ease of use, controlling for gender, age, and academic stream. Subgroup analyses examined differences by gender, academic stream, and device type. Interaction effects explored whether prior LMS experience moderated the confidence-usability relationship.

Qualitative data were analyzed using Braun and Clarke's (2006) thematic analysis:

1. Familiarization with responses through repeated reading.
2. Coding key concepts (e.g., "connectivity issues," "content boredom").
3. Generating themes (e.g., accessibility, engagement).
4. Reviewing themes for coherence and data fit.
5. Defining and naming themes with clear descriptions.
6. Reporting with illustrative quotes to ensure authenticity.

Themes were triangulated with quantitative findings to enhance validity and interpretive depth.

Results

Technology access and experience: Most students owned smartphones (97.8%), followed by laptops (46.2%), tablets (18.7%), and desktops (14.3%; Table 1). Internet access was reported by 86.8%, with connectivity via SIM cards (47.3%), ADSL modems (23.1%), or both (16.5%). Daily internet usage was primarily 1–2 hours (38.5%) or 3–4 hours (29.7%), reflecting constrained access. Only 34.1% had prior LMS familiarity, and 18.7% had online learning experience, indicating a steep learning curve.

Device type	Frequency	Percentage
Smartphone only	43	47.3
Smartphone + laptop	24	26.4
Smartphone + tablet	9	9.9
Smartphone + laptop + tablet	8	8.8
Laptop only	4	4.4
Smartphone + desktop	2	2.2
Laptop + desktop	1	1.1

Table 1: Digital device ownership among students (N = 91)

Additional descriptive statistics: Internet reliability varied (M = 3.2, SD = 1.4 on a 6-point scale), with urban students (M = 3.5, SD = 1.3) reporting better access than rural students (M = 2.8, SD = 1.5; t(89) = 2.31, p = .023). Access locations included home (68.1%), university (45.1%), and public Wi-Fi (23.1%). Females (M = 0.05, SD = 0.56) reported slightly higher TCS scores than males (M = -0.03, SD = 0.52), though not significant (t(89) = 0.67, p = .504).

Scale properties and correlations: Table 2 summarizes scale properties. The TCS showed three factors (access infrastructure, usage patterns, prior experience), explaining 62.3% of variance. The MEUS revealed two factors (satisfaction/enjoyment, perceived utility), accounting for 68.7% of variance.

Scale	N	M	SD	Skewness	Cronbach's α
TCS	91	0.00*	0.54	-0.31	.67
MEUS	91	2.64	0.81	0.21	.79
MIBS	91	1.82	0.56	0.19	.81
TPMES	5	3.15	0.72	-0.42	.73

Table 2: Descriptive statistics and reliability coefficients for study scales (Note: Mean is 0.00 due to standardization)

Correlations (Table 3) showed moderate positive relationships between technology confidence and Moodle ease of use (r = .41, p < .001) and interaction behavior (r = .36, p < .001). MEUS and MIBS were strongly correlated (r = .57, p < .001).

Scale	1	2	3
1. TCS	—		
2. MEUS	.41***	—	
3. MIBS	.36***	.57***	—

Table 3: Correlation matrix for student scales (N = 91)
Note: ***p < .001.

Regression analysis: Hierarchical multiple regression (Table 4) tested technology confidence's predictive power. Model 1 (gender, age, academic stream) explained 7% of variance, non-significant (F(3, 87) = 1.47, p = .229). Model 2, adding technology confidence, explained an additional 16% (ΔF(1, 86) = 16.65, p < .001), with the final model accounting for 23% (F(4, 86) = 5.29, p < .001). Technology confidence was significant (β = .41, p < .001).

Predictor	Model 1 B	Model 1 SE B	Model 1 β	Model 2 B	Model 2 SE B	Model 2 β
Gender (0 = male, 1 = female)	0.12	0.17	.07	0.09	0.16	.06
Age	-0.06	0.07	-.09	-0.05	0.06	-.07
Foreign Languages Stream*	0.23	0.18	.14	0.21	0.16	.13
Technology Confidence				0.61	0.15	.41***
R^2	.07			.23		
ΔR^2				.16		
F for ΔR^2	1.47			16.65***		

*Table 4: Hierarchical multiple regression predicting Moodle ease of use (N = 91) (Note. *Compared to other streams. ***p < .001)*

Subgroup and interaction analyses: Subgroup analyses revealed differences:

- **Academic Stream**: Foreign Languages students (M = 2.78, SD = 0.79) reported higher MEUS scores than Experimental Sciences students (M = 2.45, SD = 0.85; t(53) = 2.14, p = .037), suggesting language exposure enhances digital comfort.
- **Gender**: Females (M = 2.71, SD = 0.80) reported slightly higher MEUS scores than males (M = 2.55, SD = 0.83), though not significant (t(89) = 0.92, p = .361).
- **Device type**: Smartphone-only users (M = 2.58, SD = 0.82) reported lower MEUS scores than those with laptops (M = 2.75, SD = 0.79; t(65) = 1.98, p = .049), indicating device limitations.

Interaction analysis showed that prior LMS experience moderated the confidence-usability relationship (β = .22, p = .031), with stronger effects for experienced users.

Student perceptions of Moodle and CTL: Students unanimously preferred Moodle for CTL (100%), citing accessibility (70.32% agreed) and quiz suitability (95.6% agreed). However, 84.61% found CTL content uninteresting (Table 5), attributing this to dense readings and lack of multimedia.

Response	SA	A	N	D	SD
Frequency	0	10	4	72	5
Percentage	0%	10.98%	4.39%	79.12%	5.49%

Table 5: Students' viewpoints regarding the CTL course (N = 91)

Qualitative findings: Thematic analysis identified six themes:

1. **Accessibility benefits**: Students valued Moodle's flexibility, e.g., *I can study at night on my phone when the internet is stable* (Student 23). However, connectivity disruptions were common, e.g., *The network fails during quizzes, and I lose my progress* (Student 41).

2. **Engagement challenges**: Text-heavy CTL content reduced motivation, e.g., *The readings are too long and dry; I lose interest* (Student 47). Students suggested multimedia, e.g., *Videos about British history would make it fun* (Student 19).

3. **Navigation difficulties**: Novice users struggled, e.g., *I couldn't find the forum section for weeks* (Student 12). Lack of prior LMS exposure exacerbated issues.

4. **Training needs**: Students requested workshops, e.g., *A short course on Moodle would help me use it better* (Student 65). Peer mentoring was also suggested, e.g., *Students who know Moodle could teach us* (Student 33).

5. **Infrastructure barriers**: Unreliable internet and limited laptop access hindered use, e.g., *My phone is too slow for big PDF files* (Student 28). Rural students faced greater challenges, e.g., *No Wi-Fi in my village* (Student 50).

6. **Socio-cultural influences**: Collectivist norms encouraged peer support, e.g., *My classmates showed me how to submit assignments* (Student 14). However, cultural resistance to online learning was noted, e.g., *My family thinks online study isn't serious* (Student 39).

Teacher perceptions: Four instructors (80%) had taught CTL online and on-site, one (20%) online only. Two (40%) viewed Moodle positively, e.g., *It allows flexible delivery and student interaction* (Instructor 2). Two were neutral, and one disagreed, citing technical barriers, e.g., *Students' connectivity issues disrupt classes* (Instructor 4). All reported limited training, e.g., *I learned Moodle through trial and error; no formal support* (Instructor 3). Suggestions included advanced training and better server reliability.

Discussion: This study confirms that technology familiarity significantly predicts Moodle usability ($r = .41$, $p < .001$), aligning with Connectivism, TAM, DOI, SDT, CLT, and Social Constructivism (Siemens, 2005; Davis, 1989; Rogers, 2003; Ryan & Deci, 2000; Sweller, 1988; Vygotsky, 1978). The regression findings, with technology confidence explaining 16% of usability variance, highlight the critical role of prior experience and access infrastructure (Almekhlafi & Almeqdadi, 2010; Bervell & Umar, 2017). Subgroup and interaction analyses suggest that academic background, device type, and prior experience shape usability, with implications for targeted interventions.

The high smartphone ownership (97.8%) but limited laptop access (46.2%) and inconsistent internet mirror digital divides in MENA, Sub-Saharan Africa, and South Asia (Mtebe & Raisamo, 2014; Krishnakumar & Rajesh, 2011; Al-Adwan & Smedley, 2012). Students' preference for Moodle's interactivity, despite CTL content dissatisfaction, underscores the platform's potential to enhance engagement through forums, quizzes, and collaborative tools (Cole & Foster, 2007; Oproiu, 2015). Qualitative findings highlight cognitive load issues with text-heavy designs, consistent with CLT, and the need for multimedia integration, as per Mayer's (2009) principles.

Instructors' mixed perceptions reflect global trends, where training and institutional support are pivotal (Hoq, 2020; Sani, 2014). The strong MEUS-MIBS correlation ($r = .57$, $p < .001$) supports Connectivism and Social Constructivism, emphasizing networked and collaborative learning (Keengwe & Kang, 2013; Vygotsky, 1978). Compared to developed contexts, Algeria's challenges are amplified by socio-cultural resistance, infrastructure deficits, and economic barriers, necessitating context-specific solutions (Bouchefra & Baghoussi, 2020; Johnson et al., 2023). For example, while European universities leverage AI-driven LMS analytics, Algeria's reliance on mobile data requires mobile-first designs.

The findings have broader implications for developing nations. SDT suggests that fostering autonomy (e.g., flexible access) and competence (e.g., training) enhances motivation, while DOI highlights the need for compatibility with local contexts (Ryan & Deci, 2000; Rogers, 2003). Algeria's collectivist culture amplifies peer influence, suggesting peer mentoring as a scalable strategy (Hofstede, 2001). CLT and usability principles underscore the importance of intuitive, multimedia-rich content to reduce cognitive load and enhance engagement (Sweller, 1988; Nielsen, 1994).

Implications: (1) Educational Policy: Integrate digital literacy into national curricula to build technology familiarity. (2) Pedagogical Innovation: Leverage Moodle's interactive tools to foster active, collaborative learning, reducing reliance on text-based content. (3) Infrastructure Development: Partner with telecom providers to improve connectivity and subsidize student access. (4) Equity and Inclusion: Prioritize rural and low-income students through device loan programs and offline LMS solutions. (5) Global Applicability: Strategies like mobile optimization, open-source platforms, and peer mentoring are relevant to MENA, Africa, and Asia.

Limitations: The single-institution sample limits generalizability, particularly to rural Algerian universities with greater infrastructure constraints. The cross-sectional design precludes causal inferences, and self-report measures may

introduce biases. The small instructor sample (N = 5) restricts TPMES robustness. Cultural and gender dynamics were underexplored due to sample size constraints.

Future research: Longitudinal studies could track Moodle adoption over multiple semesters, capturing causal dynamics. Multi-institutional samples and cross-national comparisons (e.g., with Morocco, Nigeria, India) would enhance generalizability. Investigating gamification, AI-driven personalization, mobile-first designs, and offline LMS solutions could address engagement and access challenges. Exploring socio-cultural and gender influences on LMS adoption would deepen contextual understanding.

Recommendations: To operationalize findings, we propose a multi-stakeholder framework with short-term (1–2 years) and long-term (3–5 years) strategies:

1. **Student training programs** (Short-Term):
   - Implement mandatory, semester-long Moodle workshops during orientation, covering navigation, forums, quizzes, and troubleshooting.
   - Establish peer mentoring networks, leveraging collectivist norms, with trained student leaders supporting novices.
2. **Instructor professional development** (Short-Term):
   - Offer year-long training on Moodle's advanced features (e.g., analytics, gamification, accessibility tools), with incentives like certification.
   - Create faculty learning communities to share best practices and foster innovation.
3. **Infrastructure solutions** (Long-Term):
   - Deploy offline Moodle servers (e.g., MoodleBox) in low-connectivity areas to ensure access during disruptions (Pushpanathan, 2012).
   - Negotiate with telecom providers to offer subsidized mobile data plans for students, targeting rural and low-income groups.
4. **Content redesign** (Short-Term):
   - Revamp CTL with multimedia (videos, podcasts, interactive case studies) and culturally relevant materials to reduce cognitive load and enhance engagement (Mayer, 2009).
   - Pilot gamified elements, such as badges for forum participation, to boost motivation.
5. **Policy advocacy** (Long-Term):
   - Collaborate with the Ministry of Higher Education to fund e-learning infrastructure, including server upgrades and public Wi-Fi hotspots.
   - Integrate digital literacy into national curricula, starting at secondary levels, to prepare students for higher education.

6. **Community and NGO partnerships** (Long-Term):
   - Partner with NGOs to provide device loan programs and community-based internet access points.
   - Engage local communities to promote e-learning's value, addressing cultural resistance through awareness campaigns.
7. **Monitoring and evaluation** (Ongoing):
   - Establish a national e-learning taskforce to monitor Moodle adoption, collect user feedback, and evaluate intervention outcomes.
   - Use analytics to track engagement and adjust strategies dynamically.

Conclusion

This study underscores the pivotal role of technology familiarity in shaping Moodle usability among EFL students at the University of Batna-2, offering a roadmap for optimizing e-learning in Algerian higher education and beyond. Despite infrastructural, training, and socio-cultural challenges, Moodle's interactive features enhance CTL engagement, though content redesign is critical to address disinterest. By prioritizing student and instructor training, infrastructure improvements, innovative pedagogy, and equitable access, universities can bridge digital divides and foster inclusive learning environments. These findings resonate with other developing contexts in MENA, Sub-Saharan Africa, and South Asia, where similar barriers impede e-learning scalability. A multi-year research agenda, focusing on longitudinal adoption, cross-national comparisons, and emerging technologies like AI and gamification, can sustain e-learning's transformative potential, advancing global educational equity and innovation.

Conflict of Interests
The author declares no ethical issues or conflict of interests in this research.

Ethical standards
The author affirms this research did not involve human subjects.

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ՏԵԽՆՈԼՈԳԻԱԿԱՆ ԻՐԱԶԵԿՎԱԾՈՒԹՅՈՒՆԸ ՈՐՊԵՍ MOODLE ՀԱՐԹԱԿԻ ԿԻՐԱՌԿՄԱՆ ԳՈՐԾՈՆ ԱԼԺԻՐՅԱՆ ՈՒՍԱՆՈՂՆԵՐԻ ՇՐՋԱՆՈՒՄ. ԹՎԱՅԻՆ ԲԱՑԻ ԿԱՄՐՋՈՒՄ

Բուշրա Սի-Մուհամըդ
Ամալ Բլհլուլ

Համակցված մեթոդներով իրականացված սույն հետազոտությունը նպատակ ունի բացահայտելու տեխնոլոգիաների նկատմամբ ունեցած իրազեկվածության ազդեցությունը Moodle ուսուցման հարթակի կիրառելիության վրա՝ Ալժիրի Բատնա-2 համալսարանում անգլերենը որպես օտար լեզու (ԱՕԼ) ուսումնասիրող 91 առաջին կուրսեցիների և հինգ դասախոսների մասնակցությամբ՝ 2023–2024 ուսումնական տարվա ընթացքում։ Քանակական հարցումներով չափվել են տեխնոլոգիական վստահությունը, Moodle հարթակի օգտագործելիությունը և ուսումնական փոխգործակցման ձևերը, իսկ որակական տվյալներն ապահովել են վերլուծության համատեքստային խորությունը։ Որակական վերլուծությունը բացահայտել է մի շարք հիմնարար թեմաներ՝ մատչելիության առավելություններ, ներգրավվածության խոչընդոտներ, նավիգացիոն դժվարություններ, ենթակառուցվածքային սահմանափակումներ, վերապատրաստման անհրաժեշտություն և սոցիալ-մշակութային գործոնների ազդեցություն։ Հետազոտության արդյունքներն ընդգծում են, որ տեխնոլոգիական իրազեկվածության բարձրացմանն ուղղված նպատակային միջոցառումները կարող են զգալիորեն նպաստել Moodle հարթակի արդյունավետ կիրառմանը Ալժիրի բարձրագույն կրթության համակարգում՝ միևնույն ժամանակ առաջ մղելով էլեկտրոնային ուսուցման հավասարության գաղափարը զարգացող երկրների համատեքստում։

Բանալի բառեր՝ *էլեկտրոնային ուսուցում, Moodle հարթակ, տեխնոլոգիական իրազեկվածություն, ԱՕԼ, ուսանողներ, բարձրագույն կրթություն, Ալժիր, թվային բաց, կապակցվածություն, օգտագործելիություն։*