



ORIGINAL RESEARCH PAPER

The Effectiveness of E-learning and AI applications (Gamma, Padlet, Classroom) in Developing the Educational Process

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This study investigates the impact of the Gamma, Padlet, and Classroom applications on students across various academic levels and disciplines. It explores the effectiveness of these applications in enhancing the educational process, revealing students' perceptions regarding accessibility, interaction, and skill development, while highlighting significant differences across academic disciplines and levels. The study involved 85 female students from diverse academic majors (Early Childhood Education, English Language, Islamic Studies, and Special Education) at the Girls' College of Seiyun University, Yemen, ranging from first to fourth-year levels. The findings indicate that the initial hypothesis—which suggested that students' attitudes toward e-learning tools would differ according to their academic level—was not supported. However, the hypothesis that students' attitudes differ according to their academic major was confirmed. The results also reveal an overall positive attitude toward these tools in terms of ease of use, access to educational resources, and perceived effectiveness, despite a slight continued preference for traditional learning methods. To maximize the benefits of e-learning applications, it is essential to improve technological training and personalize learning experiences when using Gamma and Padlet to avoid negative effects on student motivation and satisfaction.

Keywords: Gamma Application, Padlet Application, Classroom Application, E-Learning, Educational Process.

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Introduction

The integration of E-learning and AI applications in education has transformed teaching and learning methods, particularly with the emergence of gamified applications and interactive platforms. Among these innovations, Gamma, Padlet, and Classroom applications stand out for their unique approaches to enriching the educational experience. They have become popular tools for making learning more interactive and motivating. Though, there isn't yet empirical work that checks how students' study level and domain major affect their use of these platforms, especially in under-researched environments like Yemeni universities. The current study occupies this space by studying student attitudes toward three top e-learning applications.

Gamma uses gamification to increase student motivation and engagement, while Padlet, as a collaborative platform, and Classroom, as a digital tool, improve access to educational resources. This study examines the effectiveness of these applications in developing the educational process, based on students' attitudes of accessibility, interactivity and contribution to learning.

Numerous studies have explored the integration of technology in education. Zainuddin et al. (2020) shows that Padlet improves student motivation and engagement, supported by Nadeem (2019) and Meletiadou (2021), who also note benefits for writing skills, although additional support is needed. Jamiludin et al. (2021) highlights that Google Classroom in schools stimulate students' interest and strengthen their academic discipline. Hamzah et al. (2015) and Alsadoon (2023) find that gamification increases motivation, while Bouchrika et al. (2019) observe an improvement in interactivity. However, Hanus and Fox (2015) note that gamification can sometimes reduce motivation and performance.

Pechenkina et al. (2017) reveal that the gamified mobile application improves engagement and academic achievement, despite enigmatic questionnaire distribution methods. Hanus and Fox (2015) show that excessive gamification in the classroom can lead to lower motivation and satisfaction. Ng and Lo (2022) find that flipped classrooms increase engagement, while traditional gamified classrooms promote academic achievement during the COVID-19 pandemic. Alam et al. (2023) demonstrate that gamified dashboards increase STEM students' final grades. Buhagiar and Leo (2018) reveal better academic results in gamified courses compared to traditional courses. Tsay et al. (2018) emphasize that the effectiveness of gamification depends on contextual factors and student characteristics.

Oguta et al. (2023) classify gamification challenges into design issues, short-term engagement, and adaptability. Despite proposed solutions, their implementation remains uncertain. Their systematic review shows positive impacts on engagement, but technical barriers persist. Teachers perceive gamification as beneficial but risky

for the classroom climate (Sánchez-Mena & Martí-Parreño, 2017). Araújo and Carvalho (2022) identify drivers and obstacles to its adoption. Mora (2020) shows transformative potential of gamification, but questions about its overall effectiveness remain (Furdu, Tomozei & Kose, 2017; Jassem & Piskadlo, 2014).

Research problem

Despite the enthusiasm for the integration of technology, there are concerns about its actual effectiveness and its impact on the personalization of learning experiences and academic performance. Gamified applications and interactive platforms can sometimes have negative effects, and students' adaptability to these new tools varies significantly. The primary research problem addressed in this study the extent to which these technological tools influence learning outcomes and to identify the factors that affect students' adaptability and performance.

Objectives

This study aims to analyze the influence of E-learning and AI applications, specifically Gamma, Padlet, and Google Classroom, in facilitating various aspects of the learning process. Specifically, it addresses their facilitation of motivation, engagement, and students' academic performance, while also analyzing the contribution of the personalization of learning experiences through the platforms to instructional and learning practice.

Scope of research

The study focuses on undergraduate students spanning various academic levels and majors (from first-year to fourth-year), analyzing their attitudes of the effectiveness of online learning applications compared to traditional methods. It also explores the challenges and limitations of implementing gamification in an educational setting.

Overview of methods used in data collection

Data was collected using questionnaires, allowing for a detailed assessment of students' attitudes and experiences with Gamma, Padlet and Classroom applications. Statistical analyzes were carried out to compare the responses of students at different academic levels and majors.

Research Hypotheses

Hypothesis 1: There is no significant relationship between students' attitudes towards e-learning tools and their academic level.

Hypothesis 2: There are significant differences in attitudes towards e-learning tools based on students' major.

Research Questions

Question 1: Do students find e-learning applications to be as effective as traditional learning methods?

Question 2: How does the preference for traditional learning vary among different academic levels and majors?

REVIEW OF LITERATURE

The Impact of e-learning tools on Student Motivation and Engagement in E-Learning Platforms

According to Zainuddin et al. (2020), exploring the twists and turns of Padlet revealed positive effects on motivational dynamics and online learner engagement. In his findings, student engagement during classroom activities saw a notable increase through the adoption of active learning through Padlet. Corroborating these findings, Nadeem (2019) provided support by highlighting Padlet's favorable impact on learner engagement, while highlighting its role in promoting active learning and creating experiences. enriching evaluations.

Similarly, Meletiadou's (2021) research revealed the virtues of Padlet as an e-portfolio, highlighting its beneficial influence on students' writing skills and intrinsic motivation. However, despite these encouraging findings, a sigh of perplexity emanates from the student testimonies. They expressed a dire need for additional support in mastering computer tools and navigating through electronic portfolios.

Thus, although the studies collectively highlight the potential of Padlet as a valuable instrument for boosting student motivation and engagement in the mysteries of online learning platforms, they also point to the need for support increased to fully exploit these resources (Zainuddin et al., 2020; Nadeem, 2019; Meletiadou, 2021).

Hamzah and colleagues (2015) undertook an exploration of the influence of gamification on student motivation in using online learning applications, based on the ARCS+G model. Their study, published in the International Journal of Emerging Technologies in Learning, revealed that the experimental group, benefiting from gamification, displayed significantly higher levels of motivation compared to the control group. The study, following a rigorous methodology with an authentic experimental design and in-depth statistical analyses, demonstrated that the experimental group obtained higher reliability scores in each category of the ARCS model compared to the control group, highlighting a significant difference motivation between the two groups.

On the other hand, Alsadoon (2023) conducted a study on the impact of gamified learning on student motivation and engagement in a basic computer science course. Its findings highlighted the effectiveness of this approach in improving these aspects in computer science education, particularly among Saudi university students. He recommended the use of electronic platforms and applications supporting gamification in the teaching of IT courses.

Similarly, Bouchrika and colleagues (2019) looked at the effect of gamification on student engagement and involvement with e-learning systems. Their research, published in *Interactive Learning Environments*, found that gamification can effectively improve interactivity and user engagement with educational platforms. Their empirical study conducted over a 10-month period showed that the integration of the gamified platform into a university's e-learning portal boosted engagement, motivation and adoption of e-learning technologies. learning.

However, the work of Hanus and Fox (2015) took a more critical perspective, evaluating the effects of classroom gamification on student motivation, satisfaction, empowerment and academic performance. Their research found that gamified courses resulted in lower motivation, satisfaction, and empowerment, as well as lower final scores compared to non-gamified courses. This finding highlights the need for caution in applying gamification in educational contexts.

Additionally, Dicheva and team (2014) presented a course gamification platform aimed at helping instructors gamify skill development courses. Their work highlighted the potential of gamification to improve user motivation and engagement in education, although specific methodological details are not provided in the abstract.

In a later study, Dicheva and colleagues (2014) compared the effects of gamification and social media on e-learning, demonstrating that both approaches outperformed traditional e-learning in terms of academic achievement for assignments. practice. However, the traditional approach was more effective in assessing knowledge. Although the new tools generated low participation rates and scores, student attitudes were positive, highlighting the potential of gamification and social media to improve certain aspects of online learning.

The integration of educational applications, such as Google Classroom, into educational processes has attracted growing interest for its diverse beneficial effects. Research indicates that these digital tools improve students' access to educational resources, thereby increasing their engagement and promoting increased discipline in their studies (Jamiludin et al., 2021). These platforms not only make learning more accessible, they also enrich educational activities by increasing student motivation and improving their performance, while providing a structured framework for managing educational tasks (Aljraiwi, 2017). Furthermore, the use of Google Classroom has demonstrated a notable improvement in the academic performance of educational technology undergraduates, highlighting the importance of these tools in strengthening the educational process (Ekpo-Eloma et al., 2022).

The adoption of digital platforms like Google Classroom in schools has revealed significant and positive impacts on education. By making educational resources more accessible, these applications stimulate students' interest and strengthen their

academic discipline (Jamiludin et al., 2021). At the same time, they optimize teaching activities, increase student motivation and improve their academic performance.

Evaluating the Efficacy of the E-learning Applications in Personalized Learning and Academic Performance Enhancement

Pechenkina and colleagues (2017) examined the enigmatic impact of a gamified mobile application on student engagement and academic success, uncovering a troubling phenomenon. Their study, reported in the International Journal of Educational Technology in Higher Education, found dramatic improvements in student retention and academic performance. They methodically deployed a quantitative approach, analyzing data from young accounting and science students during a tumultuous semester in 2015. The results, taken from a combined sample and subjected to SPSS analysis, emerged as findings statistically significant. However, how the questionnaires managed to captivate students, launched after lectures and before tutorials, remains a puzzle to be resolved (Pechenkina et al., 2017).

Hanus and Fox (2015) took an intellectual journey through a longitudinal study, revealing the mysteries hidden behind gamification in the classroom, its effects on intrinsic motivation and academic performance. Their findings, recorded in Computers & Education, shed light on unexpected paradoxes. The exploration of two groups of students over 16 weeks, one immersed in a gamified world, the other navigating more conventional waters, revealed some disturbing truths. Researchers have found that the abundance of rewards in heavily gamified systems can potentially sow discord, leading to lower motivation and satisfaction, as well as lower academic performance (Hanus & Fox, 2015).

Ng and Lo (2022), in a quest informed by academic uncertainty, ventured into exploring gamified flipped classrooms and gamified traditional classrooms. Their research, recorded in Sustainability, revealed nuanced truths. Traditional classrooms, like beacons in the haze of the COVID-19 pandemic, provided a haven of academic success, while flipped classrooms fueled learner engagement. But at the heart of this educational conundrum lies the need for an active teaching presence to nurture learners' curiosity and interest (Ng & Lo, 2022).

Alam and his colleagues (2023) have penetrated the mysteries of gamified dashboards, thus illuminating the paths to academic success of STEM students. Their revelations, published in the Journal of Computer Assisted Learning, shed light on some disturbing evidence. Students who navigated the maze of gamified dashboards reaped sweeter academic rewards, with a notable increase in their final grades (Alam et al., 2023).

Buhagiar and Leo took an academic journey into the heart of commerce, exploring the mysteries of gamification. Their writings, recorded in the Journal of Instructional Pedagogies, exposed an intriguing revelation. Comparing two sections of a basic course, one diving into the abyss of gamification, the other navigating more conventional waters, they discovered a striking advantage for students immersed in gamified educational materials (Buhagiar & Leo, 2018).

Tsay and his companions have embarked on an expedition into the realm of mediated technology, where gamification reigns supreme. Their findings, reported in Computers & Education, revealed a complex landscape. While some rays of light illuminate the effectiveness of gamification in higher education, mysterious shadows loom, highlighting the influence of contextual factors and player characteristics on this effectiveness (Tsay et al., 2018).

Enhancing Student Outcomes through Gamified Learning Platforms: Evidence and Implications

The application of gamified course design, as suggested in this work, raises serious perplexity about its implications for educators interested in creating technologically engaging learning environments conducive to improving student learning. This evaluation of the effectiveness of gamification in a student-centered learning context highlights improved student performance with gamified systems. However, it is equally important to note the influence of gender and professional status on online learning activities in higher education, which further contributes to the atmosphere of confusion (Tsay et al., 2018).

The results of this study are both positive and mixed, revealing that the effectiveness of gamification can be significantly affected by a multitude of factors, including context, participant characteristics, and the alignment of motivational incentives with goals and objectives user needs. The use of mixed methods, such as multiple regression analyses, in this approach aimed to explore the relationship between students' contextual variables and their performance in the course, while assessing the impact of different teaching approaches and professional status on their engagement and academic performance (Tsay et al., 2018).

In another vein, Esnaashari, Gardner and Rehm look at students' perceptions of electronic educational tools, highlighting positive feedback as well as the motivating effects of gamification and competition on participation. This study highlights the positive nature of educational tools, generating satisfaction, increased engagement and facilitation of learning among learners (Esnaashari et al., 2019).

As for the effectiveness of online learning compared to classroom teaching, Al-Hassan's results raise complex questions. This comparison reveals that online learning students tend to perform better, particularly when learning modalities combine online and face-to-face elements (Al-Hassan, 2011). However, this study

also highlights the presence of potential bias in educational research, adding an additional layer of confusion to this issue (Al-Hassan, 2011).

Castro, Sibó, and Ting's assessment of the impact of gamification on online learning platforms adds to this mosaic of perplexity. Their research highlights the positive influence of gamification on student performance and reduced dropout rates in online educational environments (Castro et al., 2018). Similarly, Marcos, Domínguez, Saenz-de-Navarrete, and Pagés-Arévalo compare the effects of gamification and social media on online learning, revealing results that seem, at least on the surface, clear. They indicate that both approaches outperform traditional online learning in terms of academic achievement for practical assignments, although the traditional approach seems more appropriate for assessing knowledge (Marcos et al., 2014).

Alshammari adds an additional element to this complex debate by demonstrating that gamification positively improves learning outcomes and student motivation in online learning systems for primary school students (Alshammari, 2020). However, this effort, though relevant, only adds to the nebula of differing results and interpretations.

Finally, Uden et al. highlight the important function of technology in improving learning outcomes, which stresses the beneficial effect of gamification on online platforms (Uden et al., 2019). Their work is part of the complex terrain of research on gamification and online learning, further enriching this nascent discussion.

In conclusion, gamification in education appears to be a source of both optimism and confusion. While numerous studies highlight its potential benefits, the complexity of the factors at play and the diversity of results make its evaluation and integration into educational practices a daunting task.

Challenges and Limitations in Implementing Gamified Learning Technologies in Education

Oguta and colleagues look at the challenges inherent in integrating gamification into higher education, grouping them into three distinct categories. They identify design issues, short-term engagement challenges, and barriers to user adaptability. Although potential solutions are advanced in this study, the complexity of these problems remains deeply disconcerting.

The research highlights three major categories of difficulties in the adoption of gamification in higher education institutions, proposing potential solutions to these challenges (Oguta et al., 2023). However, despite these efforts, the practical implementation of these solutions remains uncertain, contributing to the general ambiguity surrounding this issue.

In an attempt to resolve this conundrum, Oguta and colleagues (2023) used the PRISMA framework to undertake a systematic literature review, bringing together

relevant studies from databases such as Google Scholar, Scopus and ResearchGate. However, even with this robust methodology, the conclusions remain surrounded by an aura of uncertainty.

On the other hand, the technological incorporation of gamification into classrooms appears to have a positive impact on student engagement and motivation (Oguta et al., 2023). This finding appears to offer a glimmer of hope in understanding this complex phenomenon, but it is offset by technical problems such as faulty wireless connections and the risk of demobilization linked to competition.

Teachers perceive the use of gamification as beneficial while also considering it a potential risk for classroom climate (Sánchez-Mena & Martí-Parreño, 2017). This perceived duality adds an additional layer of perplexity to this already complex issue of gamification adoption in education.

Araújo and Carvalho (2022) conducted an in-depth study on the drivers and barriers to the adoption of gamification in education, identifying four main drivers and barriers. However, despite this in-depth analysis, the resolution of this enigma remains elusive.

Mora (2020) successfully explored the integration of gamification and ClassDojo to improve student behaviors and performance in the classroom. This conclusion illuminates the transformative potential of gamification in educational practices, but remains veiled with regard to its large-scale applications.

Furdu, Tomozei, and Kose (2017) assessed the challenges, benefits, and drawbacks of gamification in education, noting a decrease in motivation compared to the previous semester. This observation raises troubling questions about the overall effectiveness of gamification in educational environments.

Finally, Jassem and Piskadlo (2014) developed an open source system, CyberAcademy, to gamify courses in higher education. While this project offers promising opportunities, it also brings into question its long-term sustainability and efficacy in the classroom. Overall, research on gamification in schools is a complex and contradictory one. Despite efforts to understand and overcome the associated challenges, many questions remain unanswered, contributing to a persistent atmosphere of perplexity around this topic.

Methodology

Research Design

This study employs a quantitative research design to explore students' attitudes towards E-learning and AI applications and the influence of their academic level and major on these attitudes. The study also examines the reliability and validity of the survey instrument.

Participants

The participants comprised 85 female students from diverse academic majors at the Women's College of Seiyun University, Yemen (Kindergarten Education, English Language, Islamic Studies, Special Education), spanning various academic levels (from first-year to fourth year).

The Participants were sampled with a purposive sampling technique due to institutional constraints and the limited accessibility to a broader or mixed-gender population. This approach ensured the inclusion of participants directly engaged with the technologies under investigation, although it may limit the generalizability of the findings.

Data Collection

Data were gathered using a structured questionnaire with Likert-scale questions on a 3-point scale: (1) Never, (2) Sometimes, (3) Always. The questionnaire was tested with a pilot sample of a small group for simplicity and then confirmed via expert review and factor analysis.

Measures

The questionnaire included items assessing ease of use, accessibility, individual needs, teacher support, teaching strategies, interactivity, content quality, activity diversity, skill acquisition, clarity of information, and technical skills development.

Hypotheses

Hypothesis 1: There is a significant relationship between students' attitudes towards electronic learning tools and their academic level.

Hypothesis 2: There is a significant difference in students' attitudes towards electronic learning tools based on their major.

Reliability and Validity

Reliability

Cronbach's Alpha was used to assess the internal consistency of the questionnaire. A value above 0.70 indicates acceptable reliability.

Test-Retest Reliability was conducted by administering the same survey to a subset of participants after two weeks.

Validity

Content Validity was ensured through expert review, where subject matter experts evaluated the relevance and comprehensiveness of the questionnaire items.

Construct Validity was assessed using factor analysis to verify that the items appropriately measure the intended constructs.

Criterion-Related Validity was evaluated by correlating the survey scores with external criteria, such as academic performance.

Methodology limitations include the use of a gender-specific, small sample at one university, and heavy reliance on self-report data, which can introduce bias. The investigation did not control for geographic or socioeconomic context.

Results

Descriptive Statistics

Table 1 (*Frequency Distribution of Responses*)

Statement	Never	Sometimes	Always
Do you find it easy to use e-learning applications such as Gamma, Padlet and Classroom?	7%	55%	38%
Does e-learning provide easy access to learning resources and information?	3%	43%	54%
Do e-learning applications offer the necessary experiences learners need?	2%	50%	48%
Does e-learning cater to the individual needs of learners?	2%	41%	57%
Does e-learning support the teacher's role during content explanation?	0%	45%	55%
Do e-learning applications offer different teaching strategies and methods?	3%	36%	60%
Does e-learning support interaction among learners?	3%	40%	57%
Do e-learning applications provide up-to-date, reliable, and accurate content?	5%	43%	52%
Do e-learning applications provide various activities that suit diverse learning styles?	0%	48%	52%
Does e-learning help learners acquire new knowledge and skills?	3%	41%	56%
Does e-learning make educational information clearer and easier to understand?	2%	38%	60%
Does e-learning enhance both individual and collaborative learning processes?	3%	40%	57%
Does e-learning offer learners the freedom to learn anytime and anywhere?	2%	34%	64%
Does e-learning increase learners' technical skills?	0%	38%	62%
Does e-learning develop learners' critical thinking and problem-solving skills?	3%	36%	61%
Does e-learning create a learning environment that meets modern technical requirements?	2%	36%	62%
Does e-learning make learning more engaging and motivating for learners?	5%	43%	52%
Do you prefer traditional learning over e-learning?	17%	53%	30%

Inferential Statistics

A chi-square test and regression analysis were conducted to examine the relationships and differences based on academic level and major.

Table 2 (*Chi-Square Test Results*)

Variable	Chi-Square Statistic	p-value
Academic Major	12.34	0.05
Academic Level	8.45	0.12

The chi-square results indicate a significant difference in perceptions based on academic major ($p = 0.05$), but no significant difference based on study level ($p = 0.12$).

Table 3 (*Regression Analysis*)

Predictor	Coefficient	Standard Error	t-value	p-value
Constant	2.1	0.15	14.0	0.001
Academic Level	0.08	0.05	1.6	0.11
Major (Dummy Coded)	0.22	0.07	3.14	0.002

The regression analysis reveals that academic major significantly predicts attitudes towards e-learning tools ($p = 0.002$), whereas academic level does not ($p = 0.11$).

Interpretation

The descriptive statistics suggest that students generally perceive e-learning positively, particularly in terms of accessibility, ease of use, and skill development.

Hypothesis 1: The regression analysis and chi-square test indicate that there is no significant relationship between students' attitudes towards e-learning tools and their academic level. This hypothesis is not supported.

Hypothesis 2: Both the chi-square test and regression analysis indicate significant differences in attitudes towards e-learning tools based on students' major. This hypothesis is supported.

Reliability and Validity

Reliability

Cronbach's Alpha for the questionnaire was 0.87, indicating high internal consistency.

Test-Retest Reliability: The correlation between the two administrations of the survey was 0.82, indicating good stability over time.

Validity

Content Validity: Experts confirmed that the items were relevant and comprehensive.

Construct Validity: Factor analysis supported the theoretical structure of the questionnaire, with all items loading significantly on their respective factors.

Criterion-Related Validity: Survey scores correlated positively with academic performance ($r = 0.45$, $p < 0.01$), indicating good criterion-related validity.

Summary of Reliability and Validity

The survey instrument demonstrated high reliability and validity, making it a robust tool for assessing students' attitudes towards e-learning tools.

Discussion

1-Discussion of the Results

The results of this study show that students generally perceive online learning via Gamma, Padlet, and Classroom applications positively, especially in terms of accessibility, ease of use and technical skills development. Statistical analyzes reveal that attitudes towards these tools vary significantly according to the academic specialty of students, but not according to their academic level.

The results support the hypothesis that attitudes toward online learning tools vary significantly by academic major. This could be explained by the specific needs and varied expectations of students depending on their field of study. For example, Islamic studies students might have different expectations for content and teaching methods compared to special education or English language arts students.

2-Comparison with Current Results in the Field of Research

The results of this study are consistent with those of previous research which highlights the benefits of gamification and collaborative platforms for increasing student engagement and motivation. Zainuddin et al. (2020) and Nadeem (2019) also found that Padlet improves student engagement and promotes active learning. Likewise, the work of Hamzah et al. (2015) and Alsadoon (2023) show that gamification can significantly increase student motivation.

However, Hanus and Fox's (2015) results provide a critical perspective, revealing that gamification can sometimes reduce motivation and academic performance, highlighting the complexity of this approach. These contradictions highlight the importance of specific contexts and user characteristics in evaluating the effectiveness of gamified learning technologies.

These discrepancies suggest that the effectiveness of gamification may be contingent on its application. Whereas Hanus and Fox condemn reward-saturated systems that erode intrinsic motivation, other research supports the use of well-crafted gamified systems. This contrast underscores the importance of context-specific instructional design when applying gamified tools like Gamma.

In addition, the results of this study are consistent with current trends observed in educational technology integration research:

1. Accessibility and Engagement: As Jamiludin et al. (2021) and Aljraiwi (2017) indicate, digital tools like Google Classroom improve access to resources and

increase student engagement, which is confirmed by the 54% of students finding easy access and the 52% who find these tools engaging.

2. Academic Performance: Improved academic performance through the use of Google Classroom, noted by Ekpo-Eloma et al. (2022), is supported by students' positive attitudes of developing new skills and improving their learning (56% and 57% respectively).

3. Teaching Support and Interaction: E-learning tools support the role of the teacher and promote interaction between learners, which is in line with the conclusions of this study where 55% of students recognize supporting teachers and 57% improving interaction.

The mentioned researchers (Jamiludin, Aljraiwi, Ekpo-Eloma) provide additional evidence and contextualize the results of the current study by showing continued improvement in student engagement, motivation, and academic performance through learning platforms online. These studies help to strengthen the validity and relevance of the conclusions drawn from the data presented.

Research Limitations and Implications for Future Research

The sample population for the present study was restricted to female students from one institution, which allowed for limited generalizability of the findings. Future studies should use larger gender-mixed and multi-institutional samples to verify results and examine sociocultural or geographical determinants that can affect technology use.

Despite these limitations, the findings of this study have several implications for future research and educational applications. First, it is essential to consider disciplinary differences when designing and implementing educational technologies. Future researchers should investigate further the individual and contextual determinants of the effectiveness of such instruments. While the current findings are from an all-Yemeni female environment, future research needs to try to conduct similar interventions in mixed-sex or non-Yemeni schools to ascertain the generalizability and cross-cultural validity of the findings.

Moreover, it would be beneficial to investigate the specific mechanisms by which gamification and collaborative platforms influence motivation and engagement. For example, research could explore the role of rewards, competition, and cooperation in gamified environments. In practice, the teachers should be trained on how to use these tools optimally, taking into account the specific needs of their students. Technical support and advice are critical in achieving the maximum potential of these technologies.

Conclusion

In conclusion, this study evaluated the effectiveness of Gamma, Padlet, and classroom applications in developing the educational process, highlighting overall

positive attitudes from students. Although attitudes vary depending on academic specialty, results show that these tools help improve accessibility, interactivity and the development of students' technical skills.

This study also provides evidence that while academic level does not significantly influence students' attitudes towards e-learning tools, their major does. The findings stress the need for tailoring e-learning approaches to different academic majors to maximize their effectiveness. However, the research also revealed some limitations, such as the need for additional support in computer literacy.

This study contributes to the limited literature base in the domain of e-learning adoption in non-Western academic environments, specifically in all-female universities. From the findings, a framework for the deployment of such tools is proposed as: (1) aligning type of application with field-specific needs, (2) providing online training courses for students and teachers, and (3) including feedback loops from students to maximize usage on the platform.

Subsequent research must explore more deeply these contextual and individual differences and plan ways of responding to the challenges revealed. Teachers must be attuned to the specifics and special needs of their students so that they can appropriately use these technologies in teaching.

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اثربخشی یادگیری الکترونیکی و کاربردهای هوش مصنوعی (گاما، پادلت، کلاس روم) در توسعه فرآیند آموزشی

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این مطالعه تأثیر برنامه‌های گاما، پادلت و کلاس روم را بر دانشجویان در سطوح و رشته‌های تحصیلی مختلف بررسی می‌کند. این پژوهش اثربخشی این برنامه‌ها را در ارتقای فرآیند آموزشی مورد کاوش قرار داده، دیدگاه‌های دانشجویان را در مورد دسترسی، تعامل و توسعه مهارت‌ها نشان می‌دهد و در عین حال تفاوت‌های قابل توجه بین رشته‌های تحصیلی و سطوح آموزشی را برجسته می‌سازد. این مطالعه با مشارکت ۸۵ دانشجوی دختر از رشته‌های تحصیلی متنوع (آموزش دوران کودکی، زبان انگلیسی، مطالعات اسلامی و آموزش ویژه) در دانشکده دختران دانشگاه سیئون یمن، از سطح سال اول تا چهارم انجام شده است. یافته‌ها نشان می‌دهد که فرضیه اولیه - که حاکی از تفاوت نگرش دانشجویان نسبت به ابزارهای یادگیری الکترونیکی بر اساس سطح تحصیلی آنها بود - تأیید نمی‌شود. با این حال، فرضیه مبنی بر تفاوت نگرش دانشجویان با توجه به رشته تحصیلی آنها تأیید شد. نتایج همچنین نگرش کلی مثبتی را نسبت به این ابزارها از نظر سهولت استفاده، دسترسی به منابع آموزشی و اثربخشی درک‌شده نشان می‌دهد، علیرغم ترجیح اندک باقی‌مانده برای روش‌های یادگیری سنتی. برای به حداکثر رساندن مزایای برنامه‌های یادگیری الکترونیکی، بهبود آموزش فناوری و شخصی‌سازی تجربیات یادگیری هنگام استفاده از گاما و پادلت برای جلوگیری از اثرات منفی بر انگیزه و رضایت دانشجویان ضروری است.

واژه‌های کلیدی: برنامه گاما، برنامه پادلت، برنامه کلاس روم، یادگیری الکترونیکی، فرآیند آموزشی.

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