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TECHNOLOGICAL AVAILABILITY AS A PREDICTOR OF PERCEIVED USEFULNESS OF VIRTUAL REALITY IN NIGERIAN LANGUAGE TEACHER EDUCATION: EVIDENCE FROM PRE-SERVICE TEACHERS

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ABSTRACT

The increasing use of immersive technologies in teacher education has heightened the necessity to explore the contextual issues affecting their use in the emerging system of education. The present research examined technological availability as a predictor of perceived usefulness of Virtual Reality in language teacher teaching among pre-service teachers in Federal University Oye-Ekiti. The research was descriptive in nature and correlational research design was used. The sample was 412 pre-service language teachers enrolled in the Faculty of Education out of which a sample of the 203 participants was sampled through proportionate stratified random sampling technique. The data collection tool was Teenage Technology Availability and Perceived Usefulness of Virtual Reality Questionnaire (TAPUVRQ) whose Cronbachs alpha reliability value was 0.87. The data were processed with the help of frequency counts and percentages to respond to the research questions, mean and standard deviation to analyse the response to the research questions, and Pearson Product Moment Correlation and simple linear regression to test the relationship between the variables at the level of significance of 0.05. It was revealed that the pre-service teachers had high levels of perceived usefulness with low technological availability of VR resources. In addition, there was a significant positive association between the availability of technology and the perceived usefulness. It was decided that despite the limited access to VR resources, the higher the access, the better are the perceptions of its didactic value. The study among others advocated better infrastructural provisions, curriculum inclusion of VR- based modules and specific institutional investment to sustainability adopt technology in language teacher education.

Keywords: Virtual Reality, Technology, Pedagogy, English Language, Education, Pre-Service Teachers,

Introduction

The high growth of digital technologies has redefined the educational systems in the world, in both pedagogical practices and the learning environment. One of the emerging innovations that have received prolonged academic interest is Virtual Reality (VR) due to its ability to create immersive, interactive,

and computer-generated spaces simulating real or imagined locations (Al-Ansi et al., 2023). VR is a digital technology which employs head-mounted devices, motion sensors, and other software to place the user in a three-dimensional environment where he can look around, touch and feel objects, and experience a situation as though he was in it in person (Li et al., 2024). In contrast to traditional two-dimensional multimedia technologies, VR offers a feeling of presence and interaction with visual, auditory and, in some cases, tactile feedback (Gao, 2022). In language teaching, VR has specific opportunities to recreate the natural communicative scenarios, sociocultural backgrounds, and classroom environments, which are hard to recreate by the means of conventional teaching methods (Wu et al., 2023).

Experiments with immersive technologies are becoming more common in universities around the world as a way of enhancing teacher preparation and facilitating experiential learning. For instance, VR has been adapted into teacher training programs in the United States to recreate classroom management situations and culturally diverse learning conditions, so that pre-service teachers can train using instructional methods in safe, controlled virtual environments (Mouw et al., 2020). Also,VR technologies are believed to provide a positive and personal learning experience, offering excitement, motivation, deeper learning, long term retention and increased time-on-task for both teachers and learners (Enyiazu 2021). On the same note, in China, VR has found its way in language and teacher training institutions to develop an immersive language laboratory where trainees have to participate in interactive communicative activities that reflect real-life setting (Zheng et al., 2023). Universities in United Kingdom have also investigated VR-based simulations to reinforce reflective practice and pedagogical choice among the trainee teachers (Dai et al., 2023). It is also acknowledged to help pre service teachers and educators to practice professional competence in safe and diverse VR environment (van der Want & Visscher 2024). These examples of international experience show that there is an increasing appreciation of VR as the tool that can provide the bridge between theory and practice in the education of teachers by providing them with the experience-based learning in a structured way.

Nevertheless, there is still an unequal distribution of VR in the practice of teacher's education, particularly in developing settings where the technological adoption is predetermined by the infrastructural and financial means. In Nigeria, the exposure to emerging technologies is different based on the institutional disparities and digital infrastructure (Asaju & Ashepo, 2025). As a result, it is essential to study the impact of access to VR materials on the perceptions of pre-service teachers regarding its effectiveness in teaching language, as the key to sustainable innovation in language teacher education.

Language teacher education takes a pivotal place in the educational transformation since the pre-service teachers are the future generation of the classroom practitioners (Maijala, 2023). Their professional values, technology, and pedagogical abilities are developed under the first training and tend to influence the instructional habits in the long period (Orakova et al., 2024). Universities on the higher education sector in Nigeria are highly disparate in regard to digital infrastructure, funding systems and innovation projects (Yusuf & Ibrahim, 2024). These variations of structure determine the extent to which future teachers undergo advanced instructional technologies in their training. In the case of limited exposure to immersive tools like VR, the perceptions of feasibility and usefulness might not be developed yet. On the other hand, institutions that have been increasingly active in approaching the digital innovation offer the rich environment in analysing how the technological context influences the formulation of judgments with regard to instructional tools (Bearman et al., 2023). A study of pre-service teachers in a defined institutional setting thus allows to get to know better how localized infrastructural realities intersect the cognitive and pedagogical perceptions and hence lead to evidence based planning to implement technology integration in teacher education.

This theoretical basis of the study is based on the Cognitive Theory of Multimedia Learning (CTML) advanced by Richard E. Mayer (Mayer, 2001). CTML assumes that meaningful learning takes place when learners are given the power to choose the information that is relevant to them, arrange the information into meaningful structures, and tie the information with the already known information. This theory has centered its focus on dual-channel processing, limited working memory capacity and active thinking as the necessary conditions of effective learning. VR experiences are in line with these assumptions in that they bring together auditory, visual, and interactive stimuli in the context of immersive experiences. VR can be used in language teacher education to help create contextualized practice, model classroom situations, and provide culturally situated communication experiences (Yan et al., 2024). However, CTML equally notes that instructional value is pegged on the careful design and proper entry. When immersive technologies are not available or appear irregularly, the cognitive affordances of immersive technologies cannot be achieved to the full extent. Therefore, technological availability is a situational facilitator that dictates the possibility of the pedagogical potential that is conceptualized in CTML being translated into valuable professional preparation experiences among pre-service teachers.

In this cognitive approach, perceived usefulness shows the evaluation judgement of pre-service teachers that VR has the ability to improve instructional performance and meaningful learning. These if not other

evaluations can be influenced by both theoretical knowledge and practical experience with technological tools. The experiential framework on which the judgements of usefulness are built is based on access to VR hardware, compatible software, technical knowledge, and supportive infrastructure. In the situations where there are infrastructural constraints, perceptions could be shaped by presumptions as opposed to truly interacting (Atemnkeng, 2025). Thus, when discussing the factors of institutional reality as predictors, technological availability can be studied to better understand the influence of institutional factors on pedagogical perceptions. This study combines theoretical and environmental aspects of technology adoption in teaching by placing the perceived usefulness in cognitive theory and contextual accessibility category.

This study has an empirical context that makes it even more relevant. Federal University Oye-Ekiti is a comparatively recent federal institution, which was founded in the time of the recent advancement of accessibility to higher education in Nigeria (Akindola & Ojo, 2020). Being a young university in Ekiti State, which has traditionally been a place of vibrant educational development, the institution not only exemplifies the hopes and limitations of the current Nigerian higher educational institutions, but also represents the desires and potentials of the local population (Akindola & Ojo, 2020). Its current attempts to go digital and expand in infrastructures offer a relevant background to the investigation of access to novel technologies in teacher preparation program. Investigating pre-service teachers of language working in such environment provides an overview of the role of technological availability in institutions that are building capacity and responding to national demands to modernize their institutions at the same time. The demographic heterogeneity and the changing academic organization of the university provide it with an analytical usefulness as a place of research on the point of intersection of institutional resources and pedagogical perception within the emerging educational system.

It is against this background and theoretical context that the current study will respond to a major gap by investigating technological availability as a predictor of perceived usefulness of VR among pre-service language teachers in one of the federal universities in Nigeria. By identifying the case of an institution that represents an infrastructural growth and a systemic limitation, the study gets the realities facing most of the public universities in the country. It is likely that the findings will produce evidence that will inform the institutional investment decisions, curriculum reform, and strategic planning concerning the integration of immersive technologies. Devoid of empirical knowledge on the role of access in the formation of perception, any program promoting the use of VR in teacher education may end up being a mere formality, instead of a change agent. As a result, exploring this

relationship in a dynamic and representative institutional setting will be of academic value as well as practical, thus offering an interesting rationale behind the study.

Existing studies have predominantly emphasized psychological determinants such as attitudes, behavioral intention, perceived ease of use, and self-efficacy, often drawing from technology acceptance frameworks (Enyiazu,(2021), Taggart et al.(2023), van der Want & Visscher (2024), Tariq & Ahmad(2025). While these studies provide valuable insights into individual-level acceptance mechanisms, they tend to under emphasize the structural and infrastructural realities that shape technology integration, particularly in developing educational systems. Although the Richard E. Mayer Cognitive Theory of Multimedia Learning provides a strong explanation of how immersive technologies enhance learning through dual-channel processing and active cognitive integration, limited scholarly attention has been given to how institutional access conditions enable or constrain the realization of these cognitive affordances. In contexts where technological infrastructure is unstable or inadequate, the theoretical advantages of immersive environments may not translate into meaningful professional preparation experiences.

Within Sub-Saharan Africa, and especially in Nigerian higher education, empirical evidence on VR integration in language teacher education remains scarce. Most Nigerian studies on educational technology adoption have examined general ICT usage without isolating immersive technologies or empirically testing technological availability as a structural predictor of pedagogical perceptions. Consequently, there is insufficient understanding of whether and how access to VR resources influences pre-service teachers' judgments of its instructional value. Addressing this gap, the present study examines technological availability as a structural predictor of perceived usefulness of Virtual Reality in Nigerian language teacher education, thereby situating cognitive evaluation within institutional and infrastructural realities.

This study advances a structural-cognitive perspective on immersive technology adoption in teacher education by empirically demonstrating that technological availability significantly predicts perceived usefulness of Virtual Reality among pre-service language teachers in a developing-country context. Unlike dominant adoption models that conceptualize perceived usefulness primarily as an internal psychological construct, this research positions it as partly shaped by material access and infrastructural exposure. By integrating contextual accessibility with the cognitive assumptions of the Richard E. Mayer Cognitive Theory of Multimedia Learning, the study contributes a nuanced understanding of how institutional resources condition the realization of immersive pedagogical affordances. In doing so, it foregrounds structural readiness as a precursor to cognitive and pedagogical

acceptance in low-resource higher education systems.

Purpose of the Study

The study aimed to investigate technological availability as a predictor of perceived usefulness of Virtual Reality in language teacher education among pre-service teachers in Nigeria.

Specifically, the study sought to:

1. Determine the level of technological availability of VR resources in the language teacher education programs in the mind of pre-service teachers.
2. Assess the perceived usefulness of VR in language teacher education.
3. Examine the relationship between technological availability and perceived usefulness of VR among pre-service language teachers in Nigeria

Methodology

Research Design

This study adopted a descriptive correlational research design. This design was deemed to be suitable since the research was aimed at establishing the degree of technological availability of VR resources, anticipated usefulness of VR in language teacher education, and the correlation between technological availability and perceived usefulness among pre-service teachers. Through the correlational method, the researcher was able to establish the predictive effect of technological availability to perceived usefulness without controlling any variable.

Area of the Study

It was carried out in Federal University Oye-Ekiti in Ekiti State in Nigeria. The institution provides accredited teacher education programmes and presents proper academic environment to study problems associated with integrating technology in the preparation of language teachers.

Population of the Study

The sample size included all pre-service teachers of language studying in the Faculty of Education, Federal University Oye-Ekiti in the academic session of 2025/2026. These encompassed students in the English Education and other education programmes which deal with languages at all the levels of study. The group of teachers was approximated to be 412 pre-service teachers.

Sample Size and Sampling Technique

The study sample was 203 pre-service teachers. The size of the sample was calculated with the help of the formula of Taro Yamane to determine the sample size with 0.05 level of significance in finite populations. The proportionate stratified random sampling method was used to give the representation among the year levels (100-400 level). Simple random sampling was done in selecting participants within each of the stratum. Such a method increased representativeness and reduced sampling bias.

Instrument for Data Collection

The structured questionnaire was a Technological Availability and Perceived

Usefulness of Virtual Reality Questionnaire (TAPUVRQ) that was used to collect the data. The tool was divided into three parts. Section A included 4 questions that generated socio-demographic data of gender, age and year of study. Section B had 12 questions that assessed technological availability of Virtual Reality resources in the language teacher education programme. Section C included 10 questions which measured the perceived usefulness of Virtual Reality in the education of language teachers. Section B and C were all designed using a 4-point Likert scale starting with Strongly Disagree (1) and Strongly Agree (4). Three specialists in Educational Technology and Measurement and Evaluation validated the instrument, which is why the content and face validity were ensured. A pilot study involving 30 pre-service teachers of a neighbouring university that were not included in the main study was done. Cronbach alpha was used to test the consistency of the instrument. Co-efficients of reliability of the TAPUVRQ were also high with the overall yielding a 0.87 and Section B and C providing a 0.84 and 0.89 correspondingly.

Ethical Approval

The Research Ethics Committee of the Faculty of Education, Federal University Oye-Ekiti, provided the ethical approval to the study. The study was purposeful, and the participants were aware of the study purpose. All respondents gave informed consent and responses were ensured confidentiality. No personal data were gathered and information was utilized with academic purposes only.

Method of Data Collection

The researcher administered the questionnaire directly to the selected pre-service teachers during scheduled lecture periods with the permission of course lecturers. The purpose of the study was explained to the participants before distribution of the instrument. Completed questionnaires were collected immediately to ensure a high return rate.

Method of Data Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS), version 26. Descriptive statistics such as frequency counts and percentages were used to analyze the socio-demographic characteristics of the participants. To address Objective 1 and Objective 2, mean and standard deviation were computed to determine the level of technological availability and perceived usefulness of Virtual Reality respectively. To address Objective 3, Pearson Product Moment Correlation and simple linear regression analysis were employed to examine the relationship between technological availability and perceived usefulness, and to determine the predictive influence of technological availability on perceived usefulness. The level of significance was set at 0.05.

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Results

Table 1: Socio-Demographic Characteristics of Participants (N = 203)

Variable	Category	Frequency	Percentage
Gender	Male	91	44.8
	Female	112	55.2
Age (years)	18–20	48	23.6
	21–23	104	51.2
	24–26	40	19.7
	27 and above	11	5.4
Year of Study	100 Level	50	24.6
	200 Level	51	25.1
	300 Level	54	26.6
	400 Level	48	23.6
Area of Specialization	English Education	135	66.5
	Other Language Education	68	33.5

Table 1 shows that a slightly higher proportion of respondents were female (55.2%) compared to male (44.8%). The majority of participants (51.2%) were between 21–23 years old. Representation across year levels was relatively balanced, with 300-level students slightly leading (26.6%). Most respondents specialized in English Education (66.5%). This even distribution demonstrates that the sample is wide enough to draw any valuable conclusions about the perception of VR in the language education of pre-service teachers.

Table 2: Level of Technological Availability of VR Resources

VR Resource Availability	Mean (x̄)	Std. Dev	Level of Availability
Access to VR headsets	2.48	0.82	Low
Availability of VR software	2.35	0.79	Low
Technical support for VR use	2.21	0.75	Low
Stable electricity and internet	2.65	0.88	Moderate
Adequate VR-based instructional guides	2.30	0.77	Low
Overall Technological Availability	**2.40**	**0.80**	**Low**

Table 2 results show that overall, the level of technological availability of VR resources in the language teacher education program is low with an overall average of 2.40. The access to stable electricity and internet (mean = 2.65) was rated as somewhat improved by the participants, yet such fundamental tools as VR headsets, software, and instructional guides were lacking. This implies that the infrastructural constraints might limit meaningful interaction with VR among the pre-service teachers.

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Table 3: Level of Perceived Usefulness of VR in Language Teacher Education

Perceived Usefulness Statement	Mean (x̄)	Std. Dev	Interpretation
VR enhances understanding of language concepts	3.18	0.61	High
VR improves teaching skills and classroom management	3.05	0.64	High
VR promotes engagement in learning activities	3.12	0.58	High
VR provides authentic language practice	3.21	0.60	High
VR is likely to be used in future teaching practice	3.08	0.63	High
Overall Perceived Usefulness	**3.13**	**0.61**	**High**

Table 3 indicates that pre-service teachers find VR to be of great value in terms of language teacher education with the mean of 3.13. The participants were in agreement that VR can improve understanding, give a practice that is realistic, increase engagement, and classroom preparation. In the professional development of pre-service teachers, VR has the potential to be beneficial as teachers are aware of the technological advantage in their learning irrespective of low technological availability.

Table 4: Relationship between Technological Availability and Perceived Usefulness

Variables	1	2	r	p-value
1. Technological Availability	1			
2. Perceived Usefulness	3.13	1	0.62**	<0.001

Table 4 shows that there is a positive and significant correlation between the technology availability and perceived usefulness of VR ($r = 0.62$, $p < 0.001$). This implies that the more VR resources are made available to pre-service teachers, the better they will perceive it to be useful in language teacher education. The finding confirms the predictive value of technological access in the formation of the attitude to VR adoption in educational institutions.

Discussions

This presents the discussion of the key findings of the research by placing them in the context of existing empirical evidence as well as theoretical views with the purpose of elucidating the observed tendencies, clarifying their educational implications, and drawing their policy, practice, and research implications in the field of language teacher education. This study found that pre-service teachers had poor technological delivery of Virtual Reality materials in their language teacher training programme. This is not a surprise because of infrastructural and financial constraints, which most institutions in developing systems of education have. Restricted availability of VR equipment, application, and technical support is

inherently a natural limitation of exposure and real-world interaction. This observation is in line with previous studies done in resource limited settings. In a case in point, Nyaaba, Akanzire, and Nabang (2024) noted that despite Nokia nature of pre-service teachers in Ghana, who showed interest in VR during their first encounter, the lack of adequate infrastructure and unstable internet connectivity were cited by them among the biggest barriers to integration. The qualitative case study that they provided showed that the infrastructural gaps play an important role in determining the likelihood of implementation. Similarly, Park and Son (2022) also pointed out that institutional support and curriculum design strongly associated with readiness of pre-service EFL teachers in Hong Kong regarding computer-assisted language learning, which is also a strong emphasis of structured preparation. In the same vein, Alalwan et al. (2020) found that the absence of competency, environmental factors, and instruction design curtailed the use of VR and AR in contexts of developing countries. The implication of this result is that the pedagogic promise of immersive technologies will not be realized in Language teacher education programmes unless there is a conscious institutional investment in digital infrastructure and training.

Moreover, this research found out that the pre-service teachers perceived Virtual Reality as very useful in promoting language teaching and learning. The observation is mainly expected due to the fact that immersive environments are consistent with new forms of learner-centred pedagogy and experience-based language education. Being exposed to VR conceptually or practically, pre-service teachers might realize its potential to recreate the real-life communicative cases and become more engaged. This finding is congruent with the current research on attitudes of teachers towards immersive technologies. In one example, in an international survey of a large sample, Khukalenko et al. (2022) have indicated relatively positive teacher perceptions of VR integration in the classroom, especially when the frequency of use was greater. According to their findings familiarity leads to acceptance. Similarly, Annamalai, Uthayakumaran, and Zyoud (2023) discovered that Malaysian high school teachers related AR and VR to active learning and better student engagement, but they also noted that some practical issues were involved. Despite the fact that there are VR sceptics among Iranian teachers even before professional development, after experience, the attitudes did change to more positive ones, which means that experience can change attitudes. Conversely, Shadiev et al. (2024) note that VR significantly improved participants language abilities, cultural understanding and communication skills. The implication is that pre-service teachers can be open to VR-based innovations, which will also serve as a solid base in introducing the curriculum in case it is facilitated in the future by reinforcing enabling conditions. In the same, Fan (2025) VR-enhanced teaching boosts classroom interactivity, language

proficiency, and learner confidence, while recognizing technical barriers like hardware requirements and pedagogical adaptation challenges, the research puts forward optimization strategies

Furthermore, the regression proved that the correlation between the level of technological availability and the perceived usefulness was statistically significant and positive, meaning that the higher the access to the VR resources is, the higher the perception of the instructional value. This tendency is theoretically consistent since familiarity, experiential knowledge and the informed assessment are made easier through access. The more people tend to relate to technology meaningfully, the more level and positive is their evaluation of its utility. This finding is in line with technology acceptance literature. Almahamid et al. (2010) defined that perceived usefulness was a predictive variable in intention to use e-government services among the Jordanian citizens, which confirmed the critical role of the utility perceptions in decision making about adoption. Equally, as demonstrated by Yang et al. (2014), access to alternative technological platforms also contributed to the relative significance of perceived usefulness in embracing mobile self-service technologies, and the contextual significance of access. Shah and Attiq (2016) have also established that greater quality of technology and perceived usefulness were also sources of satisfaction in e-learning environments. Though Tahar et al. (2020) have mentioned that perceived usefulness did not have a significant effect on the intention to use e-filing in their case, this difference indicates that contextual factors might mediate the relationships between technology acceptance. The implication of the current finding is that enhancing the accessibility of VR to teacher education programmes is likely to have a positive impact on positive perceptions and, eventually, lead to permanent integration into class-related instruction.

Limitations and Future Research

While this study provides valuable insights into the relationship between technological availability and perceived usefulness of Virtual Reality in language teacher education, several limitations should be acknowledged. First, it was conducted in a single institution, limiting generalizability. Multi-institutional studies are recommended. Second, the cross-sectional design does not establish causality. Longitudinal and experimental research could provide stronger evidence. Third, reliance on self-reported measures may introduce response bias. Future studies should incorporate behavioral and observational data.

Additionally, perceived usefulness was measured largely at a conceptual level due to limited VR exposure. Structured experimental implementation would allow deeper evaluation. Lastly, the study focused solely on technological availability. Future research should incorporate mediating and moderating variables such as digital literacy, institutional support, and pedagogical self-

efficacy. Comparative regional studies across Sub-Saharan Africa and investigations into downstream outcomes such as classroom implementation and student learning impact are also recommended.

Conclusion

This study examined technological availability as a predictor of perceived usefulness of Virtual Reality in Nigerian language teacher education. Despite low infrastructural access, pre-service teachers expressed strong belief in VR's pedagogical value. Importantly, technological availability significantly predicted perceived usefulness, explaining a substantial proportion of its variance. The findings suggest that in developing higher education systems, structural readiness precedes and conditions cognitive acceptance. Sustainable immersive technology integration in Language teacher education therefore requires deliberate infrastructural investment alongside pedagogical innovation. By foregrounding technological availability as a structural determinant of evaluative judgment, this study contributes a context-sensitive framework for understanding immersive technology adoption in low-resource educational systems.

Recommendations

Following the outcomes of the research, it is possible to suggest the following recommendations:

1. The management of the university should focus on the availing of the necessary VR facilities such as headsets, compatible software, reliable internet connectivity, and the services of the technical support to expose the pre-service teachers practically.
2. To provide a guided and pedagogically sufficient use of immersive technologies, the faculty of Education must internalize organized VR-based instructional units into the language teacher education programs.
3. They should be arranged regularly (in training workshops and professional development programmes) to enhance the competence and confidence of pre-service teachers regarding the pedagogical use of VR.
4. Funding agencies and policy makers in the education sector ought to provide specific grants to help in the purchase and upkeep of immersive technologies in state universities, especially in developing countries.
5. Future studies ought to continue the study to various institutions in Nigeria through longitudinal or experimental research to have a further study on the sustained effect of access to VR on teaching competence and intentions to adopt technologies.

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