

Feasibility of Modern Pedagogical Technologies in Education

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ABSTRACT

Like many other fields, the face of education has evolved drastically. In the past, teachers had been the most effective in creating bridges between education and students, connecting them to the universe. They used conventional pedagogical strategies to explain the subject matter. However, the quantum leap in education requires and inspires learners to study profoundly to fulfil their curiosity via the introduction of unique modern progressive approaches to teaching and learning hence the revolution of the educational sector. Ed-tech tools are removing barriers in education and are extensively used in many societies. Variable digital technologies amongst students are altering changes in curricula. This article identifies ed-tech tools available to university students and how they enhanced engagement. The design-based research under qualitative design was utilised. Observations, surveys, and interviews were instruments for data collection. Findings revealed that ed-tech tools significantly contributed by addressing student inequity issues and enriching the teaching-learning experience. The use of ed-tech tools augments the conventional teaching method with the end objective of motivation, increasing engagement, and interactivity. The use of innovative modern pedagogical technologies in education is a progressive step attributable to affordances such as ubiquity, encouraging student-instructor connectedness, and moves students from passivity to being active. The data indicated that despite challenges, there is a high potential to augment the conventional approach with ed-tech tools and modern pedagogical technologies in education.

Keywords: education, ed-tech tools, pedagogical technologies, student-instructor connectedness

INTRODUCTION

An educator's understanding of how learners acquire knowledge is pedagogy. This demands interactive collaboration between the learner and tutor geared towards presenting content that is relevant to the needs of the learner; to impact significantly. Finding adaptive measures to enhance teaching, learning, interactivity, and student engagement has received much attention. An adaptive stimulation to support teaching-learning while improving student interactivity is adopting ed-tech tools and modern technologies in support of pedagogical approaches in education. There has been a noticeable variation in the style of teaching-learning. According to Chernenko (2020), teaching undergoes a set of theoretic and practical knowledge to upgrade educational goals with organizational and meaningful processes in mind in modern pedagogy. Presently, there is quite an amount of modern pedagogical technologies incorporated in training teachers, project methodology, and massive possibilities of internet resources being used in teaching-learning (Norboeva, 2020). Saidu *et al.* (2021) posit that the use of revolutionary pedagogical methods not only improves education but also meets the differentiated learning styles and learning goals of learners.

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Modern innovative pedagogical approaches have the potency to steer the course of teaching and alter learning (Herodotou *et al.*, 2019), they are most appropriate and preferred in the digital age because instructors can teach effectively with in-depth explanations made clear to learners without reservations (Vijayalakshmi, 2016) in-person or remotely.

LITERATURE REVIEW

Educational Evolution

According to Mehta (2019), traditional pedagogical technology is characterized by a writing tool and chalk-talk methods but recently it is deemed outdated with limited scope. The main goal of traditional pedagogy is for learners to memorize content and pass examinations thus they lack understanding (Saidu *et al.*, 2021) which does not promote lifelong learning as compared to modern ways of teaching-learning. The challenging question is how instructors can integrate modern technology into teaching with efficacy. In teaching with technology, there are three considerably essential interrelated components to look at, which are content, pedagogy, and technology. As an instructor, the reason to consider technology in practice is the knowledge base it offers both instructors and students (Norboeva, 2020). Educators must learn to embrace modern digital technologies to satisfy the educational demands of twenty-first-century and beyond; it improves teaching, learning, encourages active participation, learner-centric, integrative, interactive, collaborative, inclusive, organizational, and influences managerial processes. The world has become more knowledge-based, therefore increase in the value of information, and obtaining it at an apt time and place is critical to meet individuals and societal demands. Accordingly, learners differ in understanding and have varying learning pathways, and adapting flexible learning approaches can assist educators in addressing these variances efficiently. Educational environments emphasize the need for manageable learning methods that consider the singular need of learners' penchants, incentives, and ambitions.

The education system is represented by the existence of varying ed-tech tools and their usage in the practice of education should not be exempted. It is the responsibility of educational institutions to train the generation of today to become competent future specialists therefore the need to introduce and use challenging ed-tech tools in educational practice. Modern pedagogical methods emphasize nurturing learners to become innovative, curious, problem solvers, and critical thinkers with deep understanding. It has immeasurable tools of inquiry for creative brainstorming which meets curriculum needs (Saidu *et al.*, 2021). Institutions are responsible for the training of highly trained persons hence the need to employ innovative ed-tech tools in the educational stream. Furthermore, according to the modern federal state of educational standards, it is mandatory and an additional professional requirement for educators to augment the conventional method with technological tools. This is to improve and rebuild the quality and content of the knowledge flow. Instructors have to restructure systems to accommodate current policies and trends that present themselves to society.

A similar situation is the change requirements from a knowledge-based to a competency-based approach. In this regard, the modifications had an impact on the content of education as well as the teaching methods hence addressing the technologies employed in the educational process (Ivanova *et al.*, 2020). For the survival of educators in the digitized age, there is a need for them to adopt ed-tech tools to meet the needs of the twenty-first-century learner. Ed-tech tools add value to the classroom pedagogic process. The broader definition of ed-tech tools is a technology that acknowledges evolution from simple information transmission systems and justifies its function in classroom settings. The use of digital processing systems supports remote instructor-student communication, sharing data, and

inspire learners to be in charge of learning, knowledge inquiry, and construction can be considered (Martin, 2023).

Modern Digital Technologies in Pedagogy

The educational system is inundated with varying options in digital technologies and tools, on account of the advent of technology, curiosity, and professional expectations. This requires modifications to the conventional approach by employing practical, demonstrative, and exploratory methods of instruction. The focus of these new involvements brings innovative patterns to teaching, cognitive thinking, and learning. In educational spaces where modern pedagogical technologies are adopted, the role of the teacher is a facilitator paving way for students to move from being passive to being active participants. Students are central in curriculum development and lesson planning while teachers support by providing required resources. To date, these new modifications in pedagogy are effective and considered as burden relievers.

The twist in pedagogy and conventional classrooms has propelled curiosity in learners resulting in healthy productive outcomes. Apart from blended learning that combines online engagement with conventional approaches, there is a collaborative learning approach, that involves a common platform for teachers and learners to achieve synergy. To optimize time, flipped classrooms can be adopted, here, learners are allowed to study new content or attend to preliminary works at home or convenience such as videos or online seeks, then complete them in class. Spacing is another technique that gives opportunities to reinforce particular lessons in multiplicity with a ten minutes interval, allowing the brain of learners to refresh. The 10-minute gap can be filled with mindful techniques or fun activities or games. Gamification is another method that inculcates game elements or video games adopted into the educational setting. Self-learning allows the teacher to plant seeds of curiosity, pushing learners to explore interesting topics in-depth.

The need for teachers to cater to individual learner trajectories is key in the pedagogic process for more holistic education, VAK teaching makes that possible; the teacher sorts learners under visual, auditory, and kinesthetic and plans unique lessons to satisfy preferential learner styles. Least is the notable algorithmic artificial intelligence (AI) in education, the use of machines to facilitate effective and meaningful instructions, identifies knowledge gaps and provides tailored learning experiences, and assess. It is an effective tool that unburdens teachers and students alike. These strategies and modifications increase cognitive thinking, connectedness, collaboration, and cooperation among learners for healthier outcomes and consider the conventional system as the base.

Selected Frameworks in Support of Modern Pedagogy

The foundation for a successful developmental model for a blend of online and face-to-face instruction is the amalgamation of conventional learning theories (behaviourism, cognitivism, and constructivism) with contemporary theories like connectivism. The following frameworks and similar models are founded on both theoretical umbrellas to augment pedagogic approaches. They can be used as guides directing decisions in designing course or learner activities in alignment with pedagogical methods with the result of developing the teaching-learning environment. They serve as descriptive or analytic tools to define and direct practice.

Laurillard Conversational Framework: Laurillard asserts that a technology-based environment can be adapted to augment the orthodox teaching method and the learning process to make the educational environment knowledgeably rich and complete in every sense. Laurillard's 1993 and 2002 frameworks focused primarily on the practice of teaching, teacher, and learning. The framework encourages students to learn via the conventional

method and technology as well (Laurillard, 2002; Neo *et al.*, 2013; Almpanis, 2015). Laurillard emphasizes that all complex learning must involve a continuous cycle of idea exchange between tutors and students practically and theoretically to reveal each other's perceptive variance.

TPACK: The acronym TPACK was introduced in 2006 and stands for “Technological Pedagogical and Content Knowledge”, this framework speaks to the three bases of knowledge critical for instructors, these are technology, pedagogy, and content. It describes how these three interconnects and how their intersections help teachers to make appropriate arrangements that enfold digital technologies and tools into practice. Content must guide the instructor on the appropriate pedagogical strategy to adopt then lastly consider technological tools in-service with student learning (Noah, 2022).

SAMR: SAMR framework surfaced in 2010 as a build-up of TPACK, the abbreviated meaning is “Substitution, Augmentation, Modification, and Redefinition”, it is a reflective and qualitative assessment framework that prods teachers to consider how students engage with technological tools. It helps instructors think about how current they are in the use of technology in their educational spaces to design and develop learning experiences in a transformative and progressive way. The SAMR model can also be adopted in other facets of the learning environment.

E-moderating Model: Salmon's e-moderating model uses asynchronous online networked activities to scaffold progressive learning. It describes the sequential stages of teaching and learning online with the aid of computer-mediated communication. The process engages learners in a discussion and then takes a step back allowing learners to drive the ongoing discussion to construct knowledge. As the instructor-learner interactivity increases with each level, the role of the e-moderator shifts to a facilitator role when the expectations of the participants increase (Salmon, 2011; 2013).

Impact and Challenges of Modern Digital Technologies on Education

The achievement of meaningful learning requires more than one delivery channel. For instance, block-and-mortar classroom settings restrict learning to time and place, whereas a virtual setting welcomes a wider audience without restrictions. Ed-tech tools have positive effects on pedagogy, such as increased learner involvement and acting as an incentive to study, flexible learning, learning outcomes improved, and student connectedness and accumulated knowledge enhanced by networking synchronously or asynchronously. The use of ed-tech tools and modern digital technologies in education is a flexible approach used to augment the conventional approach of teaching-learning virtually. Flexibility can be achieved in a variety of ways in educational contexts. In a time and face of changing needs, the learning environment should be able to motivate learners and promote learning as an activity, support collaboration along with formal practice, provide a personalized and inclusive environment, and be flexible (Raes, 2021).

With the boundless opportunities offered by digital technologies, Awidi (2008), Starr (2011), and Kramarenko and Kvashin (2017) posits that it is not accepted as an instructional tool or a subject of instruction in many educational institutions because teaching with technology is challenging (Norboeva, n.d.). Also, some tutors are less familiar and comfortable with technology compared to their students, and others are bereft of the pedagogic use of modern digital technologies. Though institutions offer professional development seminars and workshops, educators resist attendance and give excuses for inadequate time, incentives, allowances, and also claim it increases academic responsibilities (Pineda Hoyos & Tamayo Cano, 2016). Hence, they struggle to integrate ed-tech tools and modern digital technologies into pedagogy and curriculum. However, the majority are

threatened by the introduction of AI into educational spaces, teachers are apprehensive as it challenges the teaching career (Zhai *et al.*, 2021).

Despite the highlighted objections, Starr (2011) asserts, technology involvement and integration into the classroom in so many ways but then we often do not think about how it is being used. Digital technologies help educators make better use of ed-tech tools for instruction and help students improve their technical skills within the context of the curriculum and other areas. Klamm (2011) opines that digital technology opens up all-new avenues of communication and connectedness for students and instructors. A typical class may only take a few hours a week but with digital technology, the classroom can be a lively twenty-four-hour, seven days experience. Walsh (2011) added that instructional use of digital technology can provide opportunities for teaching, learning, connecting, and engagement. Furthermore, using ground-breaking technologies in the classroom engage students-instructor communication, this moves the students from the inactive role of recipient of information transmitted by a teacher, textbook, or broadcast to an active role rather. In a classroom setting, it is difficult to assess if students have a fair understanding of the concepts covered. Thus, the use of technologies in the classroom can be useful. Moreover, the digital citizens of today who are in the habit of using the internet are mostly students', this is because there is a wide range of digital tools and devices worldwide available at their disposal for use (Al-Hamad *et al.*, 2020). Research proves the vast spread and usage of digital technologies have influenced their integration and added value to the educational environment. Correspondingly, the increasing access to wireless internet worldwide (Poushter, 2016) is another considerable factor in its usage in many institutions.

Founded on this, the study aimed to adopt ed-tech tools into the classroom to enhance the conventional pedagogic approach. The research exploited ways modern technologies could be used to support teaching, learning, improve communication, interactivity, and engagement at a Ghanaian public university. The conventional pedagogic approach although it serves as the base for teaching, it is incapable of training students to be technology-driven to meet the twenty-first-century skill requirements alone. Thus, there is a need to augment the conventional pedagogic approach with new trends to improve the educational experience for both learners and instructors as a result of raising interest and boosting learning outcomes. The difficulty of transitioning from traditional teaching techniques to modern pedagogical technologies is becoming increasingly urgent as the quality of education becomes an objective necessity (Safarova, 2021).

EMPIRICAL PROCEDURE

For addressing educational problems in an educational setting, design-based research is the best approach. McKenney and Reeves (2021) stated that design-based research requires the researcher to gain a thorough and comprehensive knowledge of educational challenges before designing a solution to be tested. Through a pilot study via observations, information was gathered from lecture halls. This design approach develops knowledge and finds solutions to difficulties in actual classroom settings, producing valued outcomes and contributions to the educational practice. The study aimed to identify ed-tech tools available to students and faculty in a Ghanaian public university and how their adoption can enhance the conventional pedagogical process with meaningful engagement that impacts and factors all learner trajectories. A random sample selection of two hundred and fifty-one participants was selected out of eight hundred and seventeen sophomores and seventy-four faculty staff. This sample size (n=251) partaking in the study is a considerable size for a population under 1,000 (Heath, 2019). Instrumentation was observations, surveys, and interviews. By observation, information concerning the availability and usage of ed-tech tools in the lecture halls was given. Surveys permit anonymity therefore resulting in more candid responses and

rejecting the subjective influence of the researcher. Also, it does not probe for more data which may result in a low response. Two hundred and forty-six surveys were given out to sophomores, two hundred and twenty-nine were obtained and seventeen add lost data. Unstructured interviews were conducted to obtain information and acquire knowledge from selected faculty.

RESULTS AND DISCUSSION

Learning with technology is a pedagogical orientation that investigates and teaches the most effective ways to attain educational goals via the use of technology. The instructor must be savvy in the use of new educational technologies. The capacity of the instructor to effectively prepare a lesson and choose the appropriate technology for the lesson determines the success of the learning process. The purpose of pedagogical technology is to educate and train based on the creation and enhancement of content, techniques, and tools of teaching (Norboeva, 2020). UNESCO added that an effective form of education with pedagogical technologies considers personal resources and technologies as well as their interrelations (Narzulloevna *et al.*, 2020). Instituted on this, the need to identify and classify ed-tech tools available and in usage by both students and faculty, internet connectivity, and digital literacy levels measured.

Classified Ed-Tech Tools and Usage

Ed-tech tools have many opportunities and their exploits impart quality online education through many channels (Dash & Kuddus, 2022) consequently, tools were categorized under software (interactive applications like social media, response systems, instant messaging, and course management systems). Altogether, ed-tech devices available to lecturers and students were laptop computers, mobile devices (tablets and smartphones), MacBooks, and desktop personal computers. Hardware data from students recorded revealed 70% and 85% ownership of laptops and mobile devices correspondingly. In the outburst of digital technologies, the most extensively used amongst students at the tertiary level are mobile devices and laptops for communicating and as a resource in education (Suárez-Lantarón *et al.*, 2022). As preferred devices, students and faculty alike connect these devices to campus or available WIFI regularly to progress learning and access online materials. Several of them used these devices for edutainment purposes synchronicity of learning and having fun (American University, 2020). Another influential factor could be how portable these devices are as compared to desktop personal computers. The numbers for MacBooks were low (3%) because their value is much more compared to Chromebooks and Windows laptops (Maiorca, 2021).

According to Gierdowski *et al.* (2020), the basic and most important technology in any educational institution is WIFI and ed-tech tools are useless without a connection to power and the internet, a system that has transformed communications by allowing several computer networks around the world to interconnect (Dennis, 2022). Students and faculty connected to the web via wired, wireless, dial-up access, and broadband. Faculty and students were digitally literate and well-informed about computer software applications without much trouble except for internet and technological-related issues. The introduction of the internet in all aspects of life has made it possible for many to connect via interactive software applications. Regarding interactive cross-platform applications for communication and messaging, on the whole, Facebook (80%) recorded the highest as the most widely used app, preceded by Twitter (42%) and 35% on Instagram. Gallardo *et al.* (2015) stated that students used these social media apps for both academic and social purposes. Additionally, WhatsApp, BlackBerry Messenger, Viber, Telegram, and Chat On were instant messaging applications used. Al-Hamad *et al.* (2020) highlighted WhatsApp and Facebook as leading

applications known for teaching and learning and people spent most of their time on these social networks. Whereas Suárez-Lantarón *et al.* (2022) identified WhatsApp as the world's leading instant messaging application. Lecturers and students interconnected with families, colleagues, and friends with identified software apps but both lacked knowledge of appropriate mediums for online instruction.

Awareness and Experience with Modern Pedagogical Technologies

Lecturers and students were in known that ed-tech tools aided in the pedagogical process. Interactive whiteboards, speakers, visualizers, response systems, online video streaming, compact disc, educational apps, projectors, et cetera are mechanical devices that aid instructors to explain content more effectively in an articulate manner (Vijayalakshmi, 2016). Students and faculty were aware that modern technologies created a more engaged teaching-learning environment; with ease, fast and round-the-clock access to information and knowledge. It expanded knowledge on theoretical concepts and practical or studio works; acts as a collaborative and interactive milieu; there is an extension of content delivery to remote learners via electronic modes, to plan, submit, and evaluate course work online (Rada & Nagasubramani, 2018). Regarding innovative pedagogic methods, though aware of it they had no pragmatic knowledge although the university had one that was solely for postgraduate distant education. This approach probably was not extended to the mainstream of undergraduates due to the outpouring numbers of students.

Exposure to Innovative Pedagogical Technologies in Practice

Aimed at the introduction of unconventional pedagogical technologies into the educational context, students and faculty needed to have high professional training, pedagogical skills, ethical qualities, be effective users of advanced modern pedagogical technologies, and interactive methods in educational work. Nonetheless, the need to deepen and update the professional knowledge and skills of educators is the social order of any progressive society. Pedagogically, technology allows more to be achieved with less effort and time in the pedagogical process and is considered one of the main criteria for improving lesson effectiveness (Narzulloevna *et al.*, 2020), with whole-class teaching in mind.

With the popularity of smartphones and students' consistency in accessing them, a couple of lecturers took advantage and committed to them to strengthen learning and learner-instructor connectedness; through the creation of groups (students and lecturers alongside class representatives as administrators) on Telegram and WhatsApp. It was an active positive approach adopted by the lecturers bearing in mind that very few instructors who are used to the conventional system will take such initiative to introduce and promote technology in the pedagogic process. These implemented applications apart from connecting and communication, have added attributes related to efficiency, planning, and encourage active learning, and can be an adoptive resource to support teaching-learning for any educational level. But the use of such applications has limitations and is not an effective pedagogical resource conducive to educational environments, it can be a distractive tool in the teaching-learning process, the flood of incoming messages from other contacts cannot be avoided, short handwriting/responses have detrimental effects on grammar and spelling, to mention a few downsides (Suárez-Lantarón *et al.*, 2022).

Norboeva (2020) stated that the right technology adopted determines the success of the teaching-learning process. A thoughtful deliberation on Noboeva's statement, it can be concluded that education-wise, the technology adopted by the lecturers was not the appropriate platform. Suárez-Lantarón *et al.* (2022) reechoed that tutors should not only focus on why and how students use mobile technologies or most frequented applications but rather they need to understand the incorporation and relevance of such tools and applications in the

teaching and learning process. Therefore, the need for professional training on a system that considers personal resources and technologies as well as their interrelations (Narzulloevna *et al.*, 2020). For an effective form of education to meet the twenty-first century standards and demands, modern pedagogical technologies are necessary. Annku (2014) added, modern pedagogical methods and strategies that support teaching-learning are of the essence, they have become suitable platforms for faculty and students alike. Even though the inadequacy of resources is a problem in some educational institutions and countries, there is the need for instructor creativity and inventiveness to buttress concepts even in well-funded institutions. Consequently, there is a need for educators to devise instructional approaches, preferably ones that meet the students' knowledge and needs (Saidu *et al.*, 2021).

Need for Professional Upgrading

To adopt modern pedagogical technologies, one must consider a pre-planned goal in the educational process as well as the implementation of a specific project in practice with constant practice. Tutors and students must have three qualifications before using new pedagogical technologies, professional know-how through training, awareness of modern innovative information and communication technologies in education, and the tutor's ability to utilize pedagogical and innovative technologies in practice (Safarova, 2021). As per Safarova's deductions lecturers' and students' professional knowledge was sought. Although the educational system of the university is built within the framework of the conventional method, there are some rudiments of educational technologies implemented within its walls, such as the use of computers and the likes, overhead projectors in lecture halls, WIFI, smart boards (Kozlava, 2018), and V-classroom for online distance education. Recognizing the technologies available to lecturers and students, their integral role in education, and their ability to engage students (Bond & Bedenlier, 2019) is a prerequisite for effective adoption.

Through an intensive course, students and faculty were introduced to modern pedagogical technology, a cloud, and subscription-based innovative platform emphasizing practical problem-solving and interaction. This was to train them on how to use it to provide an engaging experience. This cloud-based application was a software used in educational spaces for planning, documenting, implementing, and evaluating a specific learning process or delivering educational content. It is a dais used to support the teaching and learning practice (Ismail *et al.*, 2021). The innovative platform had a simple and responsive interface that made it easy to learn for the sampled population. It offered a range of learning methods that students could adapt to with ease. The application could run on computers (desktop, laptop, and MacBook), tablets, and smartphones. It was managed and controlled by lecturers making it a safe milieu where they could deliver and have access to educational content, create and partake in polls, initiate group discussions, whole class communiqué, and no private dialogue between students, therefore, reducing cyberbullying. Also, it supported knowledge development among students and lectures. This system personalized instructions that reinforced learner engagement, participation, and outcomes. The innovative method adopted is built on student entric learning, a platform for class connection, collaboration, engagement, and adapted to individual learner needs. The additional game effect of awarding badges challenged and motivated students. It retains the position of the instructor as one who controls the class but does not limit students' involvement and participation.

Learning Styles and Modern Pedagogical Approach

For the design of a meaningful learning experience for learners, learning styles are a factor that must be measured. With the expansion of modern pedagogical tools and methods, it seems vital to determine to what extent they serve the learner and what role is given to the student using these new pedagogical approaches (Khaled, 2021). The learning styles of

students and teaching strategies of lecturers were sought and observed to help identify an appropriate modern pedagogical technology that could meet learner trajectories and lecturers' instructional strategies. Adopted instructional strategies were lecture, demonstration, discussion, and multimedia content limited to laptops and projectors.

The technique by which a learner process, organize, represents, and retrieves combined information in a cognitive sense is referred to as learning style. This is founded on the theory that students vary in the way they receive content and knowledge as well as the way they acquire skills. Students' learner style scale range was solitary, social, visual, auditory, verbal, kinesthetically, musical, and logical (El-Sabagh, 2021). Retrieved data unveiled kinesthetic, visual (highest), and auditory as dominant learning styles, students acquired knowledge best through active experimental involvement and exploration of the physical world via hands-on approaches, and preferred visual displays (images and videos), and auditory. The adopted system, an interactive platform that could upload and download digital content (written text/documents, imagery, video, audio) met the identified preferential learning styles of students and the delivery approaches of the lecturers. This data gives clear comprehension of how learners process acquired knowledge and learner priorities. This then contributed to the adoption of an adaptive platform, a digital learning experience that embraced inclusiveness and is learner-centric.

Impact of Adopted Technology on Education

Research has proven that modern pedagogical technologies and ed-tech tools in education result in high achievements, satisfaction, flexibility in teaching, learning, and strong tenacity to know more (Jedishkem *et al.*, 2023). Eighty-seven percent of students ascertained that the incorporation of modern pedagogical technologies in the educational environment is of great value. Data revealed that students believed that the use of such technologies brings a boost to teaching, learning, and interactivity remotely and supports both formal and informal settings. The students agreed to the impact modern pedagogical technologies have on education although complicated and tedious, they are expedient and effective; must be involved in tertiary education and introduced usage right from year one. They requested the need for professional development for both lecturers-students' bodies regularly. They wanted the availability and extended use of such technologies to substitute and augment class time because it extends learning and interaction beyond class hours, time-saving, and access to content is remote. The acquisition of new skills and knowledge applications improved competencies, increased access to quality resources, and reduced anonymity.

Lecturers stated that its involvement aided in professional growth, enhanced their capacity to teach and frame curriculum (Chatterjee, 2021). For quick messages and communication among colleagues and students, instant messaging apps are appropriate. Modern pedagogical technologies in education are a burden reliever for both lecturers and students and increase the domain of knowledge in terms of new technologies, acquiring innovative new skills, and improving and upgrading oneself. Lecturers gave assent to the limitless opportunities offered by modern technologies in education and it is proven to stay, moreover, it has much more advantages in comparison to the orthodox approach to teaching-learning; enhancing students' understanding for productivity. Thai *et al.* (2020) added that incorporating modern pedagogical technologies and ed-tech tools into instruction results in higher student satisfaction and flexibility in teaching-learning.

Lecturers did mention that with the height in the student population as ascertained by Mulryan-Kyne (2010) who stated that there has been a considerable increase in the enrolment statistics of tertiary education in the last decade and one of the expected consequences is the maintenance and increase of class sizes, especially at the undergraduate level. Therefore,

lecture halls should be furnished with ed-tools and equipment to make the teaching-learning experience engagingly exciting. Digital technologies help instructors to be effective at teaching; acquire and update knowledge and skills on how to use new digital tools and resources (Bhat, 2017). Ed-tech tools and modern technologies in the educational environment complement the orthodox approach to teaching, and all lecturers alluded to this fact. They were of the view that it was useful in organizing lessons, dissemination of content and assessment, timely content delivery, and enhancing the teaching-learning experience not forgetting increasing learner participation and connectedness. This approach aids in less time spent in lesson delivery, reducing labour and giving room for more questioning from students to gain a deeper understanding, therefore, increasing learner outcomes.

Student-Instructor-Content Connectedness and Interactivity

Classrooms are made up of students with varied abilities, interests, and motivational levels (Mulryan-Kyne, 2010), before the involvement of ed-tech tools and the adoption of the innovative pedagogic method, over 50% of sophomores were unable to interrelate with lecturers, because they had demanding schedules thus chances of getting close were slim. The high learner-educator ratio was another challenge. Other students could not interact with lecturers due to shyness or fear. Howarth (n.d.) asserts that some students become very nervous or embarrassed when asked to speak and the rise in student numbers makes it more challenging (Forte & Tchantchane, 2010). Moreover, the traditional type of learner-instructor interaction hinders learners from having adequate opportunities to interact (Galegane, 2015), although some students may be hesitant to interact with lecturers beyond the classroom for several reasons (Pingree, 2012). Only 41% could interact with lecturers, interactivity meant being able to ask questions in class with immediate feedback which contributes to cognitive development (Galegane, 2015). Students' preferable mediums of interactivity were in-person and online. UK Essays affirmed that students' mental well-being is enhanced when they get the needed immediate attention and responses from lecturers when problems spring up (UK Essays, 2021).

In every classroom, there are always the serious, focused, and the unconcerned, Mulryan-Kyne (2010) added that classrooms are comprised of students who vary in ability, interest, and motivation. Before the introduction of the modern pedagogic involvement, 55% of sophomores were referred to materials before lectures, therefore, flipping the class to allow students to be exposed to new materials and content outside class via technological means to help them to gain knowledge and comprehension before class. This in turn gives room for the hard work of assimilating knowledge through discussion and problem-solving in-class time where they can get support from instructors and peers hence enhancing occupational efficiency (Brame, 2013). 43% of students were not exposed to reference material, which had a big impact on the teaching-learning process and does not sustain productivity (Oden, 2021). Some said it did not affect how they interacted. Reference materials serve as a guide that directs students learning and participation for productive outcomes. It takes the pressure off a teacher in introducing new concepts and makes lessons more interactive relieving the lecturer from being a dictator. Students are of the view that exposure to reference materials before class and the other way around saves hours of lecturing but is dedicated to active learning which modern pedagogical approaches adopt. The best and quickest way to disseminate these materials is via online either email or a social learning platform for easy accessibility.

One of the most important parts of an instructor's role is to maximize interaction. This requires forethought and planning (Howarth, n.d.). With the height in student enrolments worldwide, lecturers could not have in-person interactivity with all students, both in and out of school. The use of social media platforms was another way of interacting aside face-to-face. Lecturers preferred in-person interactions with students, but could not due to tiredness

which creates additional challenges and demands (Mulryan-Kyne, 2010). Lecturers stated that in-person interactivity with students is ideal because it made much impact as compared to other ways of interaction. In-person interactivity mostly draws better conclusions and productive outcomes. But then, online seems a much better alternative due to student numbers, tight schedules, tiredness, shyness on the part of some students, and the likes of those who did not like to talk in class. Interacting online holds unlimited appeal to many because it is convenient and offers flexibility in contribution.

According to Howarth (n.d.), most instructors have experienced classes where student interaction has been more limited than expected. Howarth observed that interactivity is a desirable participation that enhances learning, maximizes practice time, encourages collaboration, and socialization, and motivates. Reference material shapes the journey for an effective teaching experience and serves as a vehicle to move learners from unfamiliarity to familiarity. It sets the learning target and criteria, therefore, setting up independent learning, and can take multiple forms. Lecturers referred students to reading materials before class to improve students' interactivity which enabled students to inquire more, maximizing their knowledge capacity but when students give the impression, they are in the known lecturers did not give out referral materials. The proper thing to do as an instructor is to always make material relating to the subject matter available to students and all lecturers alluded to this fact. It comes in handy to send helpful articles and links for students to follow. With the help of assistive technologies, they can assess them without barriers (Shaw, 2019). Moreover, different perspectives create richer interactive content.

After the exposure to the modern pedagogical approach in the teaching-learning process, there was 100% student-instructor connectedness and interaction. Interactivity kills anonymity among students and gives each student the equivalent opportunity to interact with lecturers, knowing they would get immediate feedback. Effective interaction requires both in-person and online mediums to facilitate student engagement which could, in turn, enhances productivity. A perfect response to learner-instructor interactivity is to embrace the use of ed-tech tools and modern pedagogical models which welcomes in-person and virtual interactions remotely. Lecturers can involve the use of digital technologies such as email, synchronous or asynchronous chats, short message services, and online office hours can provide crucial avenues of connectedness and interaction between students and faculty outside class (Murphy & Sharma 2010; Pingree, 2012).

Learner-Instructor Reflective Experiences

With the advancement of technologies and pedagogical practices, there is the need to track its significance, 93% alluded to the fact that it made great impacts. Students' response to the experience was summed up as, competencies (typing, critical thinking, problem-solving, digital literacy, communication, surfing, research,) and new skills acquired, multiplied productivity level, and rapid shoot-up in interactions (student-lecturer, colleagues, content). Assessing and submitting content online broadened professional scope and learning; and collaborative skills were improved. It increased their confidence and encouraged them to give swift feedbacks accurately, and consciousness of class activities was stimulated.

Additionally, the components of face-to-face and online are stronger together than apart, a strong and effective educational environment is achievable with face-to-face plus synchronous conversations plus asynchronous interactions (Wolpert-Gawron, 2011), 88% of sophomores appreciated the model as a step in the right direction. It gave the satisfaction of a personalized and newer way of learning, ease in lecturer-student interaction and connectedness, improvement in curriculum and teaching, and reduced seated hours in lecture halls saving time and energy. The simplicity of the platform made it easy, effective, and convenient for both lecturers and students at large. 5% were dissatisfied with the involvement

of modern technologies since it was complicated and challenging thus making it less interesting as compared to the orthodox method. Then again, more than usual, they were compelled to be online. To conclude, Akbar (2016) stated that, understanding how students interact with digital technologies and identifying their impact is extremely important to the development and sustainability of pedagogical practices dependent on technology.

Lecturers had an optimistic disposition and admitted it had similar features to social media platforms, but was more refined and guided for educational purposes. Kumar (2020) opined that such platforms that integrates social media features is not restricted by information sharing and chats, but is a tool for personal and professional growth education-wise. Lecturers had tremendous reap of benefits. They indicated that a blend of orthodox with technology gives accurate knowledge to teach concepts with ease and efficacy. It increased the chances of instructor-student connectedness (Lynch, 2018). Lecturers agreed it had a significant effect on their profession and was an insightful experience. The flexible nature of the blend of online and orthodox approaches is at the convenience of both lecturers and students making teaching-learning more effective.

Lecturers acknowledged technology as a powerful tool relevant to their profession, educational sector and had no adverse attitude towards its integration into the professional environment. The rapid evolution of digital technologies is affecting education. Digital technologies play a fundamental role in the teaching-learning experience and are progressively moving away from the passive approach to a more collaborative project-based model. According to lecturers, the blended model confronted the use of newer interactive approaches to engage and connect with students and collaborate with lecturers worldwide. Profession-wise, they acquired new skills that valued learner diversity, aided organization, and designing of e-learning content and delivery. Instruction time could be cut and gave students opportunities to reach content remotely personalizing learning. Another effective feature that heightened participation was point-scoring known as gamification. Smiderle and co-authors stated that gamification is a strategy in education to increase engagement by incorporating game elements (Smiderle *et al.*, 2020). Although the application had inbuilt badges, lecturers could customize designs and award them to students on behavioural bases. Badges had points on the bases of the lecturer's judgments to increase students' level of involvement. It encouraged students to collaborate and be helpful game players in and out of class, present participators, attentive, on-time, idea expressors, interactive, meeting assignment and submission deadlines, hard workers, and boost in learner achievements (gender and overall). In effect, it is a tool to affect positive behaviour (Dichev & Dicheva, 2017). Gamification made the class very competitive positively, bringing the best out of everyone and the bliss of achievement for all.

Instructor-Learner Challenges

Adopting technologies into the classroom has its challenges. Jesse Stommel stated that a blend of orthodox and online is not an easy mix (Amoroso, 2014), 80% of students had no challenges, the reasons being, they were digitally competent and the available internet made connection easy. The platform had a simplified and interesting interface, making it easy to navigate. Well-set-out instructions made it simple to comprehend, easy-to-follow procedures and prompts. 13% had expected barriers such as internet connectivity, login difficulties, and newness to the platform brought up some challenges, but mastered with time. For negative side effects of experience, 10% of students had difficulties and the reason was they became indolent and connecting to the internet was expensive. Maphosa alluded to the fact that cost is an important factor to consider before the introduction of technology in the classroom and should be evaluated from both school and student perspectives (Maphosa *et al.*, 2021). Also, unfamiliarity with the internet made learning difficult, research has proven that the usefulness

and ease of using technology must be viewed from both teachers' and students' perspectives. It must not be narrowed to the use of any technological gadget one has, rather it should be considered alongside other issues, hence a critical look into it before its integration into the teaching-learning process (King & He 2006; Maphosa, 2021). For a start, lecturers were not conversant with the grading and quiz setting features but got a hang of it with time. Continuous use of the platform addressed problems and they got better with time. Other problems were day-to-day internet and technological challenges. They all had a revealing satisfactory experience with challenges within comprehension.

CONCLUSION AND RECOMMENDATIONS

Innovations in technology are a strong force propelling a global digital transformation, and instructors must assist learners in acquiring the required skills to thrive in the 21st century and yonder. University students are required to have flexible learning mediums to combine studies, employment, family, and other obligations, therefore instructors and students must be technologically savvy. Flexibility in terms of study time and location is critical for some students' admission into university education as well as their sustained involvement and learning. The use of ed-tech tools in education is justified since their application in practice improves the teaching-learning process because it expands the knowledge base, skills, and abilities of both students and faculty (Ivanova *et al.*, 2020). The use of ed-tech tools and modern pedagogical technologies are not aimed at replacing the traditional approach rather their purpose is to aid in effective teaching-learning. Based on the findings, it is evident that both students and faculty benefited from the new pedagogical approach adopted in the classroom. Power failure and unreliable internet access were some of the challenges faced in the use of modern innovative technologies. Aside from this, the use of the identified technologies in teaching and learning is helping students and faculty alike to make effective improvements, education-wise. The study recommends educational institutions to professionally upgrade faculty development skills that align with the rapidly expanding expectations of teaching-learning because it delineates the pedagogic process which embraces inclusion and equity. Good instructors expand their didactic skills to make the practice of teaching interesting, shaping the cognitive experience of diverse learners.

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