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The Role of Digital Pedagogy in Enhancing Student Engagement and Learning Outcomes

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ABSTRACT

The advent of digital technology has significantly transformed educational practices, offering innovative approaches to teaching and learning. This paper explores the role of digital pedagogy in enhancing student engagement and learning outcomes. Digital pedagogy, encompassing a wide array of tools and strategies such as online platforms, interactive multimedia, and virtual collaboration, has the potential to create dynamic and immersive learning environments. By integrating digital resources into the curriculum, educators can cater to diverse learning styles, foster critical thinking, and promote active participation among students. This study examines various digital pedagogical methods, their impact on student motivation, and the consequent improvement in academic performance. Through a comprehensive review of recent literature and case studies, we analyse the effectiveness of digital pedagogy in various educational settings. The findings suggest that when effectively implemented, digital pedagogy not only enhances student engagement but also leads to better retention of knowledge and higher overall achievement. The paper concludes with recommendations for educators and institutions on adopting and optimizing digital pedagogical practices to meet the evolving needs of learners in the digital age.

Keywords: student engagement, digital pedagogy

INTRODUCTION TO DIGITAL PEDAGOGY

Numerous studies have shown the potential of e-learning in English as a Second Language (ESL) learning such as increased language use, improvement in language fluency, reading comprehension levels, listening skills improvement, higher grade point averages, increased self-study vocabulary acquisition and enhanced examination performance. Other important advantages include: time saving, less expensive, relevant, immediate, reusable, and approachable. However, to capitalize on e-learning potential, internet facility and electronic devices should be available unconditionally at any time for students to access digital resources (Ng et al., 2020; Okegbemiro, 2021). Native-speaking professors must endeavour to develop necessary digital competence to make decisions of relevance, importance, quality of answers and maintain social presence in the virtual learning environment that can maximize student outcomes. Teachers need to train their students to develop and strengthen their digital literacy, to handle learning more efficiently and effectively with digital resources to stay engaged and productive through advanced digital skills in accordance with learning standards.

E-learning has become an educational approach increasingly applied by educators to leverage highly advanced digital developments in the delivery of personalized learning to digital-native students. It offers substantial resources to cater for diverse learning needs and enrich educational opportunities (Nuruddin Hidayat et al., 2022; Hermawan, 2021). As a

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result, e-learning has witnessed ever greater momentum during the period of the spread of COVID-19 because of social distancing and movement restriction orders. This had led to the growing adoption of e-teaching in higher education to replace traditional face-to-face modes of learning (Iffat Rahmatullah, Sultana, & Sultan, 2020; Kitishat et al., 2020). Digital pedagogy refers to the application of digital technology in instruction and involves the ability to navigate digital devices, manage and evaluate the information accessed, modify the information in accordance with students' learning needs, and behave appropriately online (Shivansh Bangroo & Amir, 2023). The learning of English as a Second Language (ESL), for instance, involves a wide array of digital and multimedia resources to help students listen, speak, read, write and think in English as in real world contexts.

Definition and Scope of Digital Pedagogy

Digital pedagogy, often used synonymously with digital learning, describes the combination of technology with pedagogical processes to improve learning and teaching. It involves the deliberate use of technology as part of a learning design to guide students towards specific outcomes. For instance, the full integration of technology into teaching must also include pedagogical processes rather than simply being an add-on. The spotlight is now shifting to understanding digital education's peculiarities in teaching and learning contexts, the sociomaterial aspects of digitally-mediated practices, and pedagogic knowledge embedded in practice. The full potential of digital pedagogy could be realized if it is seamlessly integrated into practice, encapsulating theoretical too, andragogic considerations and avoiding an oversupply mentality.

Introduction Digital technologies and pedagogies have significantly impacted learning and teaching in both formal and informal settings. In the wake of rapid technological advancements, the need to incorporate digital technologies in education and teaching have become imperative (Shrestha et al., 2022). A plethora of research in this domain seeks to explore how digital pedagogies can enhance student engagement and learning outcomes (Rivera-Vargas & Cobo, 2023). Recently, the covid-19 pandemic has led to a complete shift in teaching methodologies worldwide. Many educators who had never taught remotely underwent a rapid shift to online teaching during the pandemic. The closure of educational institutions led to educators arriving unprepared and with challenges that necessitated rapid transitions to online distance learning (Thaha Abdullateef, 2021).

Evolution and Importance in Education

Digitalization and fresh communicative advancements enable to combine traditional teaching methods with effective digital pedagogical strategies, all the while maintaining a learner-centric approach for education and learning. Inherent interactive capabilities have made digital pedagogy the tool of choice for effective integration of technology and pedagogy into educational systems. The dynamic environment created by digital pedagogy also endows the pros of developed learning communities. Simple social media platforms incorporated into the digital pedagogy can combine to produce effective learning communities. A predictive analysis of student learning was also made possible by research-based digital techniques (Rivera-Vargas & Cobo, 2023). The modern educational environment is facilitating life-long learning and self-education; with the help of e-tools students can foster deeper learning and mastery learning paradigms. Regulations and practices concerning higher education are evolving rapidly in the current uncertain economic, social and political time.

The modern-day scenario of education has forced students and institutions to adapt to digital platforms for imparting and obtaining education (Kallunki et al., 2023). Traditional lecture-based pedagogies have shifted to asynchronous and synchronous learning models.

The objective of pedagogy in digital learning has embraced new objectives in light of the transitioning paradigm to 'open' platforms made publicly available and achievable due to the advancements in technological spheres of internet and computers. A shift from instructional design to learning experience design has led to a paradigm shift from subjective assessment to diagnostic strategies. The contemporary pedagogy has positioned institutions for stress testing, thereby promoting the integration of digital platforms (Zhang, 2022). However, such an integration does not automatically address issues related to the quality of the learning experience. The open-ended problem of pedagogical methodologies is a matter of academic research on the international scale.

THEORETICAL FRAMEWORKS FOR DIGITAL PEDAGOGY

Today, learners' cognitive abilities must be balanced alongside the need to adopt advanced multimedia technologies. Learners must be active participants in the generation of knowledge, especially using digital platforms, to encourage thinking, problem-solving, active engagement. The integration of visualization, narrative strategies, cognitive theories, and multimedia components is receiving attention in the field of pedagogy research (Nguyen et al., 2023; Doberneck, 2022). Allen's theories and principles have been widely debated and have distinguished three levels of learning involvement with learning materials, including visual aspects, narrative and multimedia components (Skulmowski & Xu, 2022; Ipek & Ziatdinov, 2018). These are the: reception level, participation level and generative level. The BSC integration is based on the requirements patterned by Clark and Mayer's principles to promote the generative-level involvement to improve the learning outcomes specifically conceptual understanding and retention (Inouye & Gunshenan, 2024). Evaluation findings indicated significant impact of BSC on improving student performance and retention.

The successful integration of digital technology into the pedagogical framework generates technology-rich, student-centred classrooms that empower students to become knowledge creators, collaboratively build knowledge, and develop digital literacy, problem-solving and deep learning skills (Shivansh Bangroo & Amir, 2023). Supporting pedagogy is also evolving as technology integrates efficiently into the learning environment, helping improve student learning engagement and outcomes. Digital pedagogy seeks to use, develop and adapt technology to enhance the learning process. It also emphasizes student-initiated, self-directed learning, which can be fostered by digital technology (Iffat Rahmatullah, Sultana, & Sultan, 2020). The role of digital technologies in transforming the pedagogy are two-fold: enhancing learning engagement using technology, such as augmented reality and virtual reality, and embedding digital computing skills within the students' course work (Gillani & Eynon, 2023).

Constructivism and Digital Learning

In digital learning environments, the role of instructor has to be changed, and instructor should be facilitator not the expert provider of knowledge. A Constructivist approach places the instructor in a more student-focused role in digital learning environments (Corbett & Spinello, 2020; Li, 2023). In digital learning environments, learners often feel more autonomous and take increased levels of responsibility for their own learning. Learning is viewed as an active process in which learners construct knowledge by building on their previous knowledge and experience, and learners are creating their own meaning in the digital learning environments. Educators play an important role in structuring learning activities to maximize the chance of successful inquiry. In a digital learning environment, instructors should help learners to link their previous knowledge properly and should constantly evaluate their understanding (Russo, 2023).

In contemporary learning and educational environments, digital learning is recognised as an important pedagogical approach, enabled by digital technologies. Digital learning tools create a different learning environment than familiar traditional teaching. It helps in shifting the learning environment from an instructor and knowledge based to an environment where the students build their own understanding with the help of the instructor (Thaha Abdullateef, 2021). This knowledge is active and has to be constructed by the learner, and not passively absorbed. Therefore, constructivism theory fits best with digital learning environments. Learners have to create plausible and logical links between the given information and their existing knowledge. Social constructivism, or socio-cultural theory, takes the construct of construction of knowledge even further in its emphasis on the social and collaborative aspects of learning (DeCoito & Estaiteyeh, 2022). With this theory, the language, and discourse of the learning community have greater importance.

Connectivism and Online Learning

Mindful of these criticisms of connectivism alone as a pedagogy, two additional learning theories: enactivism and heutagogy may have particular applicability in developing educational strategies for digital learning (Ward et al., 2017; Perchard, 2022). Enactivism, inspired by cognitive science and supported by educational theories and best practices, helps to translate the digital connectivist classroom into a purposeful environment. The judicious use of boundaries (e.g., the non-negotiables that define a course) may aid the learning experience and grow opportunity, rather than limit it. Adopting heutagogy as a guiding philosophy and pedagogical approach in learning changes the role of the educator to that of a facilitator and guide and provides a holistic framework that acknowledges the learner as an active agent in their own learning. Both of these learning approaches are largely enabled through the digital platforms and tools used in courses today, but neither oversimplify the complexity of learning or problematise information and knowledge. In fact, enactivism and heutagogy challenge the learner to think critically, ask questions, and curate resources (Blaschke & Hase, 2021; Videla et al., 2021). These theories may also have more radical implications for what is commonly understood by campus-based education, pushing toward a reconceptualization of learning, especially in an online, digital environment.

While, in complex knowledge environments, connectivism can be successful in helping to prepare students for lifelong learning, and providing a useful framework for online learning, there are some criticisms of the theory. However, they focus on the concepts as an epistemological stance and set of heuristics (Timea Fülöp et al., 2022). The four main criticisms of connectivism follow: connectivism blurs the boundaries of learning and knowledge; connectivism theory is driven by technology; some educational activities that align well with the traditional education paradigm allows for collaboration and interactions among peers; and that the root of learning in connectivism is the creation of new knowledge and understanding based on exactly what a given set of information is dependent (Siemens et al., 2020). However, the key educational goal is that students not only learn the material presented to them, but also engage in deep learning activities (thinking like a historian, problem solving like a mathematician, even discussing like a philosopher). Neither social activity nor the mere presentation of information address this (Candia et al., 2022).

In the 2000s, George Siemens introduced a theory on connectivism as a digital pedagogy for a networked world (Siemens et al., 2020). Using a constructivist approach, his theory argued that we derive knowledge from the education of others: “We must know where to find information and knowledge that we need, how to connect with people who are knowledgeable and willing to share their knowledge, and how to do so productively” (Timea Fülöp et al., 2022). For this reason, digital pedagogies are grounded in assumptions that learning is achieved through the social interactions between learners and educators, and

learners with their peers. Strictly in online learning, connectivism inherently requires the use of activities and tools that encourages talking to others: forums, instant messaging, collaborative editing of documents, etc. Let us keep in mind that while connectivism challenges many traditional academic approaches to teaching, learning, and assessment in online environments, it is not a 'given' that all educators who teach online subscribe to connectivism. However, the tools available in the online environment encourage a greater focus on this theory of learning (Tang, 2024; Voskoglou, 2022; Langridge, 2023).

DIGITAL TOOLS AND TECHNOLOGIES IN EDUCATION

The digital tools supported by the digital technology for educational purposes can enhance the interactivity and collaboration between students. It has advantage in terms of student engagement and connection because it provides an option for anonymous feedback. (Richards, 2023) Several studies have shown that digital tools can increase students' engagement and in facilitating a more interactive learning environment. With the use of digital applications, teaching and learning can break out of the single file that restricts the effectiveness of instruction at both the large and small scale. A variety of technologies have been shown to be useful in promoting active involvement in classes, including the use of interactive simulations, computer animations, and virtual reality (Childs et al., 2021). These approaches are supported by theory that holds that people learn best when they are engaged both cognitively and affectively, and by a body of empirical research that documents the power of learning under conditions that activate or sustain engagement.

Digital technology has revolutionized the way people communicate, learn, and teach. It has a major influence on education and has enormously changed the traditional roles and processes of teaching and learning (MacKenzie et al., 2021). Digital technology in education has proven to have a positive effect on student learning, motivation, and academic performance. Digital technology can also be exceptionally useful for students such as facilitating question-answer sessions, quizzes, and online evaluation tools (Al-Rahmi et al., 2020). It can also provide valuable resources and tools to improve students' learning. Digital technology has enabled students and faculties to access the required resources and materials at any time, and thus offered opportunities for individualized learning.

Learning Management Systems

Description of Learning Management Systems (LMSs) were initially designed to channelize the process of information sharing and exchange, between the instructors and learners, with efficient content management tools. LMSs have evolved and now include learning tools and integrations as teaching tools and for fostering student learning and student assessments, etc. It is integrated with the intention of providing a seamless learning experience and environment. LMSs are a kind of software that offers tools and a virtual education environment, course management, communication and allows for creating and managing online resources. It is designed to be customized to meet the computational needs of English as a foreign language (EFL) context during the COVID-19 pandemic. LMS, as an instructional platform can assist learners in self-study and practising their English language learning skills.

E-learning is now integrated into educational establishments based on evidence that student learning outcomes and engagement in e-learning can be equal, if not better, than face-to-face (F2F) learning (Ghounane & Rabahi, 2023). Specifically, granted that digital pedagogy is well applied to e-learning, students reveal a higher grade and display deeper learning experiences and a stronger engagement (Hwang et al., 2023). Learning Management Systems (LMSs) are primarily designed to provide students with ready and easy access to learning material, resources, and activities. The open-source nature of LMSs is seen as an

affordable mode avoided by extra costs for proprietary alternatives. LMSs are a support to all educational contrasts in relation to their structure, as they offer efficient administration and teaching tools, and encourage good delivery methods.

Web-based Collaboration Tools

While the web-based collaboration tools discussed in this study are used episodic, few studies are reported to see the selections among web-based collaboration tools. The results of this study expose a parallel classification system based on course design- usage of web-based tools. Complexity of activity and front-loaded content-learning interaction were found. Flexible collaboration in synchrony and asynchrony were common usages of web-based collaboration tools. Activity purpose was another classification system. The teacher-centered dominant pattern parsing out through figures and a determination on time to learn were found. Collaboration between teacher and students was found by the most common web - based collaboration tool, giving a second clue about the primary participant (student). Amongst web-based collaboration tools as chosen by students, the exploration tool or the session typology of web- based collaboration was found. Figure 1 depicts the use of the tools in the three types of activities.

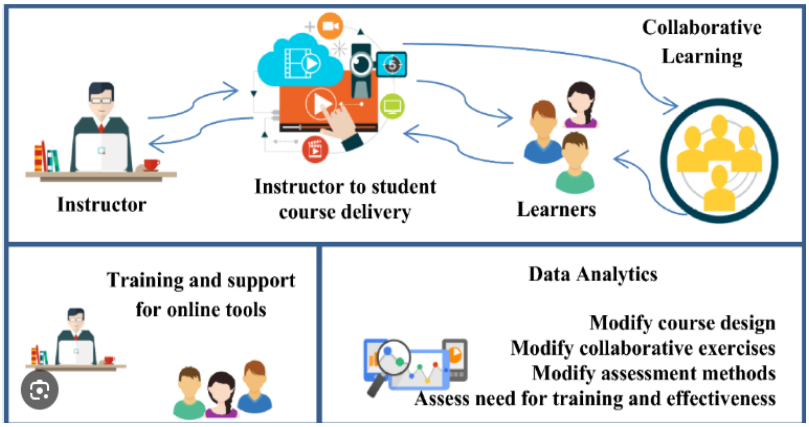

Figure 1: Collection of web-based collaboration tools

Web-based Collaboration Tools In the online learning environment, web-based collaboration tools make it possible for students to participate in live classes virtually. With web-based collaboration tools, both synchronous and asynchronous forms of collaboration are feasible. It is possible to analyse web-based collaboration tools according to their distinct aspects which will enhance selecting the appropriate tools through the purpose of the collaboration and the desired student actions.

Introduction Research shows that using web-based collaboration tools in online learning environments can develop friendships and facilitate students' engagement and discussion (DeCoito & Estaiteyeh, 2022). They also lead to self-regulation skills, cognitive development, and learning performance (Rivera-Vargas & Cobo, 2023). Web-based tools allow students and instructors to communicate and collaborate leveraging the benefits of various affordances (Marzilli et al., 2014). The objective of this study is to systematically observe and categorize various web-based collaboration tools that students have chosen out of their own will for discussion and collaborative activities. These tools can be classified in twelve categories including: blogs, discussion forums, chat, telephone/Skype, podcasts, videos, emails and webinar systems. The results show that discussion forums (41.3%), telephone/Skype (15.2%), video (13.6%), blogs (11.7%) and chat (8.7%) statistically differentiate from other web-based collaborative tools that students have chosen for discussions and collaborative activities.

Virtual Reality and Augmented Reality

There are inevitably some potential limitations to this research. This paper presents that some arguments that VR and AR are currently being heavily promoted. The pedagogical literature has generally suggested that these revolutionary technologies are very useful and lead to better educational results. As for future research, further case studies should be undertaken in an attempt to confirm the results and obtain books to share from different experiences (Sghaier et al., 2022). The library here is used to allow members to produce different creations. The risks and opportunities of exploring VR technology in primary education were articulated. For example, using a robot to keep the children excited about the new VR schemes that emerged. It was used to facilitate the VR use and clarify some of the obstacles to implementing it. The approach involved using shorthand feedback from lessons to give an eloquent argument. The approach demonstrated that the teacher's job is steeped in his or her teaching and school context. The second project went to the middle school to see how and why teachers were interfaced.

Figure 2: VR Technology in Education

Several advantages of using VR and AR are the potential of these technologies for deeper learning, conceptual understanding, meaningful learning, and cognitive learning. Research has indicated the use of VR as a 3D digital environment that supports and enhances active and intuitive decision-making and engagement in education and training. VR and AR fallbacks can restrict them from being implemented within education, and these should be the dominant focus of future research in technology use and application for learning and teaching with these technologies. As future research is encouraged in investigating the use of VR and AR in different educational settings to confirm the results obtained in this study through replication. Since it is applied to classrooms, it is hoped that the results obtained will be more generalizable (Fussell & Truong, 2022).

New innovative technologies have added a new dimension in learning and education. Virtual Reality (VR), and Augmented Reality (AR) in learning are provided through the means and the physical movement to experience understanding to explore this unfamiliar environment. VR is a three-dimensional and computer-generated environment that immerses the participant in a simulated environment. On the other hand, AR blends digital and non-digital forms of design and technology and involves interactions with a real-world setting as the participant interacts with it (Wu et al., 2021).

DESIGNING ENGAGING DIGITAL LEARNING EXPERIENCES

Designing engaging digital learning experiences requires thoughtful planning. Although the literature is rich with strategies for designing effective, technology-driven, and engaging digital learning experiences, needs persist for crossing contextual boundaries and culture-specific pedagogies (Iffat Rahmatullah, Sultana, & Sultan, 2020). Teaching in a digital environment requires that instructors apply planned communication strategies as they manipulate and develop unique learning experiences using digital tools that enable enhanced

interactions and collaborative opportunities with and among students. (O'Keefe et al., 2020; Namboodiri, 2022; Sharin, 2021).

Multimedia Integration

The results exhibited that university students were highly satisfied with digital pedagogies' implementation in their universities, while they perceived those digital pedagogies had a significant role in their learning outcomes. The results further revealed that university students have been actively engaged in the learning activities through these digital pedagogies, and they were highly motivated and interested in adopting these pedagogies for future learning. According to the faculty members, digital pedagogies powerfully enhanced student engagement, knowledge construction, and interaction and communication with the students (Richards, 2023). Moreover, they considered that digital pedagogies had an additional advantage in increasing students' critical thinking, reflection, problem-solving skills, and the quality of students' products and performances such as reflective journals/reports.

Gamification in Education

To broadly bring the same aspect of gamification to the subject of research, the current system reflects a digital learning platform. The objective of this chapter was to research the correlation of various learning styles and learning elements with attention. It comprised a blend of synchronous elements in the coursework. The engagement theory reports that students often develop a desire to continue to be involved in their learning. Once engaged in a subject, children are often more motivated to try to understand it in depth. They begin to clarify what they know and what they need to understand the subject effectively. Digital Game Based Learning (DGBL) is a modern educational technology whose main goal is to optimizes motivation, commitment, and better learning performance, underlying knowledge. The findings suggest the objectives to attract and retain the participation of learners and, as a result; studying has been essentially blooming.

According to Network of Pedagogical Workstations, Minibuses and Application Service in Educational Work (NETS) standards, Digital Game Based Learning (DGBL), and digital gamification enhances students' knowledge in solving problems, promoting critical thinking and creativity while being motivating and engaging. Games and gamification increase student engagement, motivation for learning, skills improvement, test scores, and a better understanding of lessons. Digital Gamification based learning (DGBL) and On-line Self Learning Module (OSLM) platform together promotes students' motivation to learn. The acquired knowledge of the survey participants did not show a significant difference. The best practices were observed by inclusion of extrinsic motivators such as rewards and instantaneous feedback (Dacre et al., 2021).

Gamification of education involves incorporating elements of playful activities in the learning process, representing progress, and boost motivation (Leonardou et al., 2022). Features of games like scoring, competition, rules, and level advancement are used to create a greater connection with the learning process and promote it through intrinsic and extrinsic motivation. Gamification in education not only makes the traditional learning process more exciting but also supports long-term engagement through an easy execution mechanism (Lun Wu et al., 2023).

ASSESSMENT AND FEEDBACK IN DIGITAL ENVIRONMENTS

DEF within digitally enabled learning experiences has the potential to be highly engaging for students and can enhance their learning outcomes. There are a range of benefits to using digital technologies in assessment and feedback, including; the opportunity to

provide students with instantaneous feedback and describe complex content in a range of 'alternative' formats that are beyond text-based feedback, such as audio or screen capture feedback. A key benefit is the use of formative feedback to guide students toward the final summative assessment, in real-time, on an individual need's basis. Dominant feedback models historically cast educators as providers, students as passive recipients, and audience as secondary. These could, as a result, further disempower students from claiming and co-creating knowledge. Slow feedback, in any form, can be detrimental to ESE. Use of rich assessment tasks, such as complex scenarios and problems that cannot be easily automated (e.g., case-based learning tasks, vignettes), is supported. Feedback strategies that contribute to positive SE include affirmation of qualities of the individual (e.g. attributes, traits, values). Feedback is often the primary way that the teacher–student partnership is made visible.

DEF has the potential to expedite assessment and feedback delivery, support formative strategies and self-regulatory learning, increase the frequency and variety of feedback modes, and reduce educator cognitive load, according to Wu. Students and their educators can personalize and tailor feedback, raise student ESE, and produce higher- quality summative assessments. Based on annual AUSSE results, students' levels of satisfaction with feedback and assessment in digital pedagogy are significantly higher than for traditional pedagogy. Alfrey highlighted the benefits, challenges, and SE aspects of the use of digital technologies in the pedagogy of early primary mathematics.

The Covid-19 pandemic thrust digital pedagogy into the lives of educators and students across the globe (DeCoito & Estaiteyeh, 2022). Negative effects include a reduction in learning experiences and increased student anxiety. Digital pedagogy harnesses the newest technologies to deliver highly engaging, accessible, and end-user-driven experiences, according to Porter. Digital pedagogical frameworks provide educators with clear guidance for the support and assessment of digitally enabled learning experiences. Digitally enabled assessment and feedback (DEF) has the potential to not only improve student experience but also enhance learning outcomes.

Formative and Summative Assessment

Summative assessments are conducted at the end of a unit or course of study to determine what students know how much they know. The lecture provides information and strategies for the reconstruction and creation of complex, beneficial assessment systems in the post-secondary environment that will move the needle away from constrictive and destructive examinations toward freedom in high-stakes assessments. Summative assessment is at the complicated end of the continuum (Mate & Weidenhofer, 2021). In this form of evaluation, student understanding is used with actual performance is determined based on how well they grasp the educational objectives. The aim of a summative assessment declaration is to state how well students have mastered the intent of our school and course based on specified performance standards. However, its absolute nature makes it unlikely to catch interrelated details in student understanding, makes it difficult to use as part of an indicator feedback system in terms of regular class design and exercises, and may blind students to areas of progress that require the most attention.

Formative assessment provides feedback to help students improve the quality of their work and applies assessment ‘‘as learning’’ to help students develop metacognitive and self-regulation strategies for effective learning, and engagement in the assessment of student work in order to effectively use feedback to inform practice and programs. This can be done by creating authentic assessments that ask a variety of questions appropriate for students' diverse backgrounds and different languages, abilities, cultures, and personal interests and providing effective feedback. In situations where students are learning from home, the measures of academic outcomes may, in part, reflect how they feel about themselves, their families, and

the world around them, as well as onsite experiences. Similarly, elementary school students write about school-related experiences that are characterized by both negative and positive school experiences. Assessment can become culturally sensitive and respectful of diversity in the intersection. Summative assessment is assessment of learning and involves using mechanisms or measures of student performance to evaluate learning behaviour. Rear the question and ask for clarification if necessary or useful and also keep in mind that we have both educational and personal biases.

Various studies have shown that formative assessment, which is assessment for learning, has an immediate and positive effect on student learning, compared to summative assessment, which is assessment of learning (Xuan et al., 2022). Formative and summative assessments both have a positive influence on student learning when they are conducted with digital technologies, but the data might not be precise, as many variables can affect students' learning; such are age, school grade, the technology used in the educational process, and teacher's teaching skills.

Peer Assessment and Feedback

The practice has been reported to lead to improved student grades and produced better assessments, deeper learning and critical thinking results. Both the act of giving and receiving constructive feedback benefits student and future employability. The benefits are intensified when peer assessment is combined with feedback that is provided when the submission of a draft and an opportunity to apply the feedback and improve the script (Grawemeyer et al., 2022). Peer assessment includes many of the emotional and social hurdle. Therefore, it is important for virtual classrooms to promptly handle this psychological aspect of technology. The concept of digital pedagogy in addressing these issues has become extremely important. Online or virtual education simulation and virtual class rooms, as well as interactive web-based tools are examples of digital elements utilized in virtual classrooms. In any case, virtual classroom technology enables learners from all over the world to interact in real-time. For simulation-based and case-based learning, live session or webinars, as well as group assignments, discussion, break-out rooms, flipped classrooms, debates, quizzes and peer discussion, it is a greatly valued method of learning.

Peer assessment is defined as the process of a student or student group evaluating the submitted work of their peer(s) (Mendieta-Aragón et al., 2023). In digital environments, it takes place on an eLearning platform or via email and can be completed in the same space as other studies. A defining feature of peer assessment is that students actively interact with the assessment criteria. Students must examine and consider these criteria when assessing and assigning marks to a piece of work. When students engage in peer assessment, they receive feedback from someone with similar levels of relevant knowledge or understanding, which may provide them with a more suitable level of support, according to the independent study. Students can accept this feedback more quickly and comfortably than with more formal lecturer feedback (Luke, 2021). Peer assessment offers the chance for develop and improve their academic judgement and self-evaluation expertise.

INCLUSIVE PRACTICES IN DIGITAL PEDAGOGY

Digital pedagogy provides educational materials and activities aligned with universal design for learning (UDL) principles. Wudhikarn et al. (2021) suggest following participant insights to encourage international and inner-city students to engage with digital resources and tools. Educators may scaffold digital literacy skills throughout their courses, embed safeguarding technology in course syllabi, and educate students on how to report hearing and vision impairments. They may also collaborate with instructional designers and professionals to create a website with a collection of digital UDL resources. Instructors should build

inclusive digital pedagogy by introducing interaction protocols into synchronous and asynchronous communications during online classes and discussions. Pausing during pauses, offering to summarize the transcript, providing flexibility, and using instrumentation based on self-determination theory for pedagogical reasons can be useful methods. Analysing student satisfaction can help measure success (Hengesteg et al., 2021).

The COVID-19 pandemic prompted instructors and educators to adopt flipped and blended learning. The transition to online learning created new challenges. Educators should explore inclusive practices in digital pedagogy, incorporate resources and technology tools that meet diverse student needs, monitor and individualize instruction, and provide feedback (Laufer et al., 2021). Inclusive digital pedagogy promotes belonging, connection, and fosters support for diversity. Instructors should address the digital divide and unmotivated (traditional) students by creating relevant and flexible assignments using podcasts, videos, and prerecorded lectures (Ismailov & Chiu, 2022).

Accessibility and Universal Design

Information technologies (ITs) such as digital devices, software, and applications have significantly impacted alternative formats of textbooks that combined with screen readers have significantly enhanced the accessibility of learning content for students with print disabilities including dyslexia. The students who are using assistive technology including screen readers, electronic books (e-books) using resources through digital texts gives them more effortless reading compared to the traditional format of reading (Nisbet, 2020). Accessibility laboratory for students with disabilities has been established at a number of universities and higher education institutions which includes specially licensed screen reading software and equipment, these advances have provided better equitability providing level playing field for students with or without disabilities. The online platforms that provide facilities and options have gained publicity among the students who are print disabled such as dyslexia, low vision, and blindness in accessing easily through assistive technology collaborated with the platform at their tertiary institutions. Providing such accessible materials provides student independence without any cost burden to the institutions, rather it is the legal and ethical requirement to provide as per disability.

Digital pedagogical tools available for providing text-to-speech features can enable access to learning materials for print-disabled students, especially those with reading difficulties such as dyslexia, and for English language learners, who may find listening easier than reading in English. For these students, verbal information can be better comprehended than print and academic content can be more effective when delivered via multiple sensory channels: visual, auditory, and kinesthetic (Panesi et al., 2020). One common way to make course materials accessible to diverse learners is by making them available in e-text, which facilitates text-to-speech conversion (Miliou & Angeli, 2022). Advancements in assistive technology technologies have made it much easier for users to retrieve their desired digital information without relying on the help of others (Rivera-Vargas & Cobo, 2023).

Cultural and Linguistic Diversity

The inclusivity of a digital pedagogy approach must thus resist digital cultural dominance and hegemony and disentangle digital pedagogy from linguistic and cultural homogeneity. Digital pedagogy can push the boundaries and engage with non-dominant cultural practices, languages and epistemologies in tandem. In digital learning contexts, the exchange of cultural and linguistic knowledge should not only be with the other but also within the same cultural and linguistic communities. Offering digital bursaries to non-English speaking backgrounds and greeting students with native language recognition in digital platforms is critical. More fundamentally, digital educational researchers and practitioners

need to work through the complexities of developing in culturally-specific digital pedagogies (Marsden et al., 2023).

In contrast, MacKinnon suggested digital pedagogy should comprise culturally responsive content to better suit the students' diverse cultural needs, while Hart presents digital pedagogy as a revolving concept that constantly evolves with critical dialogue between diverse cultural cohorts in digital learning spaces. However, Byrne and Nason-Clark suggest that the recognition of cultural diversity is entwined with a range of practical and ethical challenges in digital pedagogies. The digital interaction in cross-cultural digital pedagogies is often enfeebled by language and cultural barriers. Digital space has the capacity to break down the linguistic barriers posed by traditional classroom settings and to provide international collaboration opportunities for diverse linguistic groups in the curriculum through digital pedagogy (George et al., 2022).

Increasingly, the realms of digital teaching and online learning are contributing to the globalisation of higher education. Students are becoming diverse and continuing to diversify by crossing linguistic and cultural borders. As a way of responding to this demographic change, researchers and practitioners have given attention to the concept of internationalization of digital pedagogies. Wyn introduced the concept to refer to translating learning and teaching practices in digital spaces with the aim of encouraging intercultural understanding and promoting reciprocal socialization between domestic and international students.

PROFESSIONAL DEVELOPMENT FOR EDUCATORS IN DIGITAL PEDAGOGY

It is widely known that teachers do not have adequate time for their professional development. Studies have also shown that most teachers, about seventy percent, indicated that they hardly have time to improve their professional development. It exposes the dearth of resources for the improvement of professional development opportunities for teachers. The work of Frechtling (2003) shows that there are significantly high levels of disparities in the development and knowledge of professional development when making use of the digital technologies that are available for teaching. It also regards the quality of professional development that is necessary in ensuring that there are better outcomes in learning. Factors that contribute to teacher development vary, according to the research conducted by Gonzales (2018), with mainly teachers' individual background and diversity, and within-school factors. It is imperative to address the issues with regard to disparities in the system to enhance professional development for teachers (Svendsen, 2020; Hertz et al., 2022).

A critical examination of the role of professional development in the development of the digital pedagogy showcases the capacity of professional development to help in the transmission of information and knowledge (Tondeur et al., 2023). According to Bernard (2000), professional development ensures coherence in the delivery of knowledge. Moreover, it shares common goals that are shared by various stakeholders. For teachers, it makes use of the knowledge that is acquired from workshops and other teaching experiences to ensure that the broader teaching processes are in tandem with the presumed objectives of education (Iffat Rahmatullah, Sultana, & Sultan, 2020). Professional development has to go beyond the mere processes but should represent as it is practiced in the larger social context. It emphasises the daily interaction and the extent of how community members can share from each other to improve the wider context. In the case of digital pedagogy, its practice should reflect the modern trends as practiced in the community. Synergies that exist between various practices within the community and the contemporary changes that have taken place across the globe need to be brought down to the teachers in practice (El-Hamamsy et al., 2023). There is the need to teach others into the realities that present themselves in both communities and societies.

Training Programs and Workshops

Following the COVID-19 pandemic that led to the global closure of schools, many institutions, due to mandatory continuity of learning, instituted digital pedagogies. Many teachers had minimal online- teaching training to no experience in delivering their subject online. This pandemic entailed teachers privatized on a global sense, to gather knowledge in distance education. Because teachers accepted the challenge of teaching online, it gave birth to the necessity of professional development in online teaching. In addition, professional development in online teaching was mandatory due to the situational pedagogy. Situational pedagogy lacks a strategic plan and is reactive in nature. It puts to the fore the eradication of teachers' digital illiteracy and the need to engage with radical reforms in teacher development to align with contemporary needs due to technological endowment of society (Lucas & Nuno Vicente, 2022).

Professional development aims at expanding teachers' critical reflections, problem-solving, and resourcefulness in instructing learners, attesting to teaching and learners' excellence. Teachers need knowledge of the holistic scope of educational nurturing. The quality of any educational system is hinged on the quality of its teachers. The skills and knowledge teachers inspire in learners are due to quality professional development from the educator. In addition, for teachers to grow meaningfully, they need formal and informal professional development programmes. Therefore, when teachers embark on professional development, they undergo change – of positive correlation - that has been demonstrated to promote worth, development, reinforced competence, and erudition (Vekić-Kljaić & Mlinarević, 2022).

Training is inevitable for success in the world of work. Therefore, professional development is a multi-billion dollar industry which includes teacher professional development. Formal teacher professional development includes structured reform programmes, grade or departmental meetings, and general education association's conferences. The majority of informal professional development meetings take place between peer teachers. Experimental and quasi-experimental models for formal and informal professional development indicate school and professional development models matters. It is, therefore, crucial that educational stakeholders have a good understanding of the different models of teacher professional development. Professional development activities like training courses, workshops, and conferences enhance teachers' performance (Iffat Rahmatullah, Sultana, & Sultan, 2020).

Communities of Practice

In these days of increased online instructing and studying, and continuous social distancing guidelines, the focus on digital pedagogy has increased, which in turn has made the functioning of CoPs a lot harder. Students are accustomed to studying in shared areas and enjoying the benefits of high student engagement, but social interactions are limited when the educational system moves online (Thaha Abdullateef, 2021). When utilizing online platforms, especially LMS, a start project can be utilized to build student led educational communities, especially when sessions are unfold out over numerous semesters. This preliminary project permits scholar to concentrate on foundational pedagogical practices in that particular discipline.

From another perspective, CoPs provide an opportunity for developing relationships and social connections that sustain shared meaning making. CoPs, therefore, are important avenues for student engagement and persistence and provide students with a sense of belonging. Engagement in a CoP also allows students to develop a range of learning skills, as they learn token practices and pick up tools that facilitate professional work or learning in a domain. Beyond skill development, students build an identity, establish relationships, and

develop a sense of belonging in such environments. In addition to those gains, engagement in a CoP encourages critical thinking, creativity, and knowledge construction.

Communities of practice (CoPs), according to Lave and Wenger, illustrate how learning revolves around a shared work or learning activity (Gitinabard et al., 2019). This occurs specifically when students are engaged in the practice. As students become more engaged in a CoP, they move from peripheral participation to full participation as they gradually make more contributions and take on more social responsibility (Zhang, 2022). CoPs have been studied across various educational settings, but this study extends our understanding to include the educational implications of enabling students to be stakeholders in their learning and encouraging knowledge construction.

CHALLENGES AND OPPORTUNITIES OF DIGITAL PEDAGOGY

Likewise, academics and higher educational institutions have had to adapt and adjust their mode of teaching delivery to an online format. Although, some teachers and institutions had become digitally-skilled before the advent of COVID-19 pandemic. Also, the new normal mode of teaching and learning (digital pedagogy), through the use of digital technology is not without challenges. In both developed and developing countries, the use of digital technologies as a mode of teaching and learning exposes the digital divide and inequalities. Thus, (Lu & Cutumisu, 2022), only few staff and students have 24/7 access to digital technologies with active uninterrupted internet connectivity for digital learning at home and other places leading to inequality in utilizing digital technologies as a mode of teaching and learning.

In academics, novel digital technologies have become one of the most sought ways to support teaching and learning. Debatably, digital technologies do offer a number of advantages to solving real-life and academic problems (Miliou & Angeli, 2022). However, despite all the known benefits of digital technology in teaching and learning, many higher educational institutions and educators appear to be reluctant to adopt digital technologies to support learning, and teaching. In the same vein, the use of digital technologies in real life and academic settings were increased from mild to drastic upon the advent of the COVID-19 pandemic worldwide (Thaha Abdullateef, 2021).

Digital Divide and Equity Issues

However, increasingly digital divides are being understood to be influenced by social factors – for instance, the economic pressures to conform to the social norms of the school community – or cultural ones – in some ethnic groups (e.g. Bangladeshi) parents do not traditionally invest in computer technology and thus this commitment to technology seems to be conspicuously absent from them and lack of institutional effort to support home computer use (Lyu et al., 2024). It is well understood that educational culture and systems are pivotal mediating factors in young people's familiarity and fluency with digital devices and the practices that have been enabled by them. Similarly, there are many tactics that educational actors have used to enhance the smooth teaching of digitally enabled activities and, by so doing, make it easier for more socio-economically differentiated students to engage in them.

Twenty years ago the main emphasis in digital divide research was on issues of premising access to technologies on existing infrastructures that were being primarily constructed to serve the well-off. This sometimes meant studying national differentials in access to the infrastructure of advanced telecommunications technologies and comparing national contexts that were belatedly accessing the internet with those countries that were already well-served by these technologies (Russo, 2023). Unequal access to the internet was also a concern for national contexts such as the United States or the UK. Where socio-economic gradients were clear, assumed that telecommunication providers or the main

indexing concerns for technology diffusion would slowly bring less connected communities – presumably those where the potential for commercial profits were lower – onto the internet.

Over the last two decades one of the central concerns of digital divide research has been to explore how those without access to digital technologies can be brought into the digital sphere (Adhikari et al., 2016). But this agenda has been fundamentally changed due to two main developments: the scaling up of efforts to bring learners into the digital sphere, and the development of portable smart technologies which a majority of the world's population already has access to. This gives, at least in principle, an unparalleled opportunity to bring students into the digital sphere, thus potentially beginning to close the digital divide in education.

Data Privacy and Security Concerns

According to Wadera and Kairam, data privacy and security concerns existed among 31% of their respondents that created a risk for the teachers and professors during using digital tools in schools and colleges. These concerns are making some teachers not to include digital technology in their educational pedagogy. Thus it is important to ensure implementation of such measures which would help in promoting the acceptance of digital technology by teachers to increase their pedagogic efficacy. A study by Joshi and Jagdale (2021) reported the fact that only 39.7% of the teachers and 33.3% of 11 students were not aware of the imposition of data privacy at the official level and at personal level. These teachers and students were more exposed to risk when they share their contents of schools with the user of digital tools developed by the others. Keeping these academic findings in mind, we strongly recommend that educational institutions should start make students aware of data security and privacy with the help of training programme on student's data protection and security. They should include a special subject on data security and privacy which will foster better awareness and understanding on threat ecology, security and privacy issues, regulatory compliance and data protection strategies.

Today's digital era has transformed the way education is imparted and received (Anawade et al., 2024). Digital technologies and online learning have led to improved student engagement, flexibility and asynchronous learning, personalized supportive learning engagements, and more effective teaching practices. However, concerns have also been raised about student privacy, online identity theft, and information security (Sun et al., 2022). To this end, digital platforms must comply with the guidelines, directives and notifications issued by the government or statutory bodies towards data privacy and a secure environment. Teachers need to ensure the digital platforms being used do not make children more vulnerable or open to cyber security threats. Risks that may impede its adoption in school education are invasion of aptitude and attitudes of users by hackers, terrorists or other intruders. A recent study conducted in India, this year on 115 school teachers by Das and Nandan (Rivera-Vargas & Cobo, 2023). found that students private data has higher risk on cloud than school server though cloud computing is considered as a secure digital platform for schools. The study reported that about (39.8%) of the teachers were concerned that social networking, online chats, video conferencing etc., created a risk for cyber security.

CASE STUDIES AND BEST PRACTICES

Vallet (2021), focusing on science curricula enhanced with technology in middle schools in Greece, argues that digital tools have to be supplemented with Science and Computing knowledge; we also posit that digital and pedagogical competencies have to be developed to enhance teaching and student outcomes. Lastly, Hernández León (2021) argues that the yet universalized practice of making online events, resources and activities available for reinforcement have to be targeted at "learning dispositions aware autonomy of students"

for successful connection with the learner. It is a premise in discussion in the UK, as given by Hunlun et al. (2021) and Raynor et al. (2021), in controversy over tensions and practical solutions on the 'typology of educator engagement'. In accordance with literature, some of the digital tools used include GitHub, Moodle, Padlet, Zoom, and BigBlueButton. We explored the cases to identify factors that have enabled teaching staff to engage students during the COVID-19 pandemic, and in preparation for further teaching developments. In examining each case, we considered effective strategies that have facilitated remote teaching, and challenges encountered both before and during the pandemic. Specifically, questions guiding this analysis include: What remote strategies have been effective in engaging students, and how have they been used? What challenges or limitations emerged in engaging students during the pandemic? How have teaching staff navigated these challenges to engage students during the pandemic, and what potentially transferable strategies have emerged from such problem-solving? The case studies confirm the 'common' best practices the literature has identified in digital education.

In this section, we presented practices from the field in sub-Saharan Africa, Spain, Greece, and the United Kingdom, in the form of short cases, with the intention to highlight an array of approaches to digital teaching development and student engagement (Russo, 2023). Francesco et al. (2021) explain that, even though remote teaching was not a best practice in universities in a Nigerian context, the University of Uyo provided its lectures and students with professional development seminars, including topics around digital and remote teaching; this has raised the need for quality digital pedagogy development in not only Nigeria, but also other disadvantaged areas due to COVID-19 (Laufer et al., 2021). In the Spanish context, where higher education is less inclusive in terms of age, geographic, or gender, Nomikoudis et al. (2021) explain how United Nations Student Rights are addressed through digital competencies in student engagement and virtual learning (DeCoito & Estaiteyeh, 2022).

Successful Implementation in Higher Education

Facility for the acquisition of the latest technology and educational tools, the support facility, or policy and framework or mandates, the academic professional development staff that play a major role in bringing pedagogical skills and research knowledge in diversification of teaching and learning to innovate digital pedagogy in higher education. It is clear that digital pedagogy can have positive benefits in learning outcomes, particularly when supported by the institution and technology tools are integrated in close alignment with academic goals and outcomes. There will continue to be technological innovation, so it is more important to develop pedagogy that uses digital tools and platforms, engaging and encouraging learners to make use of available tools and platforms. Institutions needs to invest on required human skills and expertise as well as technological support around the adoption and implementation of digital pedagogy.

Higher education and rapid innovations in the digital world necessitate digital innovation. The educators in Africa should think of becoming early adopters of the latest technology and latest digital pedagogy. Higher education exists in many forms and formats to meet diverse learning needs of students who may be undertaking tertiary education for the first time, aiming to change career, improve employability and additional qualifications or lifelong learning and personal development and advancement. The commonest traits of successful technology transformation in teaching and learning are course content digitalization; delivery and management system and frequent use of high-definition photographs, computer apps and multimedia, audio and video teaching materials. Digital pedagogy is an interactive form of education that improves the learning outcomes necessitated by the rapid innovations in the digital world. The approach to digital pedagogy and integrating technology successfully varies from institution to institution.

Faculty attitudes regarding adopting technology to their curriculum and pedagogy play a huge role. In the modern technological era, educated faculty are more likely to include advanced technology into their teaching and learning. However, involving technology for involving sake could affect the learning eventually. Hearing particular professional development from a digital expert is applicable and is taken for credit in order to change pedagogical practice related to technology adoption in the course (Marzilli et al., 2014). Assessments particularly in science related faculty are still of tradition practice of paper and pen laboratory exercise while examinations are to be carried out face to face i.e. in classes and the eyes of peers and lecturers. A great number of faculty members are very open about adding more technology to their curricula and pedagogy with a preference for relevance and practical than theoretical involvement. E.g. if technology is to be integrated into a course the lecturer would prefer to have it also practically attached and involve students logically but not abstractly useful immediately. Online teacher education programs and professional education units aiming to integrate technology into syllabus and teaching and learning could possibly aid science/STEM teachers (DeCoito & Estaiteyeh, 2022).

Digital pedagogy refers to applying technology to traditional course content or the teaching and learning process in higher education. Pedagogy implies usage of technology in education while teaching and learning. The educator has to be innovative with respect to professional experience in the digital pedagogy field in addition to research. Courses and curriculum development in Africa would need to be redesigned in such a way that activities in a classroom are sufficiently compelling to draw students into learning. By 2023, post-secondary and higher education will leverage digital strategic platforms to escalate student enrolment, improve student retention, and advance student success through matrix campus scenarios e.g. traditional campus, hybrid campus, and virtual campus focused on optimal student learning opportunity, didactical principles, and holistic formation of human persons (Iffat Rahmatullah, Sultana, & Sultan, 2020).

Innovative Approaches in K-12 Settings

The use of digital pedagogy in primary and secondary education by the educators can entail the utilization of virtual classrooms, online textbook, digital games, school management systems, school websites, learning management systems, learning resources, social media, digital citizenship resources, learning activities, flipped classroom resources and others. Considering the advantages of digital pedagogical practices at K-12 levels, many literatures and practices suggest several different and effective digital teaching tools, resources, and methodologies to be used at primary and secondary levels, such as adaptive curriculums, online learning programs, real-time learning conferencing, gamification-based education, digital storytelling, blogging, webinars, video lectures, video conferencing, e-learning games, etc.

Digital pedagogy is proved beneficial for making education autonomous, the student's motivation starts developing to be in control of their learning with digital pedagogical practices. The digital pedagogical practices have been recognized as a cost-effective technology for providing education. Digital pedagogy also enhances the quality of education delivery by using sophisticated and enabling applications which are an essential learning need (Ipek & Ziatdinov, 2018). It also enhances the stakeholder's satisfaction and retention, as digital pedagogy is found to be useful, enjoyable, and innovative to engage in learning and teaching as a whole. To improve the learning environment for K-12 students, digital pedagogy at schools can be designed by providing proper knowledge, assessment, and teaching strategies (Miliou & Angeli, 2022).

Digital pedagogy enhances student engagement through learner-focused tools, such as Massive Open Online Courses, learning management systems, and course management

systems which facilitate a more dynamic curriculum design and enable more personalized, interactive, and collaborative learning processes (Iffat Rahmatullah, Sultana, & Sultan, 2020). To address student learning diversities, the digital environment accommodates different learning preferences and the digital resources can be modulated according to the learning needs, pace, and style of different students. In digital environments, the students receive immediate feedback and get support for individual learning. For enhancing communication links, various collaboration tools, synchronous or asynchronous, are used effectively in online platforms. The online learning environment in K-12 settings needs practical and concrete instructional strategies including the practice of instructional ideation that brings evidence-based repeatable practice to online instruction.

CONCLUSION AND FUTURE DIRECTIONS

Digital pedagogy's utilisation in teaching practices is beneficial and allows lectures to select a method that aligns heavily with their objectives. Moreover, the technology has been quite useful in fostering an all-inclusive learning environment while catering to the varied learning styles of students. Furthermore, through digital pedagogy techniques, students are provided with a more participatory role and they are more inclined to exercise autonomy and automaticity in the learning process. The future of education is heavily linked to digital technologies. In recent years, digital pedagogy's practical implications to increase student engagement and enhance their learning abilities have been reflected in students' higher order thinking skills, analytical, and evaluative abilities. These practical implications of digital pedagogy have made contemporary higher education quite vibrant.

Digital pedagogy refers to the application of digital tools and techniques in teaching and lectures to improve student engagement and learning outcomes (Gillani & Eynon, 2023). In contemporary times with the prevalence of digital tools, digital pedagogy has become crucial to enhance student learning experiences in higher education (Miliou & Angeli, 2022). One of the primary aims of these techniques is to enhance students' motivation and engagement in the class as well as to foster their critical thinking, evaluative and analytical capabilities. Presently, in higher education, digital tools aim to integrate technology and pedagogy for a more vibrant learning environment (Chua et al., 2023). In the past, these tools have had substantial effects on student engagement and learning outcomes.

Key Takeaways and Recommendations

A structured approach needs to be given to the design of digital exercises and how these findings can be pedagogically applied in the higher education classroom (Miliou & Angeli, 2022). Taking into account students' digital readiness, an informal assessment would be beneficial for the faculty to understand to what extent students are willing to use digital tools or are willing to experiment with new teaching methodologies on digital platforms. Faculty should focus on integrating methods of blended learning, such as synchronous, asynchronous and mixed methods according to their competence, infrastructure availability and their available resources (Lu & Cutumisu, 2022). Another integral part of the digital pedagogy approach in the classroom will be the integration of feedback mechanisms such as the manual check for turnaround ecosystem or feedback on the discussion boards to keep students motivated for the next assignment or discussion board. Different types of digital era educative tools, teaching methods in social networks, discussion boards, and other communication applications should be focused, in order to improve visibility and awareness among the students more effectively.

It is important to note that integrating digital pedagogies into classroom practice to enhance students' engagement and learning outcomes is not a straightforward task. This involves not only the appropriate skills and "cyberliteracy" of both the students and educators

but also a critical stance and understanding of digital media ethics, trust, bias, inequalities, privacy, and rights (Rivera-Vargas & Cobo, 2023). This study yields some key takeaways and recommendations, which may be useful not only as practical implications but also for future studies, and last but not least from the educational policy perspective.

Emerging Trends in Digital Pedagogy

Another reason features the recent advancements that digital tools have accumulated through years to provide historically unavailable but highly worthy functionality. Such as, Augmented Reality (AR) and Virtual Reality (VR) technologies have the potential to revolutionize distance learning (Childs et al., 2021). In the review by Motola et al. mobile is known to be revolutionary in the field of health professions education lending support to its usefulness in university learning in a more general context. In another review, Mason is of the view that the integration of technology in learning is a trend from 2020 onwards which is expected to gain more ground in 2021. Hrastinski stressed that COVID-19 has led to an upheaval in online learning by increasing the number of online learners and by duelling with responsibilities of families and work which is challenging in the context of online learning. AR and VR not only provide interactivity, but also increase engagement and motivation of the learners. Gamification adds to the motivational level of the learners and has been demonstrated to promote self-learning that would immensely benefit the learners in the post COVID-19 era, too.

Since the onset of COVID-19, the integration of digital technologies into pedagogy has been a subject of interest for researchers as well as policymakers and practitioners. This is because of the relative success of the online learning in diverse educational settings across the world, especially in higher education (Noor et al., 2022). This is evident from the fact that educational technologies, such as impromptu instructional content delivery tools like Microsoft Teams and Zoom and creation of full-fledged Learning Management System (LMS) software like Moodle and Blackboard, have gained immense popularity (Alshabeb & Almaqrn, 2018).

REFERENCES

Al-Rahmi, W. M., Alzahrani, A. I., Yahaya, N., Alalwan, N., & Kamin, Y. B. (2020). Digital communication: Information and communication technology (ICT) usage for education sustainability. *Sustainability*, *12*(12), 5052. mdpi.com

Alshabeb, A., & Almaqrn, R. (2018). A study of EFL Saudi students' use of mobile social media applications for learning. *Arab World English Journal (AWEJ) Special Issue on CALL*, (4). osf.io

Anawade, P. A., Sr, Sharma, D., & Gahane, S. (2024). Connecting Health and Technology: A Comprehensive Review of Social Media and Online Communities in Healthcare. *Cureus*, *16*(3), e55361. ncbi.nlm.nih.gov

Blaschke, L. M. & Hase, S. (2021). So, you want to do heutagogy: Principles and practice. edtechbooks.org

Candia, C., Maldonado-Trapp, A., Lobos, K., Peña, F., & Bruna, C. (2022). Disadvantaged students increase their academic performance through collective intelligence exposure in emergency remote learning due to COVID 19.

Childs, E., Mohammad, F., Stevens, L., Burbelo, H., Awoke, A., Rewkowski, N., & Manocha, D. (2021). An Overview of Enhancing Distance Learning Through Augmented and Virtual Reality Technologies.

Chua, Y., Cooray, S., Cortes, J. P. F., Denny, P., Dupuch, S., Garbett, D. L., ... & Nanayakkara, S. (2023). Striving for Authentic and Sustained Technology Use in the Classroom: Lessons Learned from a Longitudinal Evaluation of a Sensor-Based

Science Education Platform. *International Journal of Human–Computer Interaction*, *40*(18), 5073-5086.

Corbett, F., & Spinello, E. (2020). Connectivism and leadership: harnessing a learning theory for the digital age to redefine leadership in the twenty-first century. *Heliyon*, *6*(1). cell.com

Dacre, N., Gkogkidis, V., & Jenkins, P. (2021). Co-Creation of Innovative Gamification Based Learning: A Case of Synchronous Partnership.

DeCoito, I. & Estaiteyeh, M. (2022). Online teaching during the COVID-19 pandemic: exploring science/STEM teachers' curriculum and assessment practices in Canada. ncbi.nlm.nih.gov

El-Hamamsy, L., Monnier, E. C., Avry, S., Chessel-Lazzarotto, F., Liégeois, G., Bruno, B., Dehler Zufferey, J., & Mondada, F. (2023). An Adapted Cascade Model to Scale Primary School Digital Education Curricular Reforms and Teacher Professional Development Programs.

Fussell, S. G., & Truong, D. (2022). Using virtual reality for dynamic learning: an extended technology acceptance model. *Virtual Reality*, *26*(1), 249-267. ncbi.nlm.nih.gov

George, C., Mavima, S., & La Wourman, J. (2022). Africana Digital Pedagogy: Cultural Exchange, Learning, and Innovation. ncbi.nlm.nih.gov

Ghounane, N., & Rabahi, H. (2023). Moodle in the Algerian EFL context during COVID-19: exploring students' attitudes and academic achievements. *Arab World English Journal (AWEJ) Special Issue on Communication and Language in Virtual Spaces*. osf.io

Gillani, N. & Eynon, R. (2023). Understanding and improving social factors in education: a computational social science approach.

Gitinabard, N., Xu, Y., Heckman, S., Barnes, T., & F. Lynch, C. (2019). How Widely Can Prediction Models be Generalized? Performance Prediction in Blended Courses.

Grawemeyer, B., Halloran, J., England, M., & Croft, D. (2022). Feedback and Engagement on an Introductory Programming Module.

Hengesteg, P. S., Bestler, L., & Marcketti, S. B. (2021). "18 is not a magic number": Faculty Reflections on Student Development Theories in Creating Inclusive Classrooms. *Innovative Higher Education*, *46*(6), 707-732. ncbi.nlm.nih.gov

Hermawan, D. (2021). The rise of e-learning in covid-19 pandemic in private university: challenges and opportunities. *IJORER: International Journal of Recent Educational Research, 2*(1), 86-95. ia-education.com

Hertz, B., Grainger Clemson, H., Tasic Hansen, D., Laurillard, D., Murray, M., Fernandes, L., ... & Rutkauskiene, D. (2022). A pedagogical model for effective online teacher professional development—findings from the Teacher Academy initiative of the European Commission. *European Journal of Education, 57*(1), 142-159. wiley.com

Hwang, N. K., Shim, S. H., & Cheon, H. W. (2023). Digital learning designs in occupational therapy education: a scoping review. ncbi.nlm.nih.gov

Iffat Rahmatullah, S., Sultana, S., & Sultan, G, (2020). E-Teaching in Higher Education: an Innovative Pedagogy to Generate Digitally Competent Students at King Khalid University. *Arab World English Journal (AWEJ) Special Issue on CALL*, (6). osf.io

Inouye, M. C. & Gunshenan, C. I. (2024). Responsive facilitation: validating constructs to support in-service science teacher professional development. *Teacher Development*, *28*(4).

Ipek, I. & Ziatdinov, R. (2018). New Approaches and Trends in the Philosophy of Educational Technology for Learning and Teaching Environments.

Ismailov, M. & K. F. Chiu, T. (2022). Catering to Inclusion and Diversity With Universal Design for Learning in Asynchronous Online Education: A Self-Determination Theory Perspective. ncbi.nlm.nih.gov

Kallunki, V., Katajavuori, N., Kinnunen, P., Anttila, H., Tuononen, T., Haarala-Muhonen, A., Pyörälä, E., & Myyry, L. (2023). Comparison of voluntary and forced digital leaps in higher education – Teachers' experiences of the added value of using digital tools in teaching and learning. ncbi.nlm.nih.gov

Kitishat, A. R., Al Omar, K. H., & Al Momani, M. A. K. (2020). The Covid-19 crisis and distance learning: E-teaching of language between reality and challenges. *The Asian ESP Journal*. academia.edu

Langridge, A. (2023). Is Connectivism Viable. *The Interdisciplinary Journal of Student Success*. cdspress.ca

Laufer, M., Leiser, A., Deacon, B., Perrin de Brichambaut, P., Fecher, B., Kobsda, C., & Hesse, F. (2021). Digital higher education: a divider or bridge builder? Leadership perspectives on edtech in a COVID-19 reality. ncbi.nlm.nih.gov

Leonardou, A., Rigou, M., Panagiotarou, A., & Garofalakis, J. (2022). Effect of OSLM features and gamification motivators on motivation in DGBL: pupils' viewpoint. ncbi.nlm.nih.gov

Li, Y. (2023). Connectivism as a Framework for Informal Learning in Music Education: a Literature Review Study. cmu.edu

Lu, C. & Cutumisu, M. (2022). Online engagement and performance on formative assessments mediate the relationship between attendance and course performance. ncbi.nlm.nih.gov

Lucas, M. & Nuno Vicente, P. (2022). A double-edged sword: Teachers' perceptions of the benefits and challenges of online teaching and learning in higher education. ncbi.nlm.nih.gov

Lun Wu, M., Zhou, Y., & Li, L. (2023). The effects of a gamified online course on pre-service teachers' confidence, intention, and motivation in integrating technology into teaching. ncbi.nlm.nih.gov

Lyu, Y., Xie, J., Meng, X., & Wang, X. (2024). Digital economy and institutional dynamics: striving for equitable public service in a digitally transformed era. ncbi.nlm.nih.gov

MacKenzie, A., Bacalja, A., Annamali, D., Panaretou, A., Girme, P., Cutajar, M., ... & Gourlay, L. (2021). Dissolving the dichotomies between online and campus-based teaching: A collective response to the manifesto for teaching online (Bayne et al. 2020). *Postdigital Science and Education*, *4*(2), 271-329. ncbi.nlm.nih.gov

Marsden, L., Munn, L., Magee, L., Ferrinda, M., St. Pierre, J., & Third, A. (2023). Inclusive Online Learning in Australia: Barriers and Enablers.

Marzilli, C., Delello, J., Marmion, S., McWhorter, R., Roberts, P., & Scott Marzilli, T. (2014). Faculty Attitudes Towards Integrating Technology and Innovation.

Mate, K. & Weidenhofer, J. (2021). Considerations and strategies for effective online assessment with a focus on the biomedical sciences. ncbi.nlm.nih.gov

Mendieta-Aragón, A., Arguedas-Sanz, R., Manuel Ruiz-Gómez, L., & Navío-Marco, J. (2023). Tackling the challenge of peer learning in hybrid and online universities. ncbi.nlm.nih.gov

Miliou, O. & Angeli, C. (2022). Design principles for internet skills education: results from a design-based research study in higher education. ncbi.nlm.nih.gov

Namboodiri, S. (2022). Zoom-ing past "the new normal"? Understanding students' engagement with online learning in higher education during the covid-19 pandemic. In *Re-imagining Educational Futures in Developing Countries: Lessons from Global Health Crises* (pp. 139-158). Cham: Springer International Publishing. researchgate.net

Ng, S. F., Azlan, M. A. K., Kamal, A. N. A., & Manion, A. (2020). A quasi-experiment on using guided mobile learning interventions in ESL classrooms: Time use and academic performance. *Education and information technologies*, *25*, 4699-4719. springer.com

Nguyen, M. X. N. C., Dao, P., Iwashita, N., & Spinelli, F. (2023). Teacher learners theorizing from practice: A case of the concept of learner engagement in interactive second language learning tasks. *Teaching and Teacher Education, 129,* 104151. sciencedirect.com

Nicolaides, A. (2022). Generative knowing: Principles, methods, and dispositions of an emerging adult learning theory.

Nisbet, P. D. (2020). Assistive technologies to access print resources for students with visual impairment: Implications for accommodations in high stakes assessments. *British Journal of Visual Impairment.*

Noor, U., Younas, M., Saleh Aldayel, H., Menhas, R., & Qingyu, X. (2022). Learning behavior, digital platforms for learning and its impact on university student's motivations and knowledge development. ncbi.nlm.nih.gov

Nuruddin Hidayat, D., Young Lee, J., Mason, J., & Khaerudin, T. (2022). Digital technology supporting English learning among Indonesian university students. ncbi.nlm.nih.gov

O'Keefe, L., Rafferty, J., Gunder, A., & Vignare, K. (2020). Delivering High-Quality Instruction Online in Response to COVID-19: Faculty Playbook. *Online Learning Consortium.* ed.gov

Okegbemiro, J. O. (2021). Effects of blended and e-learning on academic achievement of business education students in word processing.

Panesi, S., Bocconi, S., & Ferlino, L. (2020). Promoting Students' Well-Being and Inclusion in Schools Through Digital Technologies: Perceptions of Students, Teachers, and School Leaders in Italy Expressed Through SELFIE Piloting Activities. ncbi.nlm.nih.gov

Perchard, S. R. (2022). Engagement through Emancipation, Empowerment, and Equity: Heutagogy and the 21st-Century Classroom. uwo.ca

Qi, Y., & Binti Othman, R. (2023). Investigating Chinese Tertiary EFL Teachers' Beliefs and Practices in the Application of Learning Management Systems Using Q Methodology. *Arab World English Journal (AWEJ), 14*(4). osf.io

Richards, S. (2023). Faculty Perception of Student Engagement in Online Anatomy Laboratory Courses During the COVID-19 Pandemic. ncbi.nlm.nih.gov

Rivera-Vargas, P. & Cobo, C. (2023). Digital learning: distraction or default for the future. osf.io

Sghaier, S., Osman Elfakki, A., & Alhumaidi Alotaibi, A. (2022). Development of an intelligent system based on metaverse learning for students with disabilities. ncbi.nlm.nih.gov

Sharin, A. N. (2021). E-learning during COVID-19: a review of literature. *Jurnal Pengajian Media Malaysia*. um.edu.my

Shrestha, S., Haque, S., Dawadi, S., & Ashish Giri, R. (2022). Preparations for and practices of online education during the Covid-19 pandemic: A study of Bangladesh and Nepal. ncbi.nlm.nih.gov

Siemens, G., Rudolph, J., & Tan, S. (2020). "As human beings, we cannot not learn". An interview with Professor George Siemens on connectivism, MOOCs and learning analytics. *Journal of Applied Learning and Teaching, 3*(1), 108-119. sfu.ca

Skulmowski, A., & Xu, K. M. (2022). Understanding cognitive load in digital and online learning: A new perspective on extraneous cognitive load. *Educational psychology review*, *34*(1), 171-196.

Svendsen, B. (2020). Inquiries into teacher professional development—what matters?. *Education, 140*(3), 111-130.

Tang, F. (2024). Understanding the role of digital immersive technology in educating the students of english language: does it promote critical thinking and self-directed learning for achieving sustainability in education with the help of teamwork?. ncbi.nlm.nih.gov

Thaha Abdullateef, S. (2021). Remote learning: Fostering learning of 21st century skills through digital learning tools. *Arab World English Journal (AWEJ) Special Issue on CALL*, (7). osf.io

Timea Fülöp, M., Odett Breaz, T., He, X., Aurelian Ionescu, C., Silviu Cordoş, G., & Geanina Stanescu, S. (2022). The role of universities' sustainability, teachers' wellbeing, and attitudes toward e-learning during COVID-19. ncbi.nlm.nih.gov

Tondeur, J., Howard, S., Van Zanten, M., Gorissen, P., Van der Neut, I., Uerz, D., & Kral, M. (2023). The HeDiCom framework: Higher Education teachers' digital competencies for the future. ncbi.nlm.nih.gov

Vekić-Kljaić, V. & Mlinarević, V. (2022). Professional development of educators' online learning during the COVID-19 pandemic in the Republic of Croatia. ncbi.nlm.nih.gov

Videla, R., Aguayo, C., & Veloz, T. (2021). From STEM to STEAM: An enactive and ecological continuum. *Frontiers in Education*. frontiersin.org

Voskoglou, M. G. (2022). Influence of the Digital Technologies to the Process of Learning. *WSEAS Transactions on Advances in Engineering Education, 19*, 72-79. wseas.com

Ward, D., Silverman, D., & Villalobos, M. (2017). Introduction: The varieties of enactivism. *Topoi*, *36*, 365-375.

Wu, C. H., Tang, Y. M., Tsang, Y. P., & Chau, K. Y. (2021). Immersive learning design for technology education: A soft systems methodology. *Frontiers in Psychology*, *12*, 745295. ncbi.nlm.nih.gov

Xuan, Q., Cheung, A., & Sun, D. (2022). The effectiveness of formative assessment for enhancing reading achievement in K-12 classrooms: A meta-analysis. ncbi.nlm.nih.gov

Zhang, L., Jackson, H. A., Yang, S., Basham, J. D., Williams, C. H., & Carter, R. A. (2021). Codesigning learning environments guided by the framework of Universal Design for Learning: a case study. *Learning Environments Research*, 1-19.

Zhang, R. Y. (2022). Digital Media Teaching and Effectiveness Evaluation Integrating Big Data and Artificial Intelligence. ncbi.nlm.nih.gov

Zhang, Y. (2022). Developing EFL Teachers' Technological Pedagogical Knowledge Through Practices in Virtual Platform. ncbi.nlm.nih.gov

Zhou, J., Zheng, Y., & Tai, J. H. M. (2020). Grudges and gratitude: The social-affective impacts of peer assessment. *Assessment & Evaluation in Higher Education, 45*(3), 345-358. researchgate.net