

FACTORS THAT AFFECT STUDENTS' ATTITUDES TOWARDS VIRTUAL LEARNING IN ABUJA, NIGERIA

Kennedy OHAZURUIKE,

Yakubu Gowon University, Abuja,

kennedyohazuruike@yahoo.com

Abstract

This study examines the determinants influencing students' attitudes towards virtual learning in tertiary institutions within the Federal Capital Territory (FCT), Abuja, Nigeria. The shift to virtual learning, accelerated by the COVID-19 pandemic, has highlighted both opportunities and enduring challenges that influence students' engagement and perceptions. Using a descriptive survey research design, data were gathered from 30 undergraduate students in the Department of Computer Science at Veritas University, Abuja, via a structured questionnaire. The research focused on primary factors including digital infrastructure, socio-economic status, digital literacy, institutional support, pedagogical elements, and student engagement and interaction. We used descriptive statistics and Pearson's product moment correlation to look at the data. The outcome indicated that digital infrastructure, socio-economic status, digital literacy, institutional support, pedagogical practices, and student engagement possess a significant and robust correlation with students' attitudes towards virtual learning. Most people who answered the survey had good digital skills and were generally positive about virtual learning. However, they also said that poor internet connectivity, unreliable power supply, and lack of technical support from their institutions were major barriers. Pedagogical approaches were regarded with relative positivity; however, insufficient interaction between students and lecturers persisted as a significant concern. The study concludes that while students are open to virtual learning, its efficacy and longevity are contingent upon enhancements in infrastructure, fortified institutional support systems, and the adoption of more interactive pedagogical approaches. To improve student engagement and get the most out of virtual learning in Nigerian colleges and universities, these issues need to be dealt with.

Keywords: *Virtual Learning, Online Learning, Digital Infrastructure, Digital Literacy, Pedagogical, Student Attitude.*

DOI: 10.31039/bjir.v3i10.98

1. INTRODUCTION

Digital technology has improved more than ever before since they are now being used in schools for teaching and learning (Raja & Nagasubramani, 2018). This technology has given teachers a different way of teaching that makes the students' learning experiences more exciting in the classrooms. However, it is fast becoming a critical factor in our education system (Boonmoh et al., 2021). The way teacher teach and how students learn is now being influenced by digital technology. More so, its application has afforded both teachers and students different ways in which they can communicate with other, with the possibility of going beyond the physical walls of the classroom (O'Connor, 2020). The rate at which mobile technology grows has given both the students and teachers more opportunity to have access to different virtual learning environments (VLEs) through a number of educational applications (Anatolyevna et al., 2018). Surani and Hamidah (2019) claimed that virtual learning has made it possible for students to interact with each other, share and make use of learning contents from different sources which has made learning more effective and efficient. According to the authors, students are more likely to hold on to virtual learning approaches due to their ease of use. Almaiah et al. (2021) highlighted that several factors could be a hinderance to students being able to make use of online learning educational applications and these factors according the authors include lack of technological infrastructure, limited access to high-speed internet, lack of institutional support, etc. More so, the scholars pinpointed a lot of critical issues that limited students usage of online learning facilities during, the Covid-19 pandemic to include such things as poor content quality, inadequate technology, poor system quality and lack students' awareness to the online learning system usage. Therefore, the goal of this study is to examine the factors the effects students' attitudes towards virtual learning in tertiary institutions in Abuja, Nigeria.

Problem Statement

The shift to virtual learning in tertiary institutions in Nigeria most especially during the pandemic has unveiled a lot of issues: a lot of students had a skeptical attitude towards online learning. even though there is a relative high awareness to digital platforms, researches have disclosed that students' effectiveness and confidence in the use of digital tools have remained low, this revealing a consistent attitudinal gap (Hamzat, 2025). These issues is particularly revealing in institutions of higher learning in the Federal Capital Territory (Abuja), where socio- environmental as well as infrastructural issues are of various magnitudes across students

population. In FCT, Abuja, students are faced in unstable power supply, poor internet connectivity, inadequate accessibility to personal digital devices and learning platforms which sometimes are inappropriate for virtual engagement sustainability. These environmental and technological limitations poses a negative effect on learners' participation, motivation and the general outlook to online learning. Pedagogical inadequacies heighten the challenges as lot of online courses find it hard to realize the communication, timely feedback as well as the peer-to-peer relationship characteristic of physical classroom instruction setting. Evidently, current researches from Nigeria indicate low acceptance of full virtual learning, with most of the students preferring conventional or hybrid learning method.

Similarly, institutional and individual factors like time management capabilities, digital literacy, teacher's skills, perceived usefulness of virtual learning and institutional strategic support meaningful impact on students' attitudes. Regardless of these certainties, empirical studies investigating the way these factors communicate within higher institutions of learning in Abuja still remains limited. Without such understanding, virtual learning risks being adopted as a temporary solution rather than a sustainable pedagogical model. Investigating these determinants is therefore essential to improving student engagement, informing institutional policy and strengthening the long-term viability of virtual learning in Abuja's tertiary institutions.

Objectives of the Study

The main objective of this study is to evaluate the factors that affects students' attitudes towards virtual learning in FCT, Abuja, Nigeria. Specifically, this research tends to:

- i. Examine how digital infrastructure, socio-economic status and digital literacy, institutional support, students' engagement and interaction and pedagogical factors affect students' attitudes towards virtual learning in tertiary institutions in FCT, Abuja.
- ii. Determine students' overall attitude towards virtual learning as a mode of teaching in tertiary institutions in FCT, Abuja

Research Questions

- i. How does digital infrastructure, socio-economic status and digital literacy, institutional support, students' engagement and interaction and pedagogical factors

affect students' attitudes towards virtual learning in tertiary institutions in FCT, Abuja.

- ii. To what extent does students' overall attitude affect virtual learning as a mode of teaching in tertiary institutions in FCT, Abuja

Hypotheses

H₀₁: Digital infrastructure, socio-economic status and digital literacy, institutional support, students' engagement and interaction and pedagogical factors affect students' attitudes towards virtual learning in tertiary institutions in FCT, Abuja has no significant effect on students' attitudes towards virtual learning in tertiary institutions in FCT, Abuja.

H₀₂: Students' overall attitude has not significant effect on virtual learning as a mode of teaching in tertiary institutions in FCT, Abuja.

2. FACTORS THAT AFFECT STUDENTS' ATTITUDE TOWARDS VIRTUAL LEARNING

2.1. Digital Infrastructure

Digital infrastructure is among the determining elements of students' perceptions of virtual education, especially in developing nations such as Nigeria. Marlana, et al. (2022) described it as the technological basis that supports connectivity, accessibility and utilization of digital platforms, such as steady power supply, reliable internet services and accessibility to appropriate devices such as computers, tablets and smartphones is what is known as digital infrastructure. Based on this, Mukuni (2019) argued that the efficacy of virtual learning systems in any higher institution is dependent on the strength of their infrastructure, as it defines how far the students can access, engage with and benefit from online learning platforms.

However, for a successful virtual learning to be possible, internet connectivity is key and its availability and affordability is equally critical to its implementation (Ogolodom et al., 2023). Over the years, in sub-Saharan Africa, the penetration of internet services has been on the increase, but its connectivity has remained unstable and expensive for a lot of students (Kibuku, et al., 2020). In Nigeria, students in urban cities such as Abuja often experience unstable connectivity due to bandwidth limitations, high costs of data and infrastructural deficits in internet service provision (Abdulmajeed, et al., 2020). Research in the course of the pandemic

posited that poor internet access was among the major issues to online learning acceptance among Nigerian undergraduates, directly affecting students' perceptions of online classes (Olanrewaju, et al., 2021). In many cases, unreliable internet not only reduced participation in live lectures but also hindered access to recorded materials, online assessments, and collaborative tools (Ogolodom et al., 2023). The majority of virtual learning platforms, in reality, demand a lot of internet data, and buying data bundles is somewhat expensive (Budiman, 2020). In Nigeria, where over half of the population lives on less than \$1 per day, this presents challenges for pupils (Abdullahi et al., 2020).

Furthermore, it would be accurate to characterise Nigeria's electricity supply status as a complete failure (Ikenga et al., 2023). Since information and communication technologies (ICTs) are significantly dependent on energy, Nigeria's inadequate electrical situation makes it challenging to utilise online learning systems successfully (Bubou & Job, 2021). According to several survey participants, Nigeria's inadequate power supply significantly impedes university students' ability to learn online. For instance, in a study by Akaeze & Akaeze (2024) where the researchers interviewed some participants. The study reported that most of the interviewee which were made up of lecturers and students from Western Nigeria disclosed that "Online classes are disrupted by frequent power outages, which causes it to be challenging for students and instructors who are dependent on digital platforms for learning." According to the study participants from Eastern Nigeria stated that "repeated outages of electricity supply impede virtual teaching sessions, thereby brining about difficulty in depending on online platforms for assessments as well as lectures,". Furthermore, according to a study on electricity availability in Nigeria by Blimpo and Cosgrove-Davies (2019), most residents in some locations do not see a daily supply of more than six hours of electricity supply. Therefore, erratic power supplies are one of the difficulties in integrating e-learning in Nigerian higher institutions.

Furthermore, schools are required to employ technology to enhance student learning, as access to it is essential in today's classroom. Nonetheless, there are difficulties, particularly when educators lack the necessary training in the usage of technology in classroom (Winter et al., 2021). When used properly, technology may be a useful tool, therefore instructors must understand how and when to make proper utilization of it. Teachers' technological proficiency and their ability to adjust the quality and quantity of the curriculum are often essential for the goal of integrating technology into the classroom (Ogolodom et al., 2023). Akaeze & Akaeze (2024) also found in their study that "Not all students have smartphones or laptops that can

effectively and efficiently run applications used for online learning." In this case, the digital divide in Nigeria is clear because students don't have the same number of devices. Many of them only have smartphones because laptops and tablets are too expensive. While smartphones provide some access, they are less effective for tasks such as writing essays, conducting research, or engaging in interactive simulations. This limitation can negatively affect how students perceive the efficacy of virtual learning (Azubuike, et al., 2020).

2.2. Socio-economic Status and Digital Literacy

The disparate division of rewards, benefits as well as economic resources among individuals or groups in a community, mostly due to characteristics like income, education, occupation, and social standing, is known as socioeconomic disparity. (Pickett & Wilson, 2009). Socioeconomic disparity can have a major impact on the accessibility and outcomes of virtual education. These distinctions are particularly significant concerning online education in which individual's socioeconomic position in conjunction with other variables, particularly during pandemics like COVID-19, can affect not only technology and internet access but also the high standards of the academic interactions (Nurdiani et al., 2024)

Low-income individuals might not be opportune to have access to computer systems or fast internet, which are the main technological resources necessary for successful participation in online learning. This is one of the consequences of socioeconomic disparity in the course of the pandemic. (Lukac, et al., 2025). In addition, Vashistha et al. (2024) stressed that socioeconomic differences may occur as a result of variations in digital literacy, as people from rich families seem to have higher exposure as well as being more proficient in technology than people from low-income families. The scholars revealed that this discrepancy may influence the capability to use online learning tools and environments. Also, the students physical home environment can differ remarkably, while some people may benefit from a quiet area conducive for learning, some others may find it hard to concentrate because of noise and lack of lighting, which makes difficult for them to participate in virtual classes (Aristovnik et al., 2020; Van Lancker & Parolin, 2020). However, the Covid-19 pandemic worsened the issue. In this, students from rich families tend to do better in virtual learning than those from poor families, which discloses that socioeconomic disparities have significant effect on learning outcomes (Kuhfeld et al. 2020). Jamil and Muschert (2023) alerted that digital divide worsened the situation as already existing disparities in education since students from wealthy homes have adequate access to learning materials for effective virtual learning.

Also, digital literacy is a very important part of modern education. It requires a variety of competencies or skill sets, including being capable to find, evaluate, use, share, and make content online and with technology (Falloon, 2020). Digital literacy is having the capacity to objectively evaluate, comprehend access, and create digital content (Wuyckens et al., 2022). It includes a range of social, technical, and cognitive abilities that are essential for productive use of the digital world. It is a broad idea that encompasses a variety of activities intended to teach people how to use technology responsibly. Digital literacy, according to Julien (2019), means the application of attitudes, knowledge and set of skills needed to access, evaluate, and use information digitally in an ethical and effective manner. Nonetheless, digital tool proficiency, knowledge of online safety, and platform adaptation are abilities that go beyond the immediate educational setting and are useful in the digitalization era. Generally, disparity in digitalization of education could be worsened by socioeconomic differences in digital literacy, which can affect students' academic achievement, mental health, and educational equity in general.

2.3. Institutional Support (Resources, Training)

In order to achieve success in moving to online learning, institutional support is essential (Alqahtani & Rajkhan, 2020). Kara et al. (2020); Hartshorn & McMurry, (2020) & Davies et al. (2020) claimed that the proposed support enhancements could be in the form of paying for subscriptions to well-known social media platforms that faculty use, offering students and faculty the needed assistance to those who are having trouble making the transition to learning online, or providing clear terms on the decisions as well as the proposed plans as they change. However, it may not be reasonable to think that teachers as well as students should simply adjust to online learning environments by replicating behaviours and procedures that were effective in face-to-face settings. At the very least, institutional support should include training students and faculty to take advantage of the opportunities of engagement in learning online, offering suitable assistance for technical issues pertaining to virtual learning, as well as pledging a support for the creation of multi-media resources for learning that are suited to virtual settings (Kebritchi et al., 2017).

This institutional support could come as in the form of training, which is crucial for the success of both teachers and students on the internet. The research done by Shawaqfeh et al. (2020) on pharmacy students virtual learning experiences emphasises this. According to this study, training requirements for both employees and students were strongly linked to obstacles to success in an online setting. Al-Balas et al. (2020) initiated that online medical teaching is

further hampered by staff members' lack of digital literacy. Also, Hartshorn & McMurry (2020) unveiled that training students and teachers on particular technology was recognised as a necessary institutional support for pupils. According to Wang et al. (2020), teachers should receive training in simulation software, and pupils should learn self-management techniques. Lastly, it was noted that effective deployment of technology in course delivery was facilitated by training for teachers in its use (Kara et al., 2020). Although it is acknowledged that during the pandemic, students and staff were not given the opportunity to adjust to their new learning platforms and technologies like Facebook, Moodle, and Zoom have become nearly universal among students and are most likely here to stay. High-quality virtual learning programs might be maintained with continued support towards training of staff to engage these virtual platforms.

2.4. Students Engagement and Interaction

In the educational landscape, the notion of students' engagement has recently received increased attention. Students' engagement refers to students' interest, self-confidence, and attention during learning activities (Alshammari & Alrashidi, 2024). In addition, Thang, et al., (2022) described students' engagement to be the degree to which students seem engaged or interested in their education and connected to their peers, their classrooms, and their institutions.

In other words, engagement is the motivational behaviour of learners during their activities in gaining knowledge and learning (Reeve et al., 2004). Researches indicated that there exists an optimistic connection between students' academic performance and students' engagement (Nifriza & Yenti, 2021). More so, according to Nguyen (2017), pupils who do not actively partake actively in learning activities does not benefit much compared to those who do. One important factor in determining students' quantity and quality of learning is engagement, which has been linked to improvements in academic performance, persistence versus dropout, and cognitive and personal growth (Ribeiro et al., 2019). Student participation is just as important to their performance and success in an online setting (Muzammil, et al., 2020). Mohammadi (2023) Also reported that learner engagement, that is, how engaged and participatory learners are in their courses, is considered a key factor that may be essential in determining students' success in an online learning environment.

Martin & Borup (2022) coalesced around three elements of students' engagement to include cognitive, behavioral and emotional engagement. Furthermore, they suggested that all of these dimensions should be measured to properly assess learners' engagement. According to the authors, behavioural engagement is related to establishing tasks and abiding by rules, while emotional engagement handles ethics, interests and emotions, and cognitive engagement is related to the effort, motivation, and strategies used to master a task. On the other hand, Philp and Duchesne (2016) theorised four dimensions of engagement: emotional, social, cognitive, and behavioural. In their schema, emotional engagement is observed when learners express emotion, for instance: satisfaction, interest, eagerness, dissatisfaction, frustration, or apprehension. Cognitive engagement is related to the process of constant attention, whereas behavioural engagement refers to learners' continuous engagement in the task, as evidenced by on-task talk. The amount of collaboration among learners while working on tasks is what social engagement is all about (Dao & McDonough, 2018). However, Appleton et al. (2008) carried out a meta-analysis of several researches that focused on engagement, and showed that learner engagement is a variable that includes three main dimensions, namely: behavioural, cognitive, and emotional.

In another development, Liebech-Lien & Sjolie (2020) argued that the ability of a teacher to foster contact and active participation among students has an impact on engagement in virtual learning settings. Furthermore, according to Strijbos & Engels (2023), organised group activities that improve critical thinking, problem-solving abilities, and cognitive comprehension are one method of promoting involvement. For instance, studies have demonstrated that cooperative learning techniques, including interdependent activities, greatly boost participation on both an individual and group level (Premo et al., 2018). Although there are various ways that researchers and practitioners think about student engagement, Kuh (2003) defined it in relation to "energy and time" that students dedicate to learning activities. Kuh's operationalisation produced four factors that demonstrate energy and time that students spend in classroom: emotional engagement, participation engagement, skills engagement and performance engagement (Handelsman et al., 2005). For example, when students work hard by completing a reading assignment, they are engaging in skills. Also, when they actively and conversely participate in small groups, they are demonstrating participation engagement. When students link a lesson's material to their own life, it's known as emotional engagement. Additionally, students who perform well on exams or earn good grades in their courses are said

to be engaged in their performance. All things considered, affective and behavioural factors play a part in student engagement (Shin, 2023).

Furthermore, Afzal & Crawford (2022) reported on student engagement during online learning. In this, the scholars maintained that, students expressed that online learning had a detrimental effect on their interactions with teachers and peers. More so, despite feeling less involved with their peers, participants of research conducted by Hollister et al. (2022), reported that online classes had no effect on their engagement with their lecturers. In contrast to in-person instruction, students in another study by Goodwin et al. (2022) alerted feeling more alone while studying and taking classes online. They disclosed that they felt alone and cut off from their teachers and peers as a result of the sudden change, which to them is hard to comprehend and align with the new style of learning. Afzal & Crawford (2022) emphasised that students expressed anxiety about conducting practical classes in science-based courses because they were unable to do so successfully when studying online. Additionally, medical students expressed discontent with their interactions with patients, which resulted in a decrease in connection and involvement (Fahim et al., 2022). According to one of the studies that were appraised on the role of engagement in improving the performance of student over time, students reported that they typically perform better on exams when they interact and engage with their lecturers and teams (Rajabalee & Santally, 2021).

2.5. Pedagogical Factors

These concern the teaching methods, instructional design, and learning experiences provided through virtual platforms. These includes quality of instruction which deals with clear explanations, organized materials, and engaging delivery that enhance students' perception of online learning. also, it is concerned with interactivity which offers the students and lecturers the opportunities for discussion, feedback and collaboration improve attitudes toward virtual learning. The pedagogical factors also has to do with the assessment methods which provide fair, transparent and flexible online assessments that contribute to a positive learning attitude. Instructor competence is where the teachers that are technologically competent and pedagogically creative foster better student engagement. Content relevance is very important as it goes with the fact that when course materials are relevant, up-to-date, and applicable, students tend to develop a more favorable view of online education.

2.6. Students' Attitude

Celik & Uzunboyly (2022) highlighted that since attitudes are thought to be determinants of behaviour, it performs an essential task in understanding how students use novel learning settings. When establishing an association towards a particular person, circumstance, or before starting an activity, a person's attitude indicates their level of readiness for action (Dundar et al., 2017). In a similar vein, Daramola (2024) emphasised that attitude is a psychological construct that reflects a person's assessment, emotions, and behavioural inclinations towards a specific thing, person, group, occasion, or concept. According to the author, attitudes have a substantial effect on the way people's behaviour, affecting how they view and react to the world. This preparedness is linked to a person's sociocultural background, past education, and prior knowledge (Ojo & Olakulehin, 2006). Students' perceptions of online learning in the educational setting were investigated by a team of researchers. Their research showed that the way learners felt toward online learning were a good indicator of how well they could take advantage of it alongside how well they did generally while using this form of education (Erarslan & Topkaya, 2017).

Uyar (2023) posits that online learning constitutes a comprehensive concept encompassing various methods of instruction supported by information and communication technology. This perception is affected by how students feel about technology and how good they are at using it (Unger & Meiran, 2020). Moreover, students' opinions of the advantages and disadvantages of online learning influence their opinions regarding it, and a positive viewpoint concerning online education increases the likelihood that students will adopt this innovative teaching method (Thapa et al., 2021). A number of things affect how students feel about virtual learning, including their patience, self-control, software skills, technical skills, and ability to manage their time (Sanchez & Karaksha, 2022). Zekan (2022) further asserted that students' attitudes and adaptability are essential for the efficacy of virtual learning. Students' views and mindsets have significance for figuring out how well the switch from in-person to virtual learning is working, since this requires a big change in how they learn.

Consequently, their disposition may be positive if the virtual learning system aligns with their needs and characteristics, or negative if they lack the requisite attributes for adaptation (Ninsiana et al., 2022). It is clear that positive attitudes toward online learning are important to making sure that students get the most out of this way of teaching. When students think that virtual learning is a useful and effective way to learn new things and improve their skills, they

are more likely to connect with the material and stay motivated throughout the process. This could lead to better academic performance and higher success rates over time (Akcil & Bastas, 2020). Furthermore, Maisha and Shetu's (2023) research investigated the factors influencing students' acceptance and adoption of virtual learning platforms. Their study emphasized the significance of understanding students' attitudes, perspectives, and motivations regarding virtual learning, as these factors determine the success of the experience. Also, having a positive attitude about virtual learning can help people feel more comfortable and trust technology, which is an important skill to have in today's digital age. In order to improve the inclusivity and effectiveness of the educational systems, institutions and educators must cultivate a right attitude to virtual learning (Cevik & Bakioglu, 2022).

3. METHOD

Research Design

The descriptive survey research design was employed in investigating the factors that affect students' attitudes towards virtual learning in higher institutions. This is most appropriate as it help in facilitating the methodological approach of obtaining of quantitative data from a particular population to take note of the trends, perceptions and associations among factors as they naturally manifest.

Participants

The population for this study comprises of undergraduate students of the Department of Computer Science, Veritas University, Abuja. The participants include 30 students. This population in deliberately chosen because of their involvement with online learning environment and digital tools making them suitable for analysing attitudes to online learning.

Instrumentation

An organized questionnaire designed in accordance with the study on virtual learning attitudes was engaged in data collection. The research instrument comprised of sections detailing on the demographic attributes, technological effects, pedagogical experiences, institutional support and individual attributes influencing attitudes to virtual learning. the responses were determined using a three-point Likert scale from Disagree to Agree

Method of Data Analysis

Collected data were analysed using descriptive and inferential statistical techniques. Descriptive statistics (frequency, percentages, means) were used to summarise students' responses and identify dominant trends across attitudinal factors. Inferential statistics, specifically Pearson's correlation analysis, were applied to examine the relationships among technological, pedagogical, institutional and personal variables influencing students' attitudes. All analyses were conducted using the Statistical Package for the Social Sciences (SPSS) version 27.

4. DATA ANALYSIS

This analyzes the data collected from the participants.

Table 1: Gender of Respondents

Gender of Respondents

	N	%
Male	16	53.3%
Female	14	46.7%

This shows the gender of respondents. In this, it could be noticed that male gender was 16 (53.3%) of the total population while the female was 14 (46.7%) of the total population. This shows that both genders were fairly represented in the study with no significant inequality among the participants.

Table 2: Digital Infrastructure

The quality of internet connectivity and power supply available to me makes it easy to participate effectively in virtual learning

	N	%
Disagree	16	53.3%
Undecided	5	16.7%
Agree	9	30.0%

From table 2 above, it could be seen that the result shows that 16 (53.3%) disagreed that quality of internet connectivity and power supply makes it easy for them to participate effectively in virtual learning. 30% agreed whereas 16.7% were undecided. This implies that poor internet connectivity and unreliable power supply remain one of the major issues to effective participation in virtual learning among the students.

Table 3: Socio-economic Status

My financial ability to afford data, devices, and other digital resources positively affects my participation in virtual learning

	N	%
Disagree	4	13.3%
Undecided	3	10.0%
Agree	23	76.7%

The result displays that 76.7% of the participants agreed that their financial capability to afford data, devices and other digital resources have a positive effect on their participation in virtual learning. 13% disagreed while 10% were undecided. However, this shows that financial capability has a major role in the support of effective participation in virtual learning.

Table 4: Digital Literacy

I have the digital skills required to use virtual learning platforms confidently and effectively

	N	%
Disagree	4	13.3%
Agree	26	86.7%

The outcome of this survey illustrates that 86.7% of the respondents agreed that they have the necessary digital skills with confidents and effectiveness needed to use virtual learning platforms while 13.3% disagreed. This shows that most students are digitally competent and comfortable using virtual learning tools.

Table 5: Institutional Support

My institution provides adequate technical support and training that help me succeed in virtual learning

	N	%
Disagree	20	66.7%
Undecided	4	13.3%
Agree	6	20.0%

The result of this survey indicates that 66.7% of the respondents disagreed that their institution provides adequate technical support and training virtual learning, 20% agreed while 13.3% were undecided. This shows that institutional support and training are not adequate and could limit students' success in virtual learning.

Table 6: Pedagogical Factors

The way lecturers teach and organize online classes makes virtual learning engaging and easy to understand

	N	%
Disagree	5	16.7%
Undecided	5	16.7%
Agree	20	66.7%

This survey depicts that 66.7% of the respondents agreed the way lecturers teach and organize online classes makes virtual learning engaging and easy to understand, 16.7% disagreed and were undecided. This illustrates that most of the students have a positive about lecturers' online teaching style even though a notable number remain unconvinced.

Table 7: Students' Engagement and Interaction

I am able to actively interact with lecturers and classmates during virtual learning sessions.

	N	%
Disagree	20	66.7%
Undecided	4	13.3%
Agree	6	20.0%

In this table it could be observed that 66.7% of the respondents disagreed that they are not able to actively interact with lecturers and classmates during virtual learning sessions, 20% agreed while 13.3% were undecided. This signifies that limited interaction still remains one of the main issues associated with virtual learning.

Table 8: Students' Attitude

I have a positive attitude toward virtual learning as a mode of instruction

	N	%
Disagree	7	23.3%
Undecided	3	10.0%
Agree	20	66.7%

In this table it could be noticed that 66.7% of the respondents agreed that they have a positive attitude toward virtual learning as a mode of instruction. More so, 23.3% disagreed while 10% were undecided. This informs that though most students see virtual learning in a positive way, some still hold some reservations.

Test of Hypothesis

All the hypotheses were tested using Pearson's product moment correlation at 0.05 level of significance.

Hypothesis One H_{01} : Digital infrastructure, socio-economic status and digital literacy, institutional support, students' engagement and interaction and pedagogical factors affect students' attitudes towards virtual learning in tertiary institutions in FCT, Abuja has no significant effect on students' attitudes towards virtual learning in tertiary institutions in FCT, Abuja.

Table 9: Correlation analysis of the effect of digital infrastructure, socio-economic status and digital literacy, institutional support, students' engagement and interaction and pedagogical factors on students' attitudes towards virtual learning in tertiary institutions in FCT, Abuja

Symmetric Measures

		Value	Asymptotic Standard Error ^a	Approximate T ^b	Approximate Significance
Interval	by Pearson's R	.929	.023	13.250	.001 ^c
Interval					
Ordinal	by Ordinal Spearman Correlation	.956	.024	17.282	.001 ^c
Ordinal					
N of Valid Cases		30			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Table 9 shows the correlation analysis result of the effect of digital infrastructure, socio-economic status and digital literacy, institutional support, students' engagement and interaction

and pedagogical factors on students' attitudes towards virtual learning in tertiary institutions in FCT, Abuja It is observed from the table that the calculated value of Pearson (r) is given as 0.929. This signifies a positive strong relationship. Furthermore, the P-value of 0.001 was found to be less than 0.05 level of significance. Since the P-value of 0.000 less than 0.05 level of significance, the hypothesis is therefore accepted. This implies that digital infrastructure, socio-economic status and digital literacy, institutional support, students' engagement and interaction and pedagogical factors have significant effect on students' attitudes towards virtual learning in tertiary institutions in FCT, Abuja

Hypothesis Two H₀₂: Students' overall attitude has no significant effect on virtual learning as a mode of teaching in tertiary institutions in FCT, Abuja.

Table 10: Correlation analysis of the students' overall attitude towards virtual learning as a mode of teaching in tertiary institutions in FCT, Abuja.

Symmetric Measures

		Value	Asymptotic Standard Error ^a	Approximate T ^b	Approximate Significance
Interval by Interval	Pearson's R	-.718	.094	-5.456	.001 ^c
Ordinal by Ordinal	Spearman Correlation	-.743	.095	-5.875	.001 ^c
N of Valid Cases		30			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Table 10 represents the correlation analysis result of students' overall attitude towards virtual learning as a mode of teaching in tertiary institutions in FCT, Abuja. In this, it could be seen that the calculated value of Pearson (r) is given as 0.718. This signifies a strong relationship. Furthermore, the P-value of 0.001 was found to be less than 0.05 level of significance. Since the P-value of 0.000 is less than 0.05 level of significance, the hypothesis is therefore accepted. This indicates that students' overall attitude has significant effect on virtual learning as a mode of teaching in tertiary institutions in FCT, Abuja.

5. DISCUSSION

The study revealed digital infrastructure, socio-economic status and digital literacy, institutional support, students' engagement and interaction and pedagogical factors have significant effect on students' attitudes towards virtual learning in tertiary institutions in FCT, Abuja. This finding is supported by Marlena, et al. (2022) who described digital infrastructure as the technological basis that supports connectivity, accessibility and utilization of digital platforms, such as steady power supply, reliable internet services and accessibility to appropriate devices such as computers, tablets and smartphones is what is known as digital infrastructure. Based on this, Mukuni (2019) argued that the efficacy of virtual learning systems in any higher institution is dependent on the strength of their infrastructure, as it defines how far the students can access, engage with and benefit from online learning platforms. However, for a successful virtual learning to be possible, internet connectivity is key and its availability and affordability is equally critical to its implementation (Ogolodom et al., 2023).

More so, Nurdiani et al. (2024) reported that socioeconomic disparity can have a major impact on the accessibility and outcomes of virtual education. These distinctions are particularly significant concerning online education in which individual's socioeconomic position in conjunction with other variables, particularly during pandemics like COVID-19, can affect not only technology and internet access but also the high standards of the academic interactions. Lukac, et al. (2025) mentioned that students from low-income household may not have the opportunity to have access to computer systems or fast internet, which are the primary technological resources required for a successful participation in online learning. Furthermore, Vashistha et al. (2024) revealed that variations in socio-economic status could end up in imbalances in digital literacy, with individuals from rich families being better adapted to and fluent in technology. The scholars, however, asserted that these distinctions may affect the capacity to navigate virtual resources and platforms.

Alqahtani and Rajkhan (2020) also said that institutional support is necessary for success in moving to online learning. Kara et al. (2020), Hartshorn & McMurry (2020), and Davies et al. (2020) asserted that the suggested aid innovations could include funding subscriptions to prominent social media platforms utilized by faculty, offering necessary assistance to students and faculty struggling with the transition to online learning, or delivering transparent communication regarding decisions and evolving plans. It may not be rational to assume that both teachers and students should adapt to online learning environments by emulating behaviors and procedures that were successful in traditional face-to-face contexts. At a minimum, institutional support should encompass training for students and faculty to leverage the benefits of online learning engagement, provision of appropriate assistance for technical challenges related to virtual education, and a commitment to the development of multimedia resources tailored for virtual environments (Kebritchi et al., 2017). In other words, institutional support could come as in the form of training, which is crucial for the success of both teachers and students on the internet. The research done by Shawaqfeh et al. (2020) on pharmacy students virtual learning experiences emphasises this. According to this study, lack of training requirements for both employees and students were strongly linked to obstacles to success in an online setting.

In another development, Thang, et al., (2022), described students' engagement to be the degree to which students seem engaged or interested in their education and connected to their peers, their classrooms, and their institutions. It means that engagement is the motivational behaviour of learners during their activities in gaining knowledge and learning (Reeve et al., 2004). Researches indicated that there exists an optimistic connection between students' academic performance and students' engagement (Nifrizza & Yenti, 2021). Mohammadi (2023) also reported that learner engagement, that is, how engaged and participatory learners are in their courses, is considered a key factor that may be essential in determining students' success in an online learning environment. Consequently, Liebech-Lien & Sjolie (2020) argued that the ability of a teacher to foster contact and active participation among students has an impact on engagement in virtual learning settings. Furthermore, according to Strijbos & Engels (2023), organised group activities that improve critical thinking, problem-solving abilities, and cognitive comprehension are one method of promoting involvement.

In addition, Celik & Uzunboylu (2022) highlighted that attitudes are the determinants of behaviour, it performs an essential task in understanding how students use novel learning settings. Dundar et al. (2017) asserted that when establishing an association towards a particular person, circumstance, or before starting an activity, a person's attitude indicates their level of readiness for action. In a similar vein, Daramola (2024) emphasised that attitude is a psychological construct that reflects a person's assessment, emotions, and behavioural inclinations towards a specific thing, person, group, occasion, or concept. According to the author, attitudes have a substantial effect on the way people's behaviour, affecting how they view and react to the world. The past education, socio-cultural background and prior knowledge of the person are connected to this preparedness (Ojo & Olakulehin, 2006). In the educational landscape, students' perceptions of online learning was examined by a team of scholars, in this, they found that students attitudes to virtual learning was the primary predictor of their ability to take full advantage of it and it influenced their overall success when making use of this learning method (Erarslan & Topkaya, 2017).

More so, Uyar (2023) stated that virtual learning may be seen as a concept that involves a variety of instructional plans that is supported by information and communication technology. However, students' views on the importance of technology and their degree of proficiency with it influence this impression (Unger & Meiran, 2020). The way students think about the pros and cons of online learning also has a big impact on how they feel about it. In this context, a favorable disposition towards virtual learning increases the probability that students will endorse this novel educational approach (Thapa et al., 2021). Students' attitudes to virtual learning are affected by several factors like time management abilities, technical capabilities, software proficiency, self-control and patience (Sanchez & Karaksha, 2022). Zekan (2022) also said that the main reason virtual learning works is because of how students feel about it and how flexible they are. To see how well the switch from in-person to online learning works, it's important to look at how students feel about it. This means that the way they learn needs to change completely. Consequently, their attitude may be favorable if the virtual learning system aligns with their needs, or unfavorable if the necessary attributes for adaptation are lacking (Ninsiana et al., 2022). It is clear that having a positive attitude toward virtual education is key to making sure that students get all the benefits of this way of teaching.

6. CONCLUSION

This research evaluated the determinants influencing students' attitudes towards virtual learning in higher education institutions in Abuja, Nigeria. The study's population consisted of students from the Department of Computer Science at Veritas University. The results show that students' feelings about virtual learning are shaped by a mix of pedagogical, institutional, technological, and other factors. Additionally, although the majority of participants demonstrated adequate digital competencies and maintained a generally positive disposition towards virtual learning, significant challenges remain that may impede its efficacy and long-term viability. A lack of reliable power and poor internet access were two of the biggest problems that made it hard for people to participate in virtual learning. More than half of the people who answered said they were unhappy with the current infrastructure. Also, the support from the school was not enough because most of the students said they didn't get enough technical help or training from their school. These weaknesses make it hard for students to get the most out of virtual learning platforms, even though they want to and know how to use them.

In contrary, financial capacity was reported to be a solid enabling factor, as majority of the students were in agreement that their ability to afford data and digital devices have a positive influence on their participation.

Pedagogical practices were seen to be relatively positive, with a lot of the respondents having acknowledged that lecturers' teaching and methods improved their understanding. Nevertheless, limited interaction between lecturers and students during online sessions was found to be a remarkable issue of concern, indicating the need for more interactive and student-centred virtual learning methods. In conclusion, the study stressed that even though students hold generally positive attitudes towards virtual learning, addressing infrastructural deficiencies, strengthening institutional support systems, and improving interactive pedagogical strategies are imperative for increasing the effectiveness of virtual learning in tertiary institutions in Abuja.

Recommendations

Improve Technological Infrastructure

That tertiary institutions should work in partnership with the government agencies and internet service providers to enhance the provision of reliable power supply and internet connectivity

in campuses. This can be done by providing subsidized data plans and access to campus-based digital facilities will improve students' effective participation in virtual learning.

Strengthen Institutional Support and Training

Tertiary institutions should create a well-structured technical support units which will help in providing regular training for both students and lecturers on the use of virtual learning platforms. Clear online education rules and ongoing programs to improve students' skills can help them feel more confident and satisfied with virtual learning.

Enhance Interactive Teaching Strategies

It is imperative that lecturers adopt a more interactive and student-centred online teaching methods, such as timely feedback mechanisms, breakout sessions and live discussions which will help improve the interaction between students and instructors by reducing the feelings of isolation and foster positive attitudes toward virtual learning.

REFERENCES

- Abdullahi, U., Sirajo, M., Saidu, Y., & Bello, U. (2020). "Stay-at-home order and challenges of online learning." *IOSR Journal of Research & Method in Education*, 10 (4), 10–17.
- Abdulmajeed, K., Joyner, D. A. & McManus, C. (2020). "Challenges of Online Learning in Nigeria." Work-in-Progress/Demonstration Session, L@S '20, August 12–14, 2020, Virtual Event, USA
- Afzal F. & Crawford, L. (2022). "Student's perception of engagement in online project management education and its impact on performance: the mediating role of self-motivation." *Proj Leadersh Soc.* 3:100057.

- Akaeze, C. O. & Akaeze, N. S. (2024). "Exploring the Challenges of Online Learning in Nigerian Higher Education." *Frontiers of Contemporary Education*. 5(2), 1-18.
- Akcil, U., & Bastas, M. (2020). Examination of university students' attitudes towards e-learning during the covid-19 pandemic process and the relationship of digital citizenship. *Contemporary Educational Technology*, 13(1), <https://doi.org/10.30935/cedtech/9341>
- Al-Balas, M., Hasan Ibrahim, A.-B., Jaber, H. M., Obeidat, K., Al-Balas, H., Aborajoo, E. A., Al-Taher, R., & Al-Balas, B. (2020). "Distance learning in clinical medical education amid COVID-19 pandemic in Jordan: Current situation, challenges, and perspectives." *BMC Medical Education*, 20, 1–7. <https://doi.org/10.1186/s12909-020-02257-4>.
- Almaiah, M. A., Al-Khasawneh, A., Althunibat, A. & Almomani, O. (2021). Exploring the main determinants of mobile learning application usage during COVID-19 pandemic in Jordanian universities. In *Emerging Technologies during the Era of COVID-19 Pandemic*, Springer: Cham, Switzerland, 275–290.
- Almaiah, M. A., Hajje, F., Lutfi, A., Al-Khasawneh, A., Shehab, R., Al-Otaibi, S. & Alrawad, M. (2022). "Explaining the Factors Affecting Students' Attitudes to Using Online Learning (Madrasti Platform) during COVID-19." *Electronics*, 11, 973. <https://doi.org/10.3390/electronics11070973>
- Alqahtani, A. Y., & Rajkhan, A. A. (2020). "E-Learning critical success factors during the COVID-19 pandemic: A comprehensive analysis of e-learning managerial perspectives." *Education Sciences*, 10(9), 216. <https://doi.org/10.3390/educsci10090216>.
- Alshammari, S. H. & Alrashidi, O. (2024). "The Effect of Students' Engagement on Their Learning Achievement in EFL Online Courses: A Structural Equation Modelling Approach." *International Journal of Online Pedagogy and Course Design*, 14(1), 1-18.

- Anatolyevna, V., Butt, S., Salmani, H., & Zaheer, S. (2018). "Do Mobile Technology in the Classroom Really Improve Learning Outcomes?" *International Journal of Evaluation and Research in Education (IJERE)*, 7(3), 188-193.
- Appleton, J. J., Christenson, S. L., & Furlong, M. J. (2008). "Student engagement with school: Critical conceptual and methodological issues of the construct." *Psychology in the Schools*, 45(5), 369–386. DOI: 10.1002/pits.20303
- Aristovnik, A., et al. (2020). "COVID-19 and remote e-learning: Experiences of parents with children during the pandemic." *Quality & Quantity*, 55, 1369–1391.
- Azubuike, O. B., Adegboye, O. & Quadri, H. (2020). "Who gets to learn in a pandemic? Exploring the digital divide in remote learning during the COVID-19 pandemic in Nigeria." *International Journal of Educational Research Open*, 100022. 10.1016/j.ijedro.2020.100022
- Blimpo, M. P. & Cosgrove-Davies, M. (2019). Electricity access in Sub-Saharan Africa: Uptake, reliability, and complementary factors for economic impact. Africa Development Forum Washington, DC: World Bank
- Boonmoh, A., Jumpakate, T., & Karpklon, S.(2021). "Teachers' Perceptions and Experience in Using Technology for the Classroom." *Computer-Assisted Language Learning Electronic Journal*, 22(1), 1-24.
- Bubou, G., & Job, G. (2021). "Benefits, challenges, and prospects of integrating e-learning into Nigerian tertiary institutions: A mini review." *International Journal of Education and Development using Information and Communication Technology*, 17(3), 6-18.
- Celik, B. & Uzunboylu, H. (2022). "Developing an attitude scale towards distance learning." *Behaviour & Information Technology*, 41(4), 731-739.
- Cevik, M. & Bakioğlu, B. (2022). "Investigating students' E-Learning attitudes in times of crisis (COVID-19 pandemic)." *Education and Information Technologies*, 27(1), 65-87. <https://doi.org/10.1007/s10639-021-10591-3>

- Dao, P., & McDonough, K. (2018). "Effect of proficiency on Vietnamese EFL learners' engagement in peer interaction." *International Journal of Educational Research*, 88, 60–72. DOI: 10.1016/j.ijer.2018.01.008
- Daramola, D. S. (2024). "Attitude to and Effect of Virtual Learning on Undergraduates Academic Performance in an Education Core Course." 49-58
- Davies, J. A., Davies, L. J., Conlon, B., Emerson, J., Hainsworth, H., & McDonough, H. G. (2020). "Responding to COVID-19 in EAP contexts: A comparison of courses at four Sino-foreign universi ties." *International Journal of TESOL Studies*, 2(2), 32–52.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319-340.
<https://doi.org/10.2307/249008> Fauzi (2021),
- Dundar, S., Candemir, Ö., Demiray, E., Kumtepe, E. G., Öztürk, S., Terlemez, M. S., & Ulutak, İ. (2017). "Anadolu Üniversitesi çalışanlarının açık ve uzaktan öğretime ilişkin tutumları." *Açıköğretim Uygulamaları ve Araştırmaları Dergisi*, 3(4), 187-227.
- Erarslan, A., & Topkaya, E. Z. (2017). "EFL students' attitudes towards e-learning and effect of an online course on students' success in English." *The Literacy Trek*, 3(2), 80-101.
- Fahim, A., Rana, S., Haider, I., Jalil, V., Atif, S., Shakeel, S. & Sethi, A. (2022). "From text to e-text: perceptions of medical, dental and allied students about e-learning." *Heliyon*. 8(12).
- Goodwin, J., Kilty, C., Kelly, P., O'Donovan, A., White, S. & O'Malley, M. (2022). "Undergraduate student nurses' views of online learning." *Teach Learn Nurs*. 17(4):398–402. <https://doi.org/10.1016/J.TELN.2022.02.005>.
- Hamzat, A. A. (2025). "Bridging the digital gap": Students' awareness, ease of use, and self-efficacy towards online learning among university students in Nigeria. *At-Tarbawi: Jurnal Kajian Kependidikan Islam*, 10(1), 16-29.
- Handelsman, M. M., Briggs, W. L., Sullivan, N., & Towler, A. (2005). "A measure of college student engagement." *Journal of Educational Research*, 98, 184-191.

- Hartshorn, K. J., & McMurry, B. L. (2020). "The Effects of the COVID-19 pandemic on ESL learners and TESOL practitioners in the United States." *International Journal of TESOL Studies*, 2(2), 140–157.
- Hollister, B., Nair, P., Hill-Lindsay, S. & Chukoskie, L. (2022). "Engagement in online learning: student attitudes and behavior during COVID-19." *Front Educ.* 7:851019.
- Holmes, A. (2019). "Constructivist learning in university undergraduate programmes. Has constructivism been fully embraced? Is there clear evidence that constructivist principles have been applied to all aspects of contemporary university undergraduate study?" *Shanlax international journal of education*, 8(1), 7-15.
<https://doi.org/10.34293/education.v8i1.819>
- Ikenga, F. A., & Ogidigben, E. A. (2023). "Electricity supply and management challenges in Nigeria: A study of BEDC." *Jurnal Transparansi Publik*, 3(2).
- Jamil, S., and Muschert, G. (2023). "The COVID-19 pandemic and e-learning: the digital divide and educational crises in Pakistan's universities." *Am. Behav. Sci.* 68, 1161–1169. doi: 10.1177/00027642231156779
- Julien H (2019). "Digital literacy in theory and practice. In: Khosrow-Pour DBA (Ed.)," *Advanced methodologies and technologies in library science, information management, and scholarly inquiry*: 22-32. IGI Global, Pennsylvania, USA.
<https://doi.org/10.4018/978-1-5225-7659-4.ch003>
- Kara, N., Çubukçuoğlu, B., & Elçi, A. (2020). "Using social media to support teaching and learning in higher education: an analysis of personal narratives: Research in Learning Technology. *Association for learning technology journal*, 28. <https://doi.org/10.25304/rlt.v28.2410>.
- Kebritchi, M., Lipschuetz, A., & Santiago, L. (2017). "Issues and challenges for teaching successful online courses in higher education." *Journal of Educational Technology Systems*, 46(1), 4–29. <https://doi.org/10.1177/0047239516661713>.
- Kibuku, R. N., Ochieng, D. O., & Wausi, A. N. (2020). "E-learning challenges faced by universities in Kenya: A literature review." *The Electronic Journal of e-Learning*, 18(2), 150-161.

- Kuh, G. D. (2003, March/April). "What we are learning about student engagement from NSSE: Benchmarks for effective educational practices." *Changes*, 24–32.
- Kuhfeld, M., et al. (2020). "Estimates of Learning Loss in the 2019-2020 School Year." *Educational Researcher*, 49(9), 685-695.
- Liebech-Lien, B. & Sjolie, E. (2020). "Teachers' conceptions and uses of student collaboration in the classroom," *Educational Research*, 63, 212-228. doi: 10.1080/00131881.2020.1839354.
- Lukac, J., Kudlova, Z., Kopcakova, J. & Gallo, P. (2025). "Impact of Socio-Economic Factors on Digital Literacy and Security." *TEM Journal*, 14(1), 925-932,
- Maisha, K. & Shetu, S.N. (2023). "Influencing factors of e-learning adoption amongst students in a developing country: the post-pandemic scenario in Bangladesh." *Futur Bus J* 9, 37. <https://doi.org/10.1186/s43093-023-00214-3>
- Marlena, N., Dwijayanti, R., Patrikha, F. D. & Saino (2022). "Online Learning Infrastructure: Does it Strengthen the Effect of Service Quality on Student Satisfaction." *Jurnal Iqra' : Kajian Ilmu Pendidikan*, 7(2). 61-75
- Mohammadi, Z. (2023). "Student interaction patterns and co-regulation practices in text-based and multimodal computer mediated collaborative writing modalities." *Educational Technology Research and Development*, 71(2), 313–338. DOI: 10.1007/s11423-022-10158-0
- Mukuni, J. (2019). "Challenges of educational digital infrastructure in Africa: A tale of hope and disillusionment." *Journal of African Studies and Development*, 11(5), 59-63, DOI: 10.5897/JASD2019.0539
- Muzammil, M., Sutawijaya, A. & Harsasi, M. (2020). "Investigating student satisfaction in online learning: the role of student interaction and engagement in distance learning university." *Turk Online J Distance Educ.* 2020;21(Special Issue-IODL):88–96.
- Nguyen, T. H. (2017). "EFL Vietnamese learners' engagement with English language during oral classroom peer interaction. [Unpublished doctoral dissertation]." University of Wollongong School of Education.

- Nifrizia, I., & Yenti, D. (2021). "Students' barriers in learning English through online learning." *Linguistic English Education and Art Journal*, 5(1), 39–46. DOI: 10.31539/leea.v5i1.3013
- Ninsiana, W., Gabidullina, F. I., Widodo, M., Patra, I., Pallathadka, H., Alkhateeb, D. A. A. M., & Gheisari, A. (2022). "High School Students' Attitudes towards E-Learning and Impacts of Online Instruction on Their General English Learning: Challenges and Issues." *Education Research International*, <https://doi.org/10.1155/2022/9103862>
- Nurdiani, T. W., Aulia, M. R., Putra, G. W. & Kusnadi, I. H. (2024). "Analysis of digital literacy sources to identify the relationship between population income, socio-economic and subjective well-being." *Jurnal Sistim Informasi dan Teknologi*, 42-47.
- O'Connor, K. (2020). "Creating, Curating and Supporting the Wall-Less Classroom." *International Journal for e-Learning Security (IJeLS)* 9(1), 604-609.
- Ojo, D. O., & Olakulehin, F. K. (2006). "Attitudes and perceptions of students to open and distance learning in Nigeria." *International Review of Research in Open and Distributed Learning*, 7(1), 1 10.
- Olanrewaju, G. S., Adebayo, S. B., Omotosho, A. Y., Olajide, C. F. (2021). "Left behind? The effects of digital gaps on e-learning in rural secondary schools and remote communities across Nigeria during the COVID19 pandemic." *International Journal of Educational Research Open* 2(100092), 1-10.
- Philp, J., & Duchesne, S. (2016). "Exploring engagement in tasks in the language classroom." *Annual Review of Applied Linguistics*, 36, 50–72. DOI: 10.1017/S0267190515000094
- Piaget, J. (1964). "PART 1 Cognitive development in children: Piaget, development and learning." *Journal of Research in Science Teaching*, 2, 176-186.
- Premo, J., Cavagnetto, A. & Davis, W. (2018). "Promoting Collaborative Classrooms: The Impacts of Interdependent Cooperative Learning on Undergraduate Interactions and Achievement," *CBE Life Sciences Education*, 17, doi: 10.1187/cbe.17-08-0176.
- Pribadi, B. A. (2024). "Designing and developing the constructivism-based online learning." *Proceedings of the 7th International Conference on Learning Innovation and Quality*

Education (ICLIQE 2023), *Advances in Social Science, Education and Humanities Research* 873, 685-695

Rahmi, B., Birgoren, B., & Aktepe, A. (2018). "A meta analysis of factors affecting perceived usefulness and perceived ease of use in the adoption of e-learning systems." *Turkish Online Journal of Distance Education*, 19(4), 4-42.
<https://doi.org/10.17718/tojde.471649>

Raja, R., & Nagasubramani, P. C. (2018). "Impact of modern technology in education." *Journal of Applied and Advanced Research* 3(1), 33-35.

Rajabalee, Y. B. & Santally, M. I. (2021). "Learner satisfaction, engagement and performances in an online module: Implications for institutional e-learning policy." *Educ Inf Technol (Dordr)* 26(3), 2623–2656.

Reeve, J., Jang, H., Carrell, D., Jeon, S., & Barch, J. (2004). "Enhancing students' engagement by increasing teachers' autonomy support." *Motivation and Emotion*, 28(2), 147–169. DOI: 10.1023/B:MOEM.0000032312.95499.6f

Ribeiro, L., Rosário, P., Núñez J. C., Gaeta, M., & Fuentes, S. (2019). "First-year students background and academic achievement: the mediating role of student engagement." *Front Psychol.* 10:2669.

Sánchez, A. D. L. M. M., & Karaksha, A. (2022). "Nursing student' s attitudes toward e-learning: a quantitative approach." *Education and Information Technologies*, 1-15.

Shawaqfeh, M. S., Al Bekairy, A. M., Al-Azayzih, A., Alkatheri, A. A., Qandil, A. M., Obaidat, A. A., Al Harbi, S., & Muflih, S. M. (2020). "Pharmacy students perceptions of their distance online learning experience during the COVID-19 pandemic: A cross-sectional survey study." *Journal of Medical Education and Curricular Development*, 7, 2382120520963039. <https://doi.org/10.1177/2382120520963039>.

Shin, A. (2023). "Exploring the Role of Interaction in Engagement and Satisfaction Within Virtual Learning Environments." *Journal of Student Research*, 12(3), 1-11

- Strijbos, J. & Engels, N. (2023). "Exploring argumentative strategies in student-teacher partnerships: patterns of deliberative communication," *Classroom Discourse*, 15, 52-72. doi: 10.1080/19463014.2023.2197120.
- Surani, D., & Hamidah, H. (2019). "Students Perceptions in Online Class Learning During the Covid-19 Pandemic." *International Journal on Advanced Science, Education, and Religion*, 3(3), 83-95.
- Thang, S. M., Mahmud, N., Mohd, J. N., Ng, L. L. S. & Abdul, A. N. B. (2022). "Online learning engagement among Malaysian primary school students during the covid-19 pandemic." *Int J Innov Creat Change*. 16(2):302–26.
- Thapa, P., Bhandari, S. L., & Pathak, S. (2021). "Nursing students' attitude on the practice of e learning: A cross-sectional survey amid COVID-19 in Nepal." *PloS one*, 16(6), e0253651.
- Unger, S., & Meiran, W. R. (2020). "Student attitudes towards online education during the COVID 19 viral outbreak of 2020: Distance learning in a time of social distance." *International Journal of Technology in Education and Science*, 4(4), 256-266.
- Uyar, A. (2023). "Exploring the students' attitudes towards e-learning at territory level: a focus on Türkiye." *International Journal of Curriculum and Instruction* 15(2), 1327–1353
- Van Lancker, W., & Parolin, Z. (2020). "COVID-19, school closures, and child poverty: A social crisis in the making." *The Lancet Public Health*, 5(5), e243-e244.
- Vashistha, D., Chandel, P. K. & Gaur, S. (2024). "Investigating Socioeconomic Disparities in Digital Education Experiences." *The International Journal of Indian Psychology*, 12(3), 1001-1009.
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view1. *MIS Quarterly*, 27(3), 425-425. <https://doi.org/10.2307/30036540>
- Wang, C., A'na, X., Wang, W., & Wu, H. (2020). "Association between medical students' prior experiences and perceptions of formal online education developed in response to

COVID-19: A cross-sectional study in China.” *BMJ Open*, 10(10), 1–10. <https://doi.org/10.1136/bmjopen-2020-041886>.

Winter, E., Costello, A., O’Brien, M., & Hickey, G. (2021). “Teachers’ use of technology and the impact of Covid-19.” *Irish Educational*
<https://doi.org/10.1080/03323315.2021.1916559>

Wuyckens, G., Landry, N. & Fastrez, P. (2022). “Untangling media literacy, information literacy, and digital literacy: A systematic meta-review of core concepts in media education.” *Journal of Media Literacy Education*, 14(1): 168-182.
<https://doi.org/10.23860/JMLE-2022-14-1-12>

Zekan, S. B. (2022). “Students' Attitudes Towards Online Learning.” *Social Science Development Journal*, 7(30), 183-187.