Exploring the future of learning: understanding the innovation in learning from the perspectives of developing nation

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Abstract

Purpose – The purpose of this study is to explore learner-centered emerging technologies, methods of learning with artificial intelligence (AI), student engagement and concerns related to the assessment process at public and private universities in Bangladesh.

Design/methodology/approach – The study employed a qualitative research approach to investigate innovations in learning, student engagement and assessment concerns. Respondents were categorized into three clusters: Cluster-A comprised students from various academic levels, Cluster-B included faculty members with online teaching experience and Cluster-C consisted of information and communication technology (ICT) experts from university information technology (IT) departments. Qualitative data were collected via in-depth interviews.

Findings – The research findings indicate the widespread acceptance and utilization of learner-centered technologies, with online and hybrid learning offering flexibility, accessibility, self-paced learning and better student engagement opportunities. While AI platforms like ChatGPT and Gemini are valued for clarifying theoretical concepts, concerns exist regarding their ethical use, particularly in completing assignments. The assessment process faces challenges related to online exams, with concerns over cheating prompting calls for AI-supported solutions. However, there is a gap between commitment and action in regulating unethical AI usage, highlighting the need for clearer guidance and investment in technological solutions for an effective assessment process.

Research limitations/implications – Limitations of this study include the inability to quantify the satisfaction level with the emergence of learner-centered technologies, which could be better explained through a quantitative study.

Originality/value – This study's originality and value stem from its thorough investigation of innovations in learner-centered education considering the emergence of AI and student engagement, uniquely focusing on the perspective of a developing country.

Keywords Future of learning, Online education, Hybrid learning, Innovation in learning, Learner-centered technologies, Developing nation

Paper type Research paper

1. Introduction

Digitalization necessitates the utilization of innovation and technology for educational purposes. It is regarded as a crucial component in preparing for the future in alignment with the goals of Industry 4.0 (Arısoy, 2022). However, The COVID-19 pandemic has impacted all

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levels of education, leading to temporary closures of schools in many countries and a transition to online learning (Jaramillo-Arévalo *et al.*, 2023). From 2020 to 2022, the COVID-19 pandemic has spurred rapid digitalization across higher education institutions (HEIs) and organizations worldwide, revolutionizing how services are delivered and how learning and working take place. This has underscored the importance of practical and inclusive digital interventions in education (Webb *et al.*, 2021).

It was also found that the success of online-based remote teaching initiatives during the COVID-19 pandemic depended largely on the readiness of HEI leadership and their swift response to the crisis; prior implementation of remote teaching initiatives facilitated smoother transitions to online learning (Bengü *et al.*, 2023).

The emergence of artificial intelligence (AI), such as ChatGPT, is one of the significant innovations of the 21st century. It is crucial to acknowledge both the opportunities and challenges that arise from integrating AI into higher education (Rouhiainen, 2019). At the same time, educational institutions also need to ensure the effectiveness of student engagement, learning evaluation and assessment processes. However, currently, there is limited research available on the topic, especially from the perspective of underdeveloped and developing nations. Therefore, this particular study discusses the innovations in learning technologies, methods, student engagement and assessment at public and private universities from the perspective of a developing nation.

2. Literature review

2.1 Innovation in learning in recent years

Since the early 21st century, there have been numerous efforts to comprehend innovation in the education sector. Chandra *et al.* (2021) discovered that innovation education is an emerging field characterized by various concepts and frameworks that require consolidation.

According to Serdyukov's (2017) analysis, educational innovation in the USA is scrutinized, covering classifications of innovations, barriers to innovation and methods to amplify the scale and speed of innovation-driven changes in the education sector. The paper also highlighted the unrelenting necessity for widespread, impactful innovations to enhance learning outcomes across the educational landscape.

Keinänen and Kairisto-Mertanen (2019) investigated the concept of innovation pedagogy and its influence on students' innovation competences. They delve into different learning environments linked with innovation pedagogy, encompassing (1) activating learning and teaching techniques; (2) real-world orientation; (3) research, development and innovation integration; (4) a multidisciplinary education environment; (5) flexible curriculum; (6) entrepreneurial initiatives and (7) internationalization. The research also revealed that students exposed to innovation pedagogy learning environments typically demonstrate higher scores in assessments of their innovation competences.

However, since the start of the COVID-19 pandemic in 2020, there has been a growing emphasis among researchers globally on innovation in learning. At the beginning, the COVID-19 outbreak necessitated the temporary closure of educational institutions worldwide (Ajibo and Ene, 2023).

This event catalyzed significant transformations and innovations within the global educational landscape in subsequent phases (Zairul *et al.*, 2023; Shahriar *et al.*, 2021). The terms such as online education (Aisha and Ratra, 2022), e-learning (Xu *et al.*, 2024; Nikou and Maslov, 2021), virtual learning (VL) (Anthony Jnr and Noel, 2021), digital classroom (Momen *et al.*, 2023), remote teaching (Valsaraj *et al.*, 2021; Waghid *et al.*, 2021), massive open online course (MOOC)-based learning (Shahriar *et al.*, 2023) and hybrid or blended learning (Mosha and Luhanga, 2023) gained widespread recognition among people worldwide during the COVID period. The emergence of AI (Halagatti *et al.*, 2023) also significantly influences the future landscape of

education. In essence, the diverse terminologies employed by researchers to depict the evolution of education all emphasize innovative methods centered on learners and educators. These emerging technologies are fundamentally reshaping the global educational ecosystem.

2.2 Journey of innovation in education

Since the beginning of the COVID-19 pandemic, educational institutions worldwide have transitioned to online teaching and learning (Samarji and Ghaddar, 2023). The emergence of educational innovation has also undergone a challenging journey, and that continues to evolve. Researchers have also tried to highlight the challenges and various aspects of this transformation. For example, Baregheh *et al.* (2022) examined the demographic, technological, political and pedagogical challenge of sustaining strategic innovation in higher education, particularly in teaching and learning, and also discussed the planned steps to prototype and test these adaptations with innovation leaders in higher education.

During the initial stages of the transition from traditional to online learning processes, all students, teachers, educational institutions, parents and governments faced significant challenges due to major infrastructural changes, digital setups, modifications in instructional design, learning methods and resource planning and management.

Anthony Jnr and Noel (2021) also discussed the challenges of emergency remote teaching (ERT) and VL during the COVID-19 pandemic. Additionally, the research presents the platforms used for implementing ERT and VL during and after the pandemic. Finally, it suggests strategies to enhance the current and future adoption of ERT and VL in educational settings.

Mooko (2022) examined the policy gaps emerging from the impact of COVID-19 on the education sector and argued that blended learning has become the most suitable method for delivering tertiary education.

2.3 Educators' perspective toward innovation in learning

Initially, teachers also faced many difficulties in operating online classes, particularly in underdeveloped and developing countries. Most of the teachers at the school, college and degree levels did not have prior experience in conducting online-based classes. Therefore, they were not proficient with the technology and lacked experience in managing students online. Some studies have also explored the difficulties educators face. For example, Rosalina *et al.* (2020) pointed out that challenges in implementing online learning revolve around facilitation, including issues such as (1) Internet connectivity, (2) data quotas, (3) home environment limitations and (4) the online learning process itself, which also encompasses (5) teachers' limited technological proficiency.

However, within a very short time, educators adapt to the digital ecosystem, familiarizing themselves with the various features and benefits of online-based education. Teachers' intention to continue using online teaching is primarily driven by satisfaction rather than just utility, ease of use or attitude (Kumar *et al.*, 2023).

Another study indicated that while service quality didn't significantly affect instructors' satisfaction, other factors did to varying degrees. However, poor Internet service and students' lack of interest are the primary challenges encountered by instructors (Hussein *et al.*, 2021).

Samarji and Ghaddar (2023) measured instructors' satisfaction using three factors from the Online Instructor Satisfaction Measure (OISM): how they interacted with students, how students interacted with each other and how courses were designed and taught.

2.4 Students' perceptions toward the student-centered learning technologies

The COVID-19 pandemic has led educational institutions globally to implement online teaching and learning methods, stimulating innovation in education (Bouranta and Psomas, 2024). Although the emergence of online education during the COVID-19 pandemic was

initially seen as the only inevitable solution to maintain the continuity of education during lockdowns, it eventually became the most flexible and convenient way of implementing student-centered learning technologies.

Haider and Al-Salman (2023) found that e-learning is more suitable for humanities courses than for science courses. It was also found that faculty members in humanities departments are generally more satisfied with the assessment tools used in online courses compared to those in science departments. Furthermore, humanities e-courses appear to offer a more interactive learning atmosphere than science e-courses.

Research has also confirmed that specific factors significantly influence students' satisfaction with e-learning. These factors include the efficacy of digital communities within e-learning, the quality and user-friendliness of technology and the design quality of online courses (Nikou and Maslov, 2023).

Shehzadi *et al.* (2021) mentioned some factors such as (1) information and communication technology (ICT), (2) the quality of e-services and (3) e-information that positively impact students' participation in e-learning, leading to heightened satisfaction with the digital learning model.

Another study on students' assessments of e-learning technology by Candra and Jeselin (2024) discovered that ensuring good quality in technology, information systems, learners and the educational setup is crucial for making e-learning more useful. However, challenges arise from problems such as poor service, low educational system quality, lack of support and inadequate instructor quality, which can lower satisfaction levels.

A two-phased mixed-method study conducted by Xu *et al.* (2024) revealed that during Phase 1, students are primarily concerned about their perceptions of e-learning and the threat of COVID-19. In Phase 2, it was found that students' intention to continue e-learning is mainly influenced by their perceived usefulness (PU) of it and their attitude towards it.

Chetioui *et al.* (2024) found that students' positive attitude toward online education and their satisfaction have a positive effect on their academic accomplishments. At the same time, the researchers also discussed some factors that influence students' satisfaction with online learning. Those are:

(1) Instructor performance;

(2) Ease of use of the online learning platform;

(3) Information quality;

(4) Interactivity and

(5) PU.

Undoubtedly, student satisfaction was one of the key elements that made online-based education so popular. At the same time, students' engagement with the learning and assessment processes, as well as the quality of education, is also important.

3. Purpose of the study

This particular research aims to explore learner-centered emerging technologies, methods of learning with AI, student engagement and concerns related to the assessment process at the public and private university levels in Bangladesh from the perspectives of (a) students, (b) teachers and (c) ICT experts working within universities.

4. Research methodology

The exploratory nature of the study suggests that employing a qualitative research approach would be most insightful at this stage in enhancing comprehension of the nature of

innovations in learning, student engagement and concerns related to the assessment process. Based on the homogeneity of the respondents' roles, the respondents were divided into three different clusters.

Cluster-A: A total of 28 students studying from the second year of bachelor's to master's levels (regular and executive masters') representing both public and private universities and MPhil and Ph.D. levels from public universities were selected using purposive sampling techniques; for details, see Table 1.

Cluster-B: A total of 15 faculty members from different public and private universities in Bangladesh, each with experience in online teaching and hybrid learning models from 2020 to the present (irregularly), were selected. Details are provided in Table 2.

Cluster-C: In this cluster, six ICT experts, comprising teachers from ICT and professionals from the working IT departments of different universities, were selected.

For the selection of participants, the purposive sampling technique was used. The required data were collected via in-depth interviews. We developed different sets of open-

Demographic	Characteristics	No	(%)	Demographic	Characteristics	No	(%)
Age	21–25	17	61	University type	Private	19	68
	26–30	6	21		Public	9	32
	Above 30	5	18	Subject	Business	9	32
Gender	Female	17	61		Economics	4	14
	Male	11	39		Computer science	2	7
Educational year	2nd year [Bachelor's]	8	29		Civil engineering	2	7
	3rd year [Bachelor's]	4	14		Electrical engineering	1	4
	4th year [Bachelor's]	5	18		Mathematics and physics	2	7
	1st year [Master's]	3	11		Pharmacy	1	4
	2nd year [Master's]	6	21		Social relations	1	4
	MPhil	1	4		English	4	14
	Ph.D.	1	4		Law	2	7

Source(s): Authors and interview analysis

Table 1. Demographic profile of the respondents from Cluster-A

Demographic	Characteristics	No	(%)	Demographic	Characteristics	No	(%)
Position	Lecturer	4	27	Subject	Business	5	33
	Senior lecturer	6	40		Economics	2	13
	Assistant professor	3	20		Computer science	1	7
	Associate professor	1	7		Electrical engineering	1	7
	Professor	1	7		Pharmacy	1	7
University type	Private	10	67		Social relations	2	13
	Public	5	33		English	2	13
Location	Dhaka	13	87		Law	1	7
	Chottogram	2	13	Teaching experience	Less than 10 Years	6	40
	Rajshahi	2	13		10 and more than 10 Years	9	60

Source(s): Authors and interview analysis

Table 2. Demographic profile of the respondents from Cluster-B

ended questionnaires for each cluster. The authors later completed the transcription, data organization, data analysis and interpretation processes.

Thematic analysis was used in data analysis to identify and describe themes among participants and groups. This involves focusing on organizing themes and creating a coherent story that best explains the study participants' experiences and observations.

5. Findings and analysis

5.1 Innovation in learning: technology and approach

The digitalization of education was inevitable, and the world has also accepted the transformation. Different digital educational approaches like online education, hybrid learning and massive open online courses (MOOCs)-based learning became very popular. Both students and educators are actively participating in digital educational setups, and educational institutions are focusing on infrastructural changes for more innovation and building a better digital ecosystem.

5.1.1 Flexibility in learning. 100% of the respondents from Clusters A, B and C agreed that flexibility in learning is the key benefit of online and hybrid learning, which truly piques students' interest in these modes of learning.

The interview analysis also revealed the key particulars of flexibility in learning, which include:

(1) Online classes;

(2) Class recordings facility;

(3) Online class participation along with score for participation;

(4) Immediate feedback on participation;

(5) Online assignments and

(6) Online exams or assessments.

However, around 87% of the respondents voiced dissatisfaction with the online assessment process. They articulated concerns regarding technical challenges and highlighted that it provides opportunities for students to engage in unethical behavior, such as cheating, to pass exams or achieve better results.

5.1.2 Accessibility and convenience. In online and hybrid learning, students can access the learning lectures or attend classes from any location using a computer, laptop or smartphone with an Internet connection. This eliminates the necessity for teachers or students to be physically present in the classroom on time. Such features significantly impact the learning experience and make learning more accessible and convenient.

Respondents from Cluster-A mentioned several facilities of online and hybrid learning, including:

(1) Teachers upload notes, lectures and other learning materials online, allowing students to revisit and download the content anytime;

(2) Students can schedule appointments with teachers online, eliminating the need to go to campus for designated office hours and

(3) Students can submit their homework and assignments online.

5.1.3 Self-paced learning. Online and hybrid learning provide students with a huge scope for self-paced learning. Students can access the learning materials at any time, allowing them to

learn, practice and revise lectures according to their own pace and schedule. They can also clear doubts through online discussions with peers and teachers at any time.

Around 93% of the respondents from Cluster-A mentioned that online and hybrid learning provide a better scope for self-paced learning and positively help them engage in more learning activities to achieve good grades. A respondent from Cluster-A mentioned,

> Yeah, I can access the lecture recordings whenever I want. Unlike in face-to-face classes, where I have to write down every topic and the teacher's special notes, I can replay the lectures as many times as I need. Plus, I don't have to buy loads of reference books anymore; we can download study materials online. Teachers even upload scanned chapters from their books, so yeah, it's really helpful. – Respondent-08 [23, Male, Bachelor of Business Administration, Dhaka]

Around 80% of the respondents from Cluster-B also mentioned that self-paced learning helps good, average and below-average students achieve desired grades.

5.2 Learner engagement

Student engagement with the learning and knowledge creation process is key to the success and sustainability of learner-centered emerging technologies. In online and hybrid learning environments, where teachers and students are connected virtually and physical control is not feasible, students' engagement with learning processes becomes particularly important to ensure active learning and motivation among students.

One of the professors from a reputable private university stated,

> If students are not engaged with the class lecture delivery, they are probably not learning. I have experienced that students often do other things off-camera, sometimes attending class solely to receive attendance marks. Therefore, I had to change my teaching style for online classes.- Respondent-36 [48, Professor, Business Administration, Private University, Dhaka]

When asked how they ensure student engagement, another faculty member mentioned,

> In online classes, I always take a few minutes and tell students to summarize the key points of the lesson. It helps solidify what we learned and lets me see if everyone's on the same page. Sometimes, I take quick quizzes too, to keep things fun and make sure the information sticks.- Respondent-40 [34, Senior Lecturer, English, Private University, Dhaka]

However, when asked, around 54% of the students (respondents from Cluster-A) mentioned that online classes are less engaging compared to physical classes. When they were asked, they mentioned the following reasons for the failure to ensure student engagement during online classes:

(1) Noninteractive content;

(2) Noninteractive lecture-giving style of the teachers and

(3) Less fun, engagement, or participatory activities in online classes.

5.3 Emergence of artificial intelligence

The arrival of AI platforms like ChatGPT and Gemini has changed many aspects of digital resources for online education. While many researchers view them as innovative learner-centered tools, according to Williams *et al.* (2019), AI-powered interfaces can help students to access digital content and services through interactions like gestures, touch and speech. In a recent study, researcher Yang (2022) proposed a pedagogical model that emphasizes AI

literacy is essential in today's digital society and suggests teaching core AI concepts through hands-on, culturally responsive methods.

At the same time, educators have numerous ethical concerns regarding the use of AI, especially in a developing country like Bangladesh, where the digital infrastructure for monitoring AI use in education is not particularly robust.

5.3.1 Use of AI for information gathering or theoretical clarification. Around 96% of respondents from Cluster-A reported using ChatGPT and Gemini to clarify theoretical concepts they struggled to understand during lectures. One student even commented,

> AI is helpful. It can provide definitions in easy-to-understand language and elaborate on concepts further in a way that books often can't. Sometimes, even searching Google doesn't provide answers as clear as those offered by ChatGPT or Gemini – Respondent-02 [22, Female, BSS in Economics, Dhaka]

Around 67% of respondents from Cluster-B and 83% of respondents from Cluster-C also mentioned AI platforms like ChatGPT, Gemini and QuillBot are helpful for learning and research purposes.

5.3.2 Use of AI for class assignments. Around 87% of respondents from Cluster-B reported that students are using AI tools to complete assignments. However, 100% of respondents from Cluster-B and Cluster- C believe that completing homework and assignments entirely through AI is unethical.

> Students can use these tools to gather knowledge, seek assistance for formatting or grammatical corrections, but completing the entire assignment solely through AI is entirely unethical – Respondent-41 [51, Female, Associate Professor, Department of Social Relations, Private University, Dhaka]

When asked whether the university utilizes any tools to detect if students are using AI for such purposes, another faculty member mentioned,

> Yes, we are using Turnitin and some free AI detector tools to assess student assignments. However, we cannot rely solely on such tools. In some cases, these tools only provide probabilities rather than accurate answers. Respondent-38 [36, Male, Senior Lecturer, Electrical & Electronic Engineering, Private University, Dhaka]

When researchers asked ICT experts working in universities whether universities or ICT departments offer any training or assistance to help teachers detect AI-generated assignments, one of the ICT experts mentioned,

> Yes, we provide training and also furnish faculty members with the necessary access to AI detector tools. Most of these tools are third-party software; currently, we do not have the capacity or budget to develop our own platform for this purpose. Respondent-47 [39, F Male, Manager, ICT, Private University, Dhaka]

On the other hand, 71% of respondents from Cluster-A stated that they use AI tools for completing assignments. They listed the following uses of AI:

(1) Collect easy definitions of theories;

(2) Gathering information;

(3) Elaborating concepts;

(4) Grammatical correction;

(5) Formulating sentences;

(6) Writing code (coding and programming) and

(7) Solve mathematical equations.

Although teachers and ICT experts mentioned measures to control AI usage for assignments, this research revealed a significant gap between the commitment and actions taken by universities to regulate the unethical use of AI for educational purposes.

Even educators and the ICT department are currently not well informed or clear about the difference and definition of ethical and unethical use of AI for educational purposes; they require proper guidance from the university authorities.

5.4 Assessment process and innovation

Around 93% of respondents from Cluster-A feel that online exams are flexible and convenient for everyone.

Interestingly, 87% of the respondents from Cluster-B similarly believe that online exams offer flexibility for all. However, it is noteworthy that 100% of the respondents from the same cluster do not favor online exams, expressing strong concerns regarding the potential for unethical practices and cheating during such assessments.

Around 67% of the teachers believe that university authorities can take necessary actions to address the issue by utilizing AI and sensor-based technology, thereby preventing students from engaging in unethical practices during exams.

However, 33% of the respondents from Cluster-B believe that exams should be held physically on campus to ensure equal opportunities for all, reduce the scope for unethical practices and establish better control over the learning assessment process. One of the faculty members explained,

> Yes, if we can use AI or any other method to stop unethical practices in exams and assignment preparation, the online assessment process will become effective ... [36, Male, Senior Lecturer, Electrical & Electronic Engineering, Private University, Dhaka]

Four out of six (around 67%) of the respondents from Cluster-C (ICT experts) believe that their university lacks the desire and budget to develop a sensor-based or AI-supported online exam system.

To address these challenges, universities should consider seeking assistance from both local and foreign ICT experts with expertise in online exam technologies. Collaborating with external partners can help universities overcome resource constraints and leverage innovative solutions to enhance the security and fairness of online exams. At the same time, universities should prioritize the development of comprehensive policies and training programs to equip faculty members and staff with the knowledge and skills needed to effectively manage and monitor online assessments.

6. Discussion

This research on learner-centered educational technologies highlights the different aspects of integrating technology into the learning ecosystem. It underlines the transformative potential of online and hybrid learning modes, which offer flexibility and accessibility to both learners and educators.

The research findings suggest that online and hybrid learning, characterized by learner-centered technology, significantly enhance self-paced learning opportunities for students. Learning materials can be accessed at any time, allowing students to tailor their learning experience to their individual pace and schedule. 100% of the respondents from all clusters agreed that flexibility empowers students to engage more actively in learning activities, including reviewing lectures, practicing and revising, which positively impacts their academic performance.

Despite many proactive measures by teachers, 54% of students find online classes less engaging compared to traditional in-person instruction. Reasons include static content, lecture-centric teaching styles and a lack of interactive or participatory elements. This indicates that while teachers are endeavoring to promote student engagement in online classes, there remains a significant gap between efforts and desired outcomes.

As per the findings of this research, it is recommended that teachers prioritize self-development in online teaching methods. Universities should offer rigorous training on effective online class delivery to support educators in enhancing student engagement.

Teachers can implement various techniques, including (1) storytelling with theoretical concepts, (2) facilitating group discussions, (3) assigning problem-solving exercises, (4) promoting group or collaborative projects, (5) integrating interactive quizzes, (6) encouraging frequent Q&A sessions and (7) organizing student presentations (both group and solo).

This study also discusses the emergence of AI and how it presents both opportunities and ethical dilemmas in the education sector. Alongside the opportunities presented by AI, the study also highlights significant ethical concerns. While students utilize AI tools for various aspects of their academic work, such as gathering information and grammatical correction, there is a consensus among educators that completing assignments entirely through AI is unethical. This raises questions about academic integrity and the role of technology in supporting, rather than replacing, student learning efforts.

AI-powered platforms like ChatGPT, Gemini and QuillBot, CopyAI, Inc., Ahrefs and Gradescope are praised for their ability to provide explanations of theoretical concepts and aid in research. Students and educators alike appreciate the accessibility and comprehensiveness of AI-generated answers, which often exceed traditional search engines and textbooks in clarity and description; they can also write complex programming codes and solve complex mathematical problems.

Furthermore, the research reveals a gap between awareness and action in addressing the ethical implications of AI usage in education. Despite acknowledging the need to regulate AI utilization, universities lack robust mechanisms for monitoring and detecting AI-generated assignments. While universities are using tools like Turnitin and third-party AI detectors, these tools are not foolproof and may not provide accurate assessments. There is also a lack of training and guidance for educators on how to effectively identify and address instances of unethical AI usage.

The research findings also highlighted significant inadequacies in universities' readiness to implement online exams effectively, particularly in addressing concerns related to unethical practices during the exams. Despite the perceived flexibility and convenience of online exams, there is widespread anxiety among teachers and ICT experts working in universities, and this is due to the lack of technological infrastructure and required resources to develop robust online exam systems. The research also showed a lack of institutional policies and training programs to address the complexities of online exams and the use of AI technology. This study recommended that universities encourage the employment of local and foreign practitioners in ICT in an effort to beef up the effectiveness of the online assessment process.

7. Conclusion

Online education, hybrid learning and AI chatbots are becoming increasingly popular by the day. However, concerns persist regarding the sustainability and effectiveness of online-based innovation in learning. These concerns emphasize the need for ongoing assessment and improvement of education management strategies. Based on the research findings, it is recommended that universities and teachers prioritize student engagement to ensure

effective online and hybrid learning experiences. Furthermore, as students become increasingly accustomed to online education and digital learning materials, their interest in AI platforms and the integration of AI within educational contexts also grows. Now, educational institutions should focus more on technological advancements to cope with AI and more student-centered innovative learning technologies and make appropriate investments and collaborations with ICT experts to design and implement effective solutions.

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