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Research Article

Perspectives Of Teachers On Using Virtual Reality In The Teaching And Learning Process In Higher Education

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ABSTRACT

The current study looks at teachers' thoughts on the usage of virtual reality (VR) in higher education. The investigation involved a representative sample of 300 college instructors from the Kozhikode district. Using a mixed-methods approach with a sequential explanatory design, the study used an attitude scale and an interview schedule as key data collection tools. Quantitative investigation found a statistically significant variation in instructors' opinions about VR implementation based on their professional experience. Although the overall mood was quite positive, respondents suggested some reservations or incomplete conviction about full-scale adoption. The qualitative investigation, which used theme and PEST analytical methodologies, discovered both enabling and restricting factors driving VR adoption in higher education. The findings emphasize that, while VR has significant potential to transform teaching and learning practices, effective integration necessitates adequate institutional infrastructure, ongoing professional development, and policy-level support to ensure pedagogical and operational sustainability.

Keywords: Virtual reality, Higher Education

Introduction

It has long been acknowledged that one of the most promising ways to improve the teaching-learning process is through information and communication technology (ICT). Artificial Intelligence (AI) has emerged as one of the most significant and user-friendly advancements in the field of education as a result of the rapid evolution of ICT applications in recent years. The idea that combining several cutting-edge technologies might greatly enhance instructional strategies and learning results has been strengthened by ongoing research. Virtual reality (VR), augmented reality (AR), extended reality (XR), cloud computing, and blockchain are a few of these innovations that have the potential to revolutionize a variety of educational settings.

Technological advancements have historically sparked significant changes in society and education. Today's digital advancements are changing the frameworks of information transmission and interaction, just as the introduction of movable-type printing revolutionized knowledge dissemination and redefined reading and learning. The idea of the metaverse, a complex digital ecosystem where the real and virtual worlds coexist and interact harmoniously, has emerged in this continuum as a result of the convergence of immersive and decentralized technology.

VR, AR, and XR are just a few of the immersive technologies that make up the metaverse, which gives users access to incredibly realistic and interactive learning environments. These technologies make it possible to replicate sensory experiences that improve comprehension and involvement. This ecosystem is further strengthened by blockchain technology, which ensures ownership and authenticity in virtual learning environments through safe, transparent transactions and digital asset management. In a similar vein, digital twin technology enhances conceptual knowledge by replicating real-world systems and encouraging analytical and reflective learning. These developments are supported by cloud computing, which offers the infrastructure required to maintain expansive, easily available, and cooperative virtual learning environments.

With these advancements, an era of immersive, adaptable, and inclusive digital learning is emerging in the educational scene. With the help of integrated technology, the metaverse offers higher education revolutionary opportunities for creative teaching methods, experiential learning, and international cooperation. But this

change also brings with it issues with institutional readiness, digital equity, and psychological flexibility. Understanding educators' viewpoints on the adoption and integration of such technology is therefore crucial. Examining teachers' opinions regarding the usage of virtual reality and related immersive technologies in higher education is the main goal of this study. The research aims to discover factors influencing technological acceptability and to emphasize the benefits and problems that the metaverse may offer to teaching and learning in the academic context by investigating experiences, perceptions, and potential reservations.

Objectives of the Study

1. To compare the perceptions of college teachers on Virtual Reality based on
   i) Gender
   ii) Year of experience
2. To find out the strengths and challenges faced by teachers on using Virtual Reality equipped classrooms

Hypothesis of the Study

1. There exists significant difference in the mean scores of attitudes of college teachers towards using Virtual Reality in higher education based on
   i) Gender
   ii) Year of experience

Materials and Methods

To accomplish the goals and verify the validity of the hypothesis, a mixed methodological design utilizing the sequential explanatory technique was employed. A representative sample of 300 teachers from various colleges in the Kozhikode area made up the study sample. Here, stratified random sampling is the method of sampling that is employed. Interviews were conducted based on the purposiveness.

Instrument

Data collection constitutes a crucial component of the research process, as it enables the verification, validation, or rejection of tentative hypotheses and generalizations (Koul, 1984). The accuracy and reliability of any study largely depend on the appropriateness of the instruments employed for gathering data. Accordingly, two instruments were used for data collection in the present study.

1. Attitude Towards Virtual Reality Usage Scale
2. Interview Schedule

Both instruments were carefully designed and standardized with close alignment to the objectives of the research to ensure the validity and relevance of the data obtained.

Process

The investigation started with the administration of the perception scale in both offline and online modes. To enable the respondents to share in-depth perspectives, an interview was then conducted. The ethical guidelines of anonymity and impartial treatment were adhered to when collecting the data.

The scale on insights on use virtual reality is a five-point scale which consisted of 24 items on relevant areas. The scale was tried out first and then item analysis were carried out. Also, the validity and reliability were established.

The interview schedule consisted of 10 items. Following the instrument's pilot testing, an interview was conducted and the results were analyzed in accordance with the stated objectives.

Data Analysis

Following the completion of data collection, the data were exported and readied for use with the Statistical Package for Social Sciences (SPSS) v.26. During this process, statistics such as average and standard deviation (SD) were calculated, the instrument's validity and reliability were assessed.

Results and Findings

This section aims to present the fundamental findings of the study organized in the form of figures and tables for optimal visualization. The results are organized as two sections based on the type of analysis.

SECTION A: QUANTITATIVE ANALYSIS

Comparison of attitude towards use of Virtual Reality according to gender:

The results obtained for the comparison of attitude towards virtual reality according to gender are reflected in Table 1

Table 1 *t-test for gender differences for attitude towards use of virtual reality in classrooms*

Group	N	Mean	SD	t value	p value
Male	129	60.6	9.37	1.8	0.23
Female	171	58.4	10.1		

The mean of attitude scores for male and female teachers is found to be Mean=60.6 & SD = 9.37 and Mean = 58.4 & SD = 10.1 respectively. It indicates that male and female teachers have a high attitude towards metaverse introduction.
Z- value is found to be Z = 1.8 at significance level of 0.05, which is not statistically significant Therefore, there is no significant difference in attitude towards metaverse introduction, between male and female teachers.

Comparison of attitude towards virtual reality according to experience in years.

The results obtained for the comparison of attitude towards metaverse introduction according to years of experience are reflected in Table 2.

Table 2 *t-test for years of experience differences for attitude towards use virtual reality*

Group	N	Mean	SD	t value	p value
Above 10 years	125	61.3	7.4	2.08	0.05
Below 10 years	175	59.4	7.8		

The mean of attitude scores for teachers who have experience below 10 years and above 10 years are found to be Mean=61.3 & SD = 7.4 and Mean = 59.4 & SD = 7.8 respectively. It indicates that regardless of experience the attitude towards metaverse introduction is high among teachers.
z-value is found to be t = 2.08 at significance level of 0.05 which is statistically significant Therefore, there is a significant difference in attitude towards metaverse introduction, between teachers who have experience below 10 years and above 10 years.

SECTION B: Qualitative Analysis

A qualitative research interview seeks to cover both a factual and meaning level, though it is usually more difficult to interview on a meaning level (Kvale, 1996). When a researcher wants an in depth understanding of the interviewee's perceptions and feelings in his or her own words, a qualitative interview is the method of choice. The present study attempted to investigate the attitude towards the usage of virtual reality in classrooms among teachers in higher education. The interview was conducted on 20 teachers in higher education from different colleges.

Data Analysis

The second stage of the analysis was reviewing the preliminary codes. The researcher then focused on developing overarching elements and higher-level sub-themes while preserving the diversity of the original codes. In the third step, the investigator's examination found quotations that were consistent with the major themes. The themes needed to be reviewed before they could be defined and named. After the subjects were settled upon, the report writing began.

Thematic analysis and PEST analysis techniques were used and the data and results are presented below:

Thematic Analysis

The qualitative portion of the study, which was analyzed using theme and PEST frameworks, showed several variables defining instructors' attitudes on the usage of Virtual Reality (VR) in higher education. The emergent themes from the data reflect the pedagogical opportunities, technological hurdles, ethical implications, and institutional contexts that influence educators' opinions toward VR integration.

1. **Pedagogical Potential**: Progressive educators saw VR as a transformational pedagogical technology that might enhance the teaching-learning process through immersive and experiential involvement. They stressed its potential to improve conceptual understanding, student motivation, and the reality of abstract information. Yet some teachers expressed cautious optimism, acknowledging VR's promise but emphasizing the necessity for established pedagogical frameworks and empirical evidence of its long-term impact on learning outcomes. A minority saw virtual reality as a supplementary rather than essential teaching tool, afraid that it would divert students' attention away from primary learning objectives.
2. **Technological Readiness and Concerns**: Teachers with technology expertise expressed enthusiasm for VR adoption, noting its potential to modernize instructional procedures and boost involvement. Others expressed pragmatic concerns about technical faults, software-hardware compatibility issues, and the necessity for ongoing technical support. Some educators with little technological experience raised concerns, noting the complexity of VR tools and infrastructure as potential impediments to effective classroom use.

3. **Equity and Accessibility**: Several participants saw VR as a viable option for inclusive education, catering to varied learning styles while also giving equitable access to virtual experiences that might otherwise be unavailable in regular classrooms. Nonetheless, concerns have been raised about the affordability of VR equipment, unequal access to digital infrastructure, and the likelihood of exacerbating existing disparities between well-resourced and under-resourced institutions.
4. **Professional Development and Institutional Support**: Teachers with prior experience or training in educational technology had a considerably more positive attitude toward VR integration. They emphasized the need of institutional investments in professional development, technical guidance, and ongoing capacity building. In contrast, poor assistance and orientation were seen as important barriers, resulting in feelings of unpreparedness and reluctance to use VR-based teaching approaches.
5. **Ethical and Privacy Considerations**: Educators generally recognized the necessity to protect students' privacy and data security in virtual environments. While some saw VR as a tool for developing digital citizenship and ethical awareness, others were concerned about the potential misuse of personal data, surveillance concerns, and exposure to offensive content. Participants advocated for strong ethical principles and institutional regulations to ensure responsible VR-based interactions.

Key Findings

Thematic interpretation yielded the following main findings:

- Virtual reality (VR) has the potential to transform training by combining interactivity, imagery, and experience learning.
- Proper teacher training and implementation frameworks are crucial for VR's educational success.
- While VR integration can increase inclusion and engagement, equal access to technology is necessary to eliminate digital imbalances.
- Successful VR adoption requires institutional preparation, reliable infrastructure, and ongoing technical assistance.
- Clear ethical norms and privacy safeguards are necessary for safe and responsible use of immersive technologies.

The study found that instructors had a good attitude towards VR, but widespread acceptance requires extensive institutional methods to overcome technological, pedagogical, and ethical issues.

PEST Analysis

A PEST analysis examines the Political, Economic, Social, and Technological factors influencing a particular domain. In the context of this study, the analysis highlights how these external factors shape higher education teachers' perceptions of the adoption and integration of Virtual reality in teaching and learning environments.

Table 3 *PEST Analysis of Teachers' Perceptions on the Use of Virtual reality in Higher Education*

Factors	Key Features
Political	Government laws governing virtual learning environments and digital education can have a substantial impact on the inclusion of technology into higher education. Supportive laws, regulatory frameworks, and enough government financing for educational technology efforts can help to integrate metaverses into institutional processes. Conversely, stringent restrictions or a lack of policy direction may impede adoption.
Economic	The cost of creating, implementing, and sustaining virtual environments is a significant financial consideration for organizations. Financial limitations or economic downturns may restrict investment in immersive technologies. When comparing metaverse-based learning to traditional teaching techniques, institutions frequently consider the return on investment (ROI) to establish viability and sustainability.
Social	Teachers' perspectives and willingness to implement these technology treatments are influenced by public attitudes towards digital learning and virtual environments. While metaverse platforms can foster dynamic and inclusive learning experiences, questions about accessibility and equality remain, especially if students lack access to the necessary digital infrastructure. Teachers' alignment of metaverse use with students' learning preferences and pedagogical goals influences acceptance levels.
Technological	Rapid improvements in virtual reality (VR) and augmented reality (AR) technology have improved metaverse functioning, accessibility, and engagement. However, the successful integration of these technologies is contingent on the availability of dependable hardware, robust internet connectivity, and interoperability with existing learning management systems. Teachers' preparation and comfort in using technology tools are also important factors in successful adoption.

Conclusion

According to the analysis and opinions received from experts, higher education should make advantage of technological developments in order to be more efficient and learner-friendly. It also stated that teachers are favourable about the introduction and use of virtual reality in higher education. Experience is equally important in this context. The in-depth investigation could also indicate that the process of employing virtual reality is still in its early stages, with some concerns that need to be solved as soon as feasible. Many elements influence how the introduction presents its opinion. With all the newer advances in the field of Artificial Intelligence, it is of greatest essential to check all these concepts and make use of them for the sustainability.

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