Digital Learning Technology Usage and Teaching Effectiveness of Business Educators in Nigeria's South-South Universities

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Received: January 2, 2023 Accepted: August 26, 2023 Online Published: October 27, 2023

doi:10.5430/jct.v12n6p89 URL: https://doi.org/10.5430/jct.v12n6p89

Abstract

All subjects may be taught well, but a big part of it is how the instructor uses technology to make learning beneficial for the learners. This study investigated the extent to which digital learning technologies' usage influences the teaching effectiveness of business educators in Nigeria's South-South universities. Two specific objectives were established and two null hypotheses were tested. The level of significance was set at 0.05. Relevant literature was reviewed. The study adopted a predictive correctional research design. The study participants were 170 business educators from twelve universities in South-South Nigeria. No sample was drawn because the population was manageable. Data was generated using a 24-item Likert scale questionnaire called the "Digital Learning Technologies and Teaching Effectiveness Questionnaire (DLTTEQ). Seven experts from the University of Calabar validated the DLTTEQ. The study's assumptions were evaluated using simple linear regression. The use of virtual reality simulation and teleconferencing by business educators in Nigeria's South-South universities was found to significantly predict their teaching effectiveness. Sequel to the research findings, the study recommends that the national government should foster simulation-based education by building a digital learning environment appropriate for Business Education. The insights of this study call for the implementation of international best practices in order to help learners and instructors transition from digital immigrants to electronic natives.

Keywords: digital learning technologies, utilization, teaching effectiveness, business educators

1. Introduction

In today's world, technology is completely pervasive, and students adapt to it faster than anyone else **(**Bhat, 2020). Students, as opposed to teachers, are growing up in a digital age. It is entirely natural to incorporate technology into all aspects of their education in order to make them tech-savvy. Technology enriches classrooms with digital learning aids like computers and portable devices to improve teaching and learning. It broadens course options, experiences, and learning materials; fosters 21st-century skills; heightens student involvement and motivation; and leads to improved learning and understanding (United States Department of Education, n.d.). Every effective teacher prioritizes these factors, and they can be obtained by utilizing Digital Learning Technologies (DLTs).

Digital learning technologies are teaching and learning tools that are created digitally or through the digitization of analogue materials (State Library of Victoria, n.d.). These tools include simulation, animation, quizzes, electronic textbooks, learning objects, graphics, photographs or photos, audio, video, and other digitally formatted capabilities (Bizimana&Orodho, 2014). All sorts of electronically supported learning materials in which text, voice, photographs, images, graphics, and videos can be delivered to students online at the same time are referred to as DLTs. While learning online, these resources enable students to interact with digitally delivered content, network-based services,

and tutoring support. In the context of this paper, a Digital Learning Technology (DLT) is any general-purpose or learning-specific facility that is available online for use by the classroom teacher in addition to being a learning aid for the learners. Digital learning technologies are used in web-based learning to generate information and enable the transmission of educational material content.

These relatively new technologies, according to Ghavifekr and Rosdy (2015), have new pedagogical delivery systems with the ability to use responsive, quick access, and inclusive instructional climate. Some of the new pedagogical delivery systems introduced by digital learning facilities include computer-managed instructions, audio-tutorial systems, cybernetics, computer-enabled networking, video and audio conferencing and so on. The new systems have varying degrees of interactivity, as well as ways for users to actively participate in knowledge transmission. These distribution systems broaden students' learning options and also impact the educational process, particularly on how, where, and when teachers and students can obtain knowledge and information in the twenty-first century.

In reiterating the importance of DLTs in effective teaching and learning, Jude et al. (2014) stated that digital learning frees learners from the constraints of time and space that conventional learning imposes, allowing them to choose the time and location for online learning and avoid time or space constraints via the instructors' online engagement mechanism. In a traditional classroom setting, the equipped vibrate with vitality, while the experienced exhibit self-assurance in the unfolding process of instruction. This is because the instructor is the most important factor in a conventional classroom. He sets the tone, defines the space, and directs the flow. He relies solely on the lecture method. This technique gives little room for student-teacher interaction, as a result, teaching becomes monotonous and student engagement suffers. In this regard, digital learning technology has emerged as the most effective medium because it allows for two-way communication as well as the visual presentation of objects and other activities. The application of digitized educational aids could provide more significant and effective direction to the instructor than any personal efforts made in the absence of these resources. People's learning habits, where they learn, and when they learn can all be altered by DLTs. Traditional teaching methods are already evolving in order to improve instructors' professional practice and better meet students' needs in the 21st century (Pavlova, 2020).

Students in the twenty-first century are increasingly becoming digital natives. Most of them need to be taught quickly, while others need further encouragement. Some people, on the other hand, need to study at any time and in any place. Adapting diverse curriculum delivery modalities into the educational environment is one strategy to respond to the needs of today's students. Traditional large-group lectures may meet the learning needs and lifestyles of some students, while others may require a variety of modalities. Digital learning resources hold the key as they can provide a variety of benefits, including personalized instruction design to meet the needs, abilities, learning styles, and interests of the learners; unlimited access to the same quality content as a full-time student; and encouraging collaboration among students from various locations and cultures. Digital learning technologies allow for a variety of ways to learn. In hybrid learning approaches, regular in-person classroom sessions are combined with remote access to technology. In both cases, technology can be used to personalize learning strategies for individual students. Teachers can create classes based on their students' interests and strengths. Furthermore, learners can progress at their own pace, which is advantageous (School of Education Online Programmes, 2020).

As DLTs advance teaching practices, it is unsurprising that it has infiltrated virtually every discipline, including Business Education [BE]. According to Umoh and Undie (2014), Business Education is one of the most powerful tools for building entrepreneurship abilities... and making its beneficiaries self-sufficient. Business education aims to provide people with the skills and knowledge they need to find work, whether it is starting a small business or working in a job that allows them to put their abilities to use. This commendable aim of Business Education can be achieved by using DLTs. The benefit of using digital learning technologies is justified by its low cost, access flexibility, and reduction of distance, as well as access to individual variants and permission for alternative pedagogy including simulation, experiential, interactive, and self-paced learning. The ability to reap the aforementioned benefits is primarily dependent on the teacher's experience and the type of learning resources used to reinforce the lesson. Online photographs, charts, diagrams, maps, and other visual representations of selected information are a few examples of DLTs that could be deployed by a teacher to enable learners to react quickly, leaving a visual impact on them. These resources aid a teacher in instilling a sense of reality in the classroom. They represent something that is actual while also serving as a summary of what will be taught to the students. As a result, if teachers do not have access to these educational resources, they will be constrained in their capacity to deliver the content of educational materials; learners' opportunities to learn about specific subjects will be limited. Failure to learn about their application will have an impact on their academic performance and, as a result, their performance in today’s workplace.

2. Literature Review

Giving high-quality instruction made possible by correctly integrating technology in a more contemporary manner is one of the goals of any good educator (Whitehead, et al., 2012). Some of the strategies that may assist the teacher in innovative teaching are Virtual Reality Simulation (VRS) and teleconferencing.

2.1 Virtual Reality Simulation

According to Your Dictionary (n.d.), VRS is a computer-generated simulation of a world, complete with sights, sounds, and other elements, that someone with appropriate electrical equipment can interact with in a seemingly tangible manner. Virtual reality simulations are computer-generated 3-D simulations that provide the user with a wide range of features so that they can interact with items in a virtual classroom as if they were physically present (Sule and Nurcan, 2020). A few of these qualities include the capability for students to see and engage in conversation with a 3-D automated model and explore it, encounter a simulated reality throughout real-time, understand complex ideas, share their own understanding of occurrences whilst also creating virtual worlds, envision the complex linkages among many factors inside a simulated environment, and acquire an endless supply of computer-generated content. (Chen, 2009). There are numerous ways to support education using VRS. Simulating the virtual environment using immersive technology is one of the core organized approaches for giving people limitless opportunities (Cushman, et al., 2008; Shin, 2002), for active education, imitation, and other sorts of information acquisition (Chen, 2009). This encourages the possibility of learning from anywhere.

2.2 Teleconferencing

Another DLT used in current culture on a regular basis is Teleconferencing (Garad, et al., 2021). Telephony is the practice of having a meeting with a bunch of participants who may not be physically available in the same place. The participants may use a communications infrastructure to achieve this (Charles, n.d.). Negash et al. (2008) describes it as a gathering of multiple people that enables two-way communication via simultaneous audiovisual interactions over the web. Skype telephonic enables communication between people in different locations, but it may also include video, graphics, or facsimile transmission. Teleconferencing simulates remote educational experiences that are remarkably comparable to those of physical education by providing sensory clues that minimize individuals' alienation (Brunken, et al., 2003). By offering audiovisual cues that lessen learners' isolation, individuals' synchronous engagement using sensory cues could be improved, fostering better friendships and teamwork (Wei & Tang, 2022). Managers from various organizations have held successful meetings with decisions reached while remaining in remote locations among themselves via teleconference. In academic institutions, teleconferencing has become a necessary tool because it allows several people and computers to engage and participate in a live exchange of informed ideas while remaining in separate locations connected by a telecommunication link. Teleconferencing is employed in tertiary institutions as a learning tool, as well as for instructional applications and programme links between educational institutions. Teachers communicate and organize the educational process via teleconferencing, which is one of the most advanced technologies of information plus communication.From the preceding, it is clear that engagement through teleconferencing, VRS and other cutting-edge instructional devices have altered pedagogical strategies,making it clear that these changes have an effect on how students learn in addition to increasing opportunities for the transfer of experiences, opinions, and facts as well as serious evaluation, teamwork, and civic outreach. These changes also connect directly to the wealth of breakthroughs and ideas that are available globally (Maghsudi, et al., 2021). It seems relevant, therefore, to investigate the extent to which e-learning technologies have been shown to be effective methods for supporting learning, engagement and the outcomes of student learning.

2.3 Empirical Studies

According to the findings of a research study conducted by Suleman et al. (2019), 3-D representationtechnology which uses immersive experiences may aid the instructor in the teaching approach while also acting as a powerful method to raise student involvement. Bensching (2020) asserts that this is achievable because of the extremely fast conversion and engagement experienced in current digitized education, which enhances users' feeling of connectedness, particularly when compared to actual online communication. The usage of augmented and virtual reality in tertiary institutions, in addition to how it affects virtual learning, was thoroughly examined by Nesenbergs, et al. (2021). The findings indicated that when learners' physique is not constrained, employing these instruments in laboratory settings has the greatest benefits. We assume in this research that since almost any environment can be replicated, every instructional procedure may be improved by a fresh approach to encourage information transmission. Research has also shown that the deployment of simulation software and tools (Juan, et al., 2017), like instructional gaming headsets (Mystakidis et al., 2022), in teaching helps students gain practical knowledge of

complicated systems while also enhancing their teachable momentthrough the construction of appropriately prepared skill–building activities (Juan et al., 2017). In a study of the application of Simulation-Based Education (SE) in an automated control course, das Dores Cardoso, et al. (2014) came to the conclusion that students can use simulation to gain practical experience and talents through exposure to a variety of realistic situations. In the capacity-building training, established by trainers and improved with expert direction and supervision, SE delivers intrinsic motivation, encouraging them to achieve more in academics.

According to Martin-Gutierrezet al. (2015), VRS offers a lot of possibilities for fostering schooling, studying in idealized contexts (Thornhill-Miller & Dupont, 2016), plus individual and group learning (Cai, et al., 2014). Furthermore, VRS research has demonstrated that it enhances students' comprehension of the teaching and learning process. This may be due in part to the fact that VRS combines flexible, fundamental pedagogical practices that expose learners to real-world settings and activities while also providing teachers with practical benefits (Bello, et al., 2016; Jenson & Forsyth, 2012; Marin-Marin, et al., 2020; Lasisi, et al., & Ojoko, 2021; & Ke, et al., 2021). This partly explains why earlier studies in the field of education on the use of e-learning technologies have continued to emphasize their effects on teaching and learning (e.g., Saunders & Gale, 2012; Taja-on, et al., 2021; Gomez-Garcia, et al., 2020; Moreno-Guerrero, et al., 2021; Bierne, et al., 2018; Lamb, et al.,2018; Shehzadi, et al., 2020; Boozer, 2020).

Similar to VRS, teleconferencing has been found to significantly improve teaching and learning. Mavroidis et al. (2013), Themelis and Sime (2020), Bakare et al. (2018) reported that teleconferencing allows students to actively participate and benefit maximally from the educational process while also providing a friendly manner of communicating with lecturers and their peers. Mavroidis et al. (2013) further indicated that students overwhelmingly expressed a desire to take part in future educational teleconferences because they saw them as viable educational media for communication and the development of new abilities. Its efficacy is linked to self-regulated learning, which is a successful combination of will and abilities as well as a multifaceted approach to managing the instructional process that allows students to benefit from online learning to the greatest extent possible. A teleconference course's support is believed to be considerably more important and vital because students have a great degree of learning autonomy. When used as a study aid, online videoconferencing combines instruction and education (Bonk, et al., 2016). Genuine engagement between students and teachers fosters a more social mindset and lessens frustration (Adipat, 2021). In the same manner, as face-to-face meetings raise awareness levels among participants, according to Bonk et al. (2016), online meetings do the same. Teleconferencing has also been demonstrated to considerably boost faculty and student access to educational resources, cooperation among schools (Hurst, 2020), and training programmes (Marvridis, et al., 2011). Although evidence abounds in the reviewed materials that virtual reality simulation and teleconferencing are widely used in teaching and learning, and have even been designated as invaluable tools in educational practice, these technologies are rarely used by most teachers in instructional delivery especially in Nigerian South-South universities (Akah, et al., 2022). This may be due in part to a number of challenges, some of which have been identified by Athanasius (2018), such as a lack of leadership, training facilities and the appropriate mindset.

According to Athanasius (2018), one of the most significant impediments to educational technology application in Nigeria is a lack of leadership. Even when they are leading without a vision, leaders find it difficult to sit down and devise methods to help facilitators use technology in teaching and learning. When there is no vision, people’s capacity to discharge assigned responsibilities is constrained. This is a clear example of how those in power are prevented from carrying out the statutory mandate that directs the full-scale deployment of advanced educational technology in Nigeria. Training as a means of keeping teachers current on current technology has not been considered. With this backdrop, most instructors may struggle to understand the value of technology in education. No teacher in this new digital age can truly engage in effective teaching without adhering to training programmes and ongoing upkeep by the relevant authorities. Lack of training specific to educational technology has become a major challenge in Nigerian schools. Another significant issue encountered during the process of incorporating technology into classroom instruction and learning in Nigerian schools is a lack of an appropriate student mindset. It is difficult to determine whether children embrace technology in education. This, on the other hand, emphasizes the importance of technology authorities keeping teachers in mind when putting together technology facilities, in order to stimulate students' appreciation of technology in education for easy assimilation as presented by the teacher. Without a doubt, these elements have the potential to influence teaching effectiveness.

Our review of empirical papers indicates that many types of technology have been employed in education, and have been found to significantly improve teaching and learning. However, while few authors of the reviewed materials focused on the use of e-learning technologies in teaching at the secondary school level, (e.g., Bello et al., 2016 &

Moreno-Guerero, 2021), many researchers focused on the impact of creative instructional practices in institutions of higher learning (e.g., Bakareetal, 2018; Taja-on et al., 2021; Shehzadi et al., 2020; Akah et al., 2022). Despite the fact that innovative teaching approaches in higher institutions around the world have attracted a lot of study attention, there does not seem to be much literature on how well university teachers employ leading-edge technology in South-South, Nigerian public universities. The available research, however, shows that digital devices are poorly utilized in Nigerian public universities (e.g., Akah et al., 2022). The detected gaps are primarily indicative of the impact of electronic resources and instructional effectiveness whichsignalled the necessity for additional research on the aforementioned variables, subjects, and research setting.

2.4 Teaching Effectiveness

Teaching effectiveness is conceptualized in this paper as the extent to which teachers, within the framework of teaching-learning activities, demonstrate their knowledge and professionalism using the necessary facilities such that students' learning would be maximized. According to Mupal and Chinooneka (2015), teaching effectiveness entails far more than simply delivering content and employing strategies to express it. It addresses each student's needs, as well as their interests, aptitude, and the rapidly changing environment, in which they live, as well as the developmental challenges they face and their mental capacity. It also necessitates a critical learning operation that is conducive to creating an environment in which learning can take place in the most encouraging way, causing every learner to want to learn. Teaching effectiveness in 21st-century educational contexts denotes the ability of the tutor to help the student develop practical digital literacy (Lau & Yuen, 2014). According to Leu et al. (2007), fresh pedagogies necessitate specific abilities, as well as methods… Without a doubt, technology-based approaches are critical in this regard. This is because digital methods impact not only what a teacher teaches but also how he teaches in the contemporary e-learning environment, making them crucial for effective teaching and learning of any subject. Teaching in a digital environment entails the teacher bringing his complex but organized self into the teaching arena and emerging as a fulfilled being. The satisfied awareness of successful task accomplishment measured in terms of wholesome quality in the process of teaching the students, to produce cultured beings that are tech savvy, socially adjusted, morally dependable, intellectually equipped, and technically adequate, is what contributes to that sense of fulfilment. Students in the modern era become digital natives as a result of effective teaching. The teacher is expected to reflect on the realities of the task of teaching in a digital environment. As a result, teachers are regarded as the brain box of a digital future, and their task of moulding young minds is regarded as an endeavour in the construction of a digital society. Students are adults in the making; their exposure to effective teachers' guidance and instructional services ensures a viable future for the country, the achievement of which is largely dependent on technology-enabled instruction's effectiveness.

The efficacy of technology-assisted learning is a crucial factor and may, in fact, constitute a major constraint to students' learning. The researchers have noticed that many business educators with little or no formal experience in cutting-edge educational technologies are asked to teach business education subjects in some Nigerian South-South universities. On the assumption that a teacher with a bachelor's degree in any teacher education programme can teach the majority of business education subjects. However, for most business educators, their training is in general education, core business education courses, management, office information technology, and marketing. Given this context and an understanding of the multidisciplinary nature of business education, the majority of these teachers only teach and give differential emphasis to the curriculum units that fall under their primary areas of expertise, particularly those that do not require the use of digital tools. As a result, students frequently leave the university's business education programme as individuals who do not fit the stereotype of tech-savvy, digitally-ready persons with a skewed and narrow understanding of the field of business education. Apparently, if this situation is not addressed, business educators and even their products from universities in South-South Nigeria will be unable to function effectively in the near future. In light of this, the researchers believe it is necessary to investigate the extent to which online educational technologies influence the teaching effectiveness of business educators in Nigeria's South-South universities.

2.5 Purpose of the Study

The primary goal of the research was to determine the extent to which digital learning technologies usage predicts the teaching effectiveness of business educators in Nigeria's South-South universities, specific objectives included the extent to which:

1. Virtual reality simulation usage predicts the teaching effectiveness of business educators in Nigeria's South-South universities.

2. Teleconferencing usage predicts the teaching effectiveness of business educators in Nigeria's South-South

universities.

2.6 Null Hypotheses

The study's direction was provided by the following null hypotheses (short for H_0):

H_{01}: Virtual reality simulation usage does not significantly predict the teaching effectiveness of business educators in Nigeria's South-South universities.

H_{02}: Teleconferencing usage does not significantly predict the teaching effectiveness of business educators in Nigeria's South-South universities.

3. Method

3.1 Research Design and Participants

Table 1. Demographic Characteristics of Study Participants

		Participants	%
Gender	Male	112	65
	Female	59	35
	Total	171	100
Age	25-35 years old	34	20
	35-45 years old	41	24
	45-55 years old	31	18
	More than 50 years old	65	38
	Total	171	100
Work experience	1-10 years	63	37
	10-20years	81	47
	More than 20 years	27	16
	Total	171	100
	Holders of MSc.Ed and, a	103	60
Qualifications	BSc.Ed	68	40
	Holders of Ph.D, MSc.Ed and, a	171	100
	BSc.Ed	15	9
	Total	5	3
	Professors	47	28
Academic rank	Readers	43	25
	Senior lecturers	39	23
	Lecturer I	22	12
	Lecturer II	171	100
	Assistant Lecturer		
	Total		

This study used a predictive correlation research design. The predictive correlation research method was considered appropriate for this study because it enabled the researchers to predict the association … between the predictor and the criterion variable(Study.com, n.d.). This research design informed the choice of simple linear regression that enabled the researchers to test the null hypotheses through data obtained from the research instrument. The study's participants were 171 business educators from twelve government-owned universities in Nigeria's South-South region. Considering data from the scholastic planning departments of the twelve campuses,72 business educators were from the five federal government-owned universities and 99 business educators from seven state government-owned universities where business education is offered. Business educators from private universities were not part of the study population. However, the choice of business educators from public universities was informed by the fact that the phenomenon that informed this research appears to be more prevalent in public than private universities in Nigeria's South-South region. The study participants comprised 110 males (65%) and 59 females (35%). The age of the participants ranged between 25 to more than 55 years old while their work experience spanned one to twenty years. Included in the population, were business educators ranging from assistant lecturers to professors. Out of these participants,103 (39%) had both degrees of Master of Science [MSc.Ed] and, a degree of Bachelor of Science [BSc.Ed] in Business Education. In addition to having both an MSc.Ed. And a BSc.Ed., 67 participants (61%) also

had a degree of Doctor of Philosophy [PhD], an MSc.Ed. and a BSc.Ed in Business Education. Graduate assistants were not included in the research population, due to their lack of teaching credentials at the time of this investigation. We did not consider sampling owing to elements in the population as can be seen in Table 1.

3.2 Measures and Instruments

Three measures were studied-virtual reality simulation usage, teleconferencing usage and teaching effectiveness. Virtual reality simulation refers to a web-based educational method that combines pertinent knowledge systems to create a life-like learning scenario. Teleconferencing refers to various methods and means of communicating in the classroom with one another over long distances. Teaching effectiveness is the extent to which a classroom teacher performs his or her instructional role such that learners benefit maximally. We employed the researchers' created instrument called the "Digital Learning Technologies and Teaching Effectiveness Questionnaire" (DLTTEQ) to obtain data after operationalizing the study's measures. The study questionnaire had 24 items divided into two sections, with seven items for each of the two sub-independent variables in section A and 10 items for the dependent variable in section B. For items 1-14, a five-point rating scale of Very Great Extent (VGE)-5 points, Great Extent (GE)-4 points, Moderate Extent (ME)-3, Little Extent (LE) -2 points, and Very Little Extent (VLE)-1 point was used, whereas section B items were constructed on a five-point scale of Very Effective (VE), Effective (E), Neither (N), Ineffective (I), and Very Ineffective (VIE). An instrument with acceptable psychometric properties was not used for data collection because we gathered after a perusal of some existing research instruments that most questionnaires with acceptable psychometric properties contain items that are not relevant to the present study. Previous research instruments focused on different aspects of pedagogic duties as indicators of e-learning and teaching effectiveness (e.g., Trinidad, et al., 2005; Walker, 2002; Rosenberg, et al., 2009). The DLTTEQ is designed to assist investigators in gathering exact information on e-learning technologies while not undermining earlier technology-based learning assessment scales. The scale can be used in future research to quantify the amount of teaching efficacy attributed to VRSs and teleconferencing, producing results that can be used to improve educational standards.

3.3 Validity and Reliability

The DLTTEQ was validated by seven specialists: Measurement and Evaluation [ME] (n=2); Business Education [BE] (n=2); and Educational Technology [ET] (n=3); While domain experts in ME performed the face validity, the content validity was completed by specialists in BE and TE. High-profile academic professionals from the University of Calabar with a combined total of over 17 years of work experience comprised all of the specialists engaged to provide their assessments of the suitability of DLTTEQ. Due to their background, they were qualified to evaluate and assess the DLTTEQs' quality. Before creating the final copy, the instrument was refined using the advice of the specialists. e adopted the quantitative approach to validity. We conducted a pilot study and 40 business educators who were not a part of the research population participated in our pilot research. Following pilot testing, we determined the DLTTEQ's reliability using an internal consistency metric. Table 2 displays the study instrument's psychometric characteristics.

3.4 Ethical Consideration and Data Collection

Before any data was gathered for this investigation, the informed written consent of the participants—all humans—was acquired. Having obtained all respondents' consent, the regulatory authorities' ethical approval for item amendment as a condition of conducting this research was not necessary, as the respondents' safety was not in any danger by answering the survey. (see page 13 of http://www.nhrec.net/nhrec/NCHRE 10.pdf). All respondents who took part in the research were told of its objectives and given the assurance that the information they provided would be treated confidentially. We engaged three research assistants for help throughout our trips to the different universities, and they guided us to every participant's workplace. The research instrument was collaboratively administered by some members of the research team to the respondents between 25th to 26th July2022 using the hand-delivering method after which the respondents were requested to sincerely respond to the items contained therein by the ticking the options that best represent their opinions using the response options aforementioned as a guide. Respondents filled out the questionnaire namelessly. One hundred and seventy copies were retrieved from respondents out of the 171 distributed copies of the DLTTEQ and utilized to produce data for statistical analysis. It took the researchers two days to retrieve the completed questionnaire because not all the respondents were disposed to respond at the time of its administration.

3.5 Procedure for Data Analysis

The obtained data were scored and coded based on each variable and measurement scale. Items in section A of the instrument were scored 5 Very Great Extent (VGE), 4 Great Extent (GE), 3 Moderate Extent (ME), 2 Little Extent

(LE), and 1 Very Little Extent (VLE). In the same vein, items in section B were scored 5=Very Effective (VE), 4=Effective (E), 3=Neither (N), 2=Ineffective (IE) and 1=Very Ineffective (VIE). The data were then coded using a computerized spreadsheet on a person-by-item matrix. Then, version 26 of the Statistical Package for Social Sciences (SPSS) was opened with the coded data. A statistical technique used was simple linear. The null hypotheses were tested at .05 alpha levels. Relevant data arising from the test of hypotheses were extracted, tabulated and interpreted as seen in Tables 4 and 5. It took the researchers between May to September 2022 to complete the research.

4. Results

4.1 Exploratory Factor Analysis (EFA)

Principal axis factoring (PAF) was carried out based on a varimax rotation with Kaiser normalization to evaluate the internal structure and dimensions of the questionnaire. The analysis was set to extract factors with eigen values above 1. The coefficient display format was sorted in descending order of size to suppress small coefficients below .30. Based on these settings, the result initially yielded a six-factor answer that, taken together, explained 47 per cent of the variability. However, 11 dysfunctional items (Items 1, 4, 8, 14, 15, 16, 22, 23, 27, 29, and 33) were spotted after examining the rotated factor matrix. These items were considered dysfunctional because some loaded solely to a latent factor, some cross-loaded to two factors, whereas others did not load unto any factor, thus reducing the 35 items originally included in the questionnaire to 24.

Table 2. Principal Axis Factoring Showing the Dimensionality Indices of the Questionnaire

Items	λ (EFA)	λ (CFA)	λ^2	E	λ^2/ε	Factors
It30	.86	.85	.73	.27	2.67	Teaching
It21	.84	.83	.70	.30	2.28	Effectiveness
It24	.83	.84	.70	.30	2.30	
It35	.82	.81	.66	.34	1.91	Variance
It25	.80	.82	.67	.33	1.99	explained= 28.50%
It34	.79	.78	.61	.39	1.57	Cronbach alpha
It26	.78	.78	.60	.40	1.51	= .95
It32	.78	.78	.61	.39	1.60	
It31	.77	.77	.60	.40	1.49	
It28	.76	.74	.55	.45	1.20	
Sum	8.01	8.00	6.42	3.58	18.54	
It12	.93	.95	.90	.10	9.46	Teleconferencing
It13	.86	.91	.82	.18	4.53	usage
It19	.84	.84	.70	.30	2.30	
It17	.80	.73	.54	.46	1.17	Variance explained
It20	.79	.79	.62	.38	1.64	= 18.90%
It11	.72	.67	.45	.55	0.81	Cronbach alpha
It18	.64	.65	.43	.57	0.74	= .92
Sum	5.59	5.54	4.45	2.55	20.65	
It3	.78	.77	.60	.40	1.49	Virtual Reality
It2	.75	.76	.58	.42	1.38	Simulation usage
It9	.69	.68	.46	.54	0.86	
It7	.69	.66	.43	.57	0.77	Variance explained
It5	.68	.68	.46	.54	0.85	= 14.91%
It6	.68	.68	.47	.53	0.87	Cronbach alpha
It10	.62	.62	.39	.61	0.63	= .86
Sum	4.88	4.86	3.39	3.61	6.86	

Extraction Method: Principal Axis Factoring.
Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 4 iterations.

After all the dysfunctional items were removed, the analysis was re-run using the same settings documented above. Three factors were extracted after rotation converged in four iterations. Additionally, the scree plot identified three

factors with eigen values greater than one. These variables together accounted for 62.3 per cent of the variance. Specifically, the first, second and third factors explained 28.50, 18.90, and 14.91 per cent of the shared variance. A KMO value of 0.66 and Bartlett's test of sphericity [$\chi^2(276) = 746.99$, $p < .001$] indicated that the pilot sample of 40 respondents was adequate (to use a dimensionality reduction technique such as the PAF). The factor matrices showed that all factor loads across the three factors ranged from .62 to .93. After carefully analyzing the variables in each factor, the latent features were identified and named teaching effectiveness (factor 1), teleconferencing usage (factor 2), and virtual reality simulation usage (factor 3) as shown in Table 2.

4.2 Confirmatory Factor Analysis (CFA)

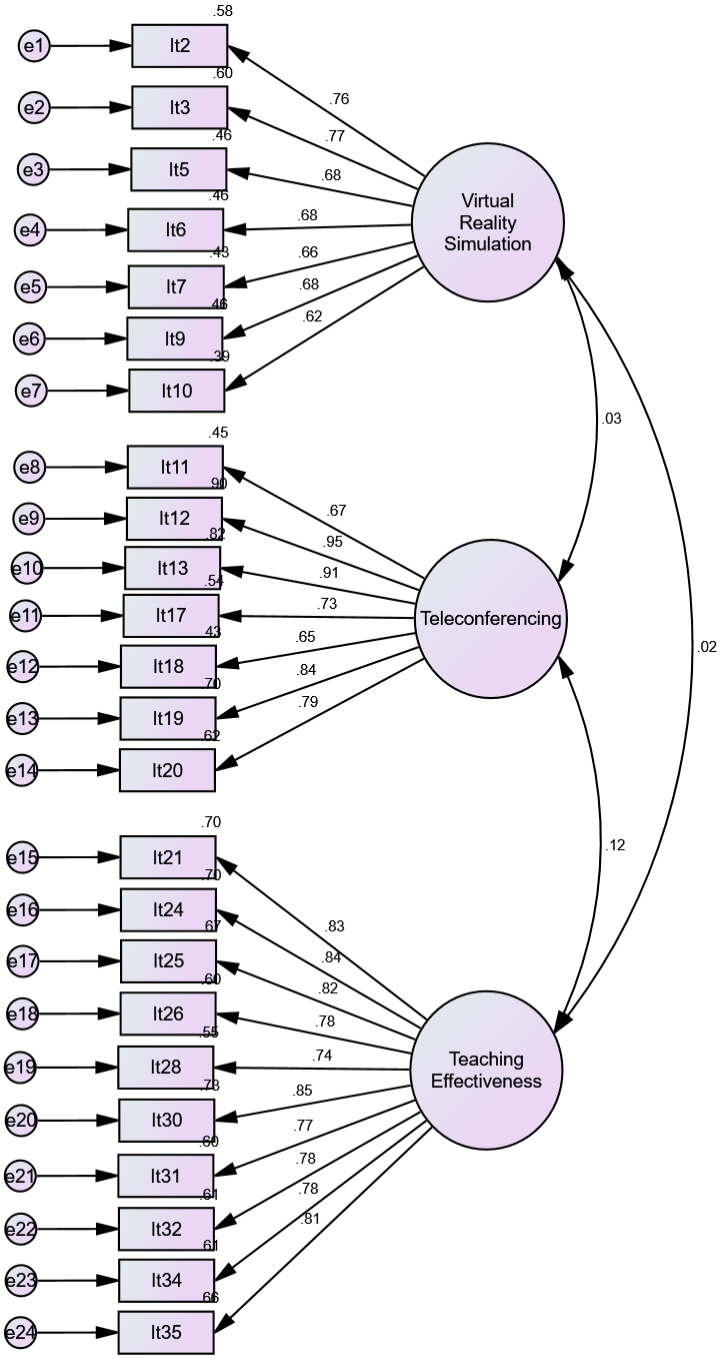

Figure 1. Three-factor Confirmatory Factor Analysis Model of the Questionnaire

According to Owan et al. (2021), the CFA "determines the accuracy with which variables measure their respective factors (constructs); assesses the acceptability or otherwise of hypothesized models based on theoretical models; verifies the existence of relationships established by the EFA between observed variables (indicators) and their supposed constructs" (p. 11). Furthermore, a CFA was conducted to confirm the EFA's results and gauge the theoretical models' acceptance (Ekpenyong, et al., 2022; Owan, Owan, & Lata,2022). The Maximum Likelihood (ML) estimation technique was used for the CFA analysis in the current study, with the result presented in Figure 1. The model's validity/goodness of fit was evaluated using several different indices based on the suggestions of instrument validation (e.g., Kline, 2016; Perry, et al., 2015). For instance, Kline (2016) suggested using at least four fit indices (Chi-square, RMSEA, CFI, and SRMR) to decide whether or not a CFA model should be approved. In this study, the following fit indices were used in evaluating the model's overall goodness of fit: Chi-Square, CMIN/DF, the "Adjusted Goodness of Fit Index" (AGFI), the "Normed Fit Index" (NFI), "Relative Fit Index" (RFI), the "Incremental Fit Index" (IFI), the "Tuck- er-Lewis Index" (TLI), the "Comparative Fit Index" (CFI), and the "Root Mean Square Error of Approximation" (RMSEA).

For the CFA model (see Figure 1), the Chi-square value of 375.65 was obtained at 249 degrees of freedom, with a p-value greater than .05. This shows the model's acceptability based on the Chi-square criterion (Finch, Immekus, & French, 2016; Hu &Bentler, 1999). Other fit indices also showed acceptable values that are within the recommended cut-off criteria, such as AGFI = .87 > .80 (Ma, et al., 2021); CFI = .95 > .90 (Schumacker& Lomax, 2004); CMIN/DF = 1.51 < 3.00 (Kline, 2016); IFI = .96 > .90 (Perry et al., 2015); RMR = .06 < .08 (Bentler, 1992); RMSEA = .04 < .08 (Hooper, Coughlan, & Mullen, 2008; SRMR = .05 < .08; TLI = .94 > .90 (Byrne, 1994). Additionally, NFI = .94 and RFI =.93, two additional fit indices, were also getting close to the recommended value of .95, a positive indicator of an acceptable model (Owan et al., 2022).

4.3 Construct Reliability, Convergent and Discriminant Validity

The construct reliability of the CFA model in Figure 1 was evaluated by utilizing Composite Reliability (CR) and Maximal Reliability (MaxR or H). For CR, values of .70 or higher are acceptable (Fornell & Larcker, 1981), whereas values of .80 or higher are required for MaxR (Munoz Gonzalez, Ariza Carrasco, Hidalgo Ariza, & Romero Esquinas, 2022; Ozsungur, 2020). As can be seen in Table 3, construct reliability was attained for three sub-scales based on CR and MaxR(H) criteria. For convergent validity, the AVE values for each factor must be above .50 (Owan, et al., 2022). A cursory look at Table 3 shows that factors such as teleconferencing and teaching effectiveness had AVE values above the .50 threshold. Therefore, convergent validity was achieved for these two latent factors. Although virtual reality simulation had an AVE of .484 (which is slightly below .50), convergent validity was achieved since the CR value is above .60. Some researchers have shown that if the AVE of a factor is greater than .40 and the composite reliability is greater than .60, then convergent validity has been attained (Hair Jr, et al., & Sarstedt, 2021; Lam, 2012). Therefore, convergent validity was achieved for the three factors. Regarding discriminant validity, the square root of the AVE of each variable must be higher than the inter-factor correlation under the Fornell-Larcker criterion (Fornell & Larcker, 1981). As indicated in Table 3, the bold text values in the leading diagonal are higher than the correlation coefficients below them; thus, discriminant validity was achieved. Using the Maximum Shared Variance (MSV) approach, discriminant validity was also achieved because all the MSV values are less than AVE of their respective factors.

Table 3. Construct Reliability, Convergent and Discriminant Validity Evidence of theQuestionnaire

Factors	CR	AVE	MSV	MaxR(H)	1	2	3
1. Virtual reality simulation	.867	.484	.001	.873	.696		
2. Teleconferencing	.923	.636	.013	.954	.027	.798	
3. Teaching Effectiveness	.947	.642	.013	.949	.024	.116	.801

CR = Composite reliability; values of .70 or higher indicate evidence of internal consistency

AVE = Average Variance Extracted; Values above .50 are desirable for convergent validity

MSV = Maximum shared variance; AVE must be greater than MSV as discriminant validity evidence for each factor

MAXR(H) = Maximal reliability; Values of .80 or above are required to establish the reliability

Bold text values along the diagonal are discriminant validity indices based on the Fornell-Larcker criterion; Values must be greater than factor correlations immediately below them.

4.4 Hypothesis Testing

Hypothesis 1

Virtual reality simulation usage does not significantly predict the teaching effectiveness of business educators in Nigeria's South-South universities. The result of the analysis in Table 4 shows that virtual reality simulation usage is accountable for 44 percent of the total variance in business educators' teaching effectiveness. This implies that 56 per cent of the model's unexplained variation may be accounted for by other predictors that are not included in the model. Table 4 further shows that VRS usage is a significant predictor of business educators; teaching effectiveness, $F(1,169) = 133.87$; $P< .001$. Based on the statistical evidence, the null hypothesis is rejected, whereas the alternative hypothesis is upheld. Therefore, virtual reality simulation usage significantly predicts the teaching effectiveness of business educators in Nigeria's South-South universities. Predictively, Table 4 shows that increasing business educators' use of VRS by 1 per cent is connected with a 0.66per cent increase in their teaching effectiveness, assuming other factors do not change. The regression line of best fit is provided as:

$$TE = 23.19 + 0.52VRS + 1.12 \quad - \quad - \quad - \quad - \quad (1)$$

Where: TE = Teaching Effectiveness VRS= Virtual Reality Simulation

Table 4. Simple Linear Regression of the Prediction of Teaching Effectiveness of Business Educators by Virtual reality Simulation Usage

Model	SS	Df	Ms	F	Sig
Regression	891.56	1	891.56	133.87	.000
Residual	1125.39	169	6.66		
Total	2016.95	170			

R = .67; Adj. R^2 = .44; SE = 2.58; t = 20.65; α = 23.19; B = .52; β = 66.

Hypothesis 2

Teleconferencing usage does not significantly predict the teaching effectiveness of business educators in Nigeria's South-South universities. A simple linear regression analysis was performed to predict the teaching effectiveness of business educators using scores of the use of teleconferencing. The result of the analysis in Table 5 clearly indicates that 42per cent of the variation in teaching effectiveness is attributable to business educators' use of teleconferencing. This suggests that other variables might account for the remaining 58per cent of the variance in the criterion variable. The analysis of variance associated with the regression model shows that business educators' use of teleconferencing significantly predicts their teaching effectiveness. Therefore, the alternative hypothesis was taken into consideration rather than the null hypothesis. Consequently, it can be said that teleconferencing usage significantly predicts the teaching effectiveness of business educators in Nigeria's South-South universities. Based on Table 5, it is predicted that a 1per cent increase in business educators' use of teleconferencing is associated with a 0.65per cent improvement in their teaching effectiveness, other things being equal. The regression model of this hypothesis is therefore fitted as

$$TE = 24.96 + 0.50TEL + 1.012 \quad - \quad - \quad - \quad - \quad (2)$$

Where: TE =Teaching effectiveness; TEL = Teleconferencing.

Table 5. Simple Linear Regression of the Prediction of Teaching Effectiveness of Business Educators by Teleconferencing Usage

Model	SS	Df	Ms	F	Sig
Regression	851.72	1	851.72	123.53	.000
Residual	1165.23	169	6.90		
Total	2016.95	170			

R = .65; Adj. R^2 = .42; SE = 2.63; t = 24.68; B = .50; α = 24.96; = β .65

5. Discussion

The study's result indicate that virtual reality simulation significantly predicts the teaching effectiveness of business educators in Nigeria's South-South universities. The current study's finding partially agrees with those of prior empirical researchers. According to Lasisi et al. (2021), modelling had a greater positive impact on participants' understanding of complex concepts... Similarly, Ke et al. (2021) uncovered that virtual reality-based modelling

favoured lab-based knowledge building over real-time experimentation, whilst the true experiment favoured the development of knowledge within the confines of a normal class. This study's finding supports, Sule and Nurcan's (2020) belief that virtual reality simulations give users a wide range of sensory input, allowing them to interact with items in a virtual classroom as if they were physically present. Without a doubt, this will assist students in rapidly and successfully acquiring and comprehending the fundamentals of business education in a more efficient and effective manner. To be effective, business educators must create real-world scenarios that allow students to build functional knowledge, which necessitates the supply of digital learning materials and equipment for students to engage with and use firsthand experience in their business education classes. The relationship between virtual reality simulation uses and the teaching effectiveness of business educators in universities in South-South, Nigeria is as shown herein. This could be because, in virtual reality simulations, learners interact with and manoeuvre their avatars by viewing simulated scenarios on a computer monitor and interacting with and manoeuvring them with a mouse or keyboard. When interacting with their virtual teacher, students usually choose from a menu of actions and communications. After the simulation is completed, an automatic report is generated that offers standardized input on whether the student satisfied the learning objectives in the scenario. These enable teachers especially those who are deficient in the use of DLTs to re-strategize for effective service delivery.

The report's findings show that the use of teleconferencing significantly predicts the teaching effectiveness of business educators in Nigeria's South-South universities. This study's finding is consistent with the findings of past research carried out by other scholars. As reported by Themelis and Sime (2020), using a communication mechanism in a virtual classroom can increase class participation. Bensching (2020) indicated that simultaneous digital training tends to boost learners' feeling of belongingness, relative to real-time virtual encounters since communication and interplay are exceedingly swift. The finding of this research backs Bakare et al. (2018) findings that students use virtual meetings and benefit from the use of web conferencing equipment for academic purposes. The association between teleconferencing use and teaching effectiveness of business educators in universities in South-South, Nigeria may be as reported because incorporating a dynamic strategy which mixes in-person and online learning may result in the production of individuals who can function effectively and efficiently in a technologically villagized world. This explanation comes from the notion that the use of automated learning devices requires the guidance of an equipped mind, as well as the touch of a digital native, in order to learn and grow. A well-equipped mind is quick to notice the plethora of elements at work in the classroom, including students' traits, the web of human connections, and the variety of stimuli and responses. A skilled hand would expertly tighten some nuts here and loosen some nuts there to achieve a workable balance thus making education and learning easy. As a social engineer, the teacher should use accessible digital technologies in accordance with the features of the students, their cognitive potentials, interests, and prior experiences.

6. Conclusion

This study uncovers that teaching effectiveness is a function of the extent to which DLTs are used in the transmission of educational material content to learners. However, the influence of virtual reality simulation and teleconferencing on teaching effectiveness, as demonstrated here foreshadows that our efforts toward a digital future may improve if digital learning resources are optimally utilized in the classroom. As a result, universities will be able to produce more digital natives than digital immigrants. The present method envisioned for university-level education in Nigeria emphasizes the use of electronic aids accessible in the natural world. Considering their supporting function in education, it is widely assumed that this technique will improve students' grasp of every subject and position them for competitiveness worldwide. Countries that ignore this truism are risking the future of their youths. If today's youths are not properly equipped with basic knowledge on how to apply advanced educational technologies, they will grow up only to discover that they are not technically ready for survival in a digital environment. The outcome of this research has ramifications for technology adoption and digital literacy. The findings of this study highlight the importance of teachers implementing cutting-edge educational technology in order to prepare students to resist unchecked optimism or pessimism regarding the nature and effects of technological activities. Learners exist in a technologically and scientifically advanced environment. They deal with concerns and problems that stem from science and technology throughout their entire lives. Digital awareness is a life vest people have to put on in order to face the challenges of an age fueled by technology. The development of problem-solving abilities and a positive outlook, as well as a respect and interest in science and technology, will all be made possible by the use of digital tools in the classroom. The development of these abilities involves both general life preparation for young people and technology-based schooling. A civilization cannot use digitally oriented technology without a population of men and women who are technologically competent. Technology literacy prepares a person to function well in a world where

there are many different types of technical devices. Future flexibility will be based on technological literacy. People can use it to regulate and assess technology, adapt to a changing environment, and help technology's capabilities grow. Sequel to the findings of this research, the study recommends that: The federal government should encourage simulation-based education by creating a digital learning environment relevant to Business Education. Teleconferencing should be deployed by lecturers to deliver many aspects of the curriculum to meet the needs of learners in regular classrooms and those in remote locations. This is crucially important, especially in this era of the pandemic of Covid-19 where people are advised to maintain some parameters of safety to avert the spread of this deadly disease.

7. Limitations

A variety of difficulties, including the difficulty we had determining the respondents' level of sincerity when responding to the questionnaire, left our study with short sleeves. Despite the fact that the study instrument was created to elicit factual information or what respondents knew to be true rather than their feelings, a few of the instrument's items could not have been completely free of the participants' personal prejudice and perceptions. One hundred per cent insulation against variables that may have affected participants' emotional and psychological states during questionnaire completion cannot be assured because data analysis was based on data gathered from the study's questionnaires distributed and a less advanced test was used to test the null hypotheses. This could have had an impact on the study's outcome in some way. Getting the study tool in front of the target audience in the twelve government-owned universities in Nigeria's South-South zone was another problem we encountered. To work around this limitation and make sure the desired scope was met, we employed three research assistants.

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Acknowledgments

We sincerely thank Mr. Owan, Valentine Joseph, for his insightful criticism, which has elevated this work to the level at which it now appears. We also appreciate the team members who gave their time to take part in this research.

Authors contributions

US, and RO, SU: Conceptualization, design, and coordination of the study, as well as preparation, review, and editing of the paper. EA, NB, AB, IE, and UA: Methodology, investigation, data curation, review, and editing. US, EM, and AA,: Statistical analysis. EA, UU, MU, OI, AA,EU, and PA: Data collection, manuscript revision, review, and editing. All the authors approved the submitted version of our study for publication. All the authors contributed equally to the study.

Funding

This study did not receive any financial support.

Competing interests

The authors affirm that they have no conflicts of interest that could have influenced the research described in this publication.

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Sciedu Press.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and peer review

Not commissioned; externally double-blind peer reviewed.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.