



EXPLORING THE USE OF VIRTUAL REALITY (VR) IN ENHANCING EDUCATIONAL LEADERSHIP TRAINING FOR EDUCATIONAL LEADERS IN DELTA STATE

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Abstract

This research examined the use of Virtual Reality (VR) as a tool to improve leadership training for secondary school principals in Delta State, Nigeria. A quasi-experimental approach was employed, utilizing a structured questionnaire with closed-ended questions to collect quantitative data. The study involved 120 secondary school principals, who were randomly divided into two groups: an experimental group that received VR-based leadership training and a control group that participated in traditional training. The data were analyzed using ANCOVA to evaluate the impact of VR training on principals' engagement, decision-making skills, and overall learning outcomes, while accounting for initial differences. The results indicated that the VR group showed significantly greater engagement, enhanced decision-making abilities, and superior learning outcomes compared to the control group. The immersive qualities of VR provided a more interactive and dynamic learning experience, allowing participants to engage with realistic simulations. These findings revealed the potential of VR to enhance leadership training, particularly in regions facing challenges such as limited resources and high rates of teacher turnover. The study suggested integrating VR into leadership development programs to better prepare educational leaders with the essential skills needed to navigate the changing demands of modern educational leadership.

Keywords: Virtual Reality, Educational Leadership, Leadership Training, Professional Development, Technology in Education, Immersive Learning

1.1 Introduction

As education continues to evolve, effective leadership is increasingly recognized as a key factor in the success of schools. In Nigeria, secondary school principals play a central role in driving educational change, as they manage the academic, administrative, and operational functions of the school system. The influence of their leadership extends to various aspects of the school, including student performance, teacher effectiveness, and the overall atmosphere within the institution. However, the ability of principals

to lead effectively is often dependent on the quality of the training they receive. Traditional methods of leadership development, such as workshops, seminars, and mentoring, have been shown to have limitations in addressing the complex and dynamic nature of educational leadership (Ogunyemi & Adeoye, 2018). These methods often lack the capacity to provide immersive, hands-on experiences where principals can actively engage with real-world challenges in a secure, regulated setting.

Incorporating technology into educational leadership training has the potential to fill this gap. Specifically, Virtual Reality (VR) has garnered interest due to its ability to create engaging and interactive learning experiences. VR enables individuals to experience realistic simulations of various situations that may be difficult or impossible to replicate through traditional training methods. In educational leadership, VR-based simulations offer principals the opportunity to practice key leadership skills, such as decision-making, resource management, and conflict resolution, in realistic yet risk-free scenarios (Bers & Gallo, 2020). The immersive nature of VR has been demonstrated to enhance engagement, improve information retention, and facilitate the development of practical skills (Gomez et al., 2019; Liu et al., 2021). These advantages suggest that VR could offer significant benefits for training educational leaders, particularly in complex, high-stakes situations where leadership decisions directly affect the outcomes of students and staff.

In Nigeria, efforts to integrate technology into education have gained momentum in recent years. In Delta State, for instance, government initiatives have aimed to enhance digital literacy and promote technology-driven educational practices (Delta State Government, 2025). These initiatives, however, have primarily focused on student learning, with relatively little emphasis placed on the professional development of educational leaders. Although digital tools like VR have been explored in other contexts, their use in the training of secondary school principals in Nigeria remains largely under-researched. This gap highlights the necessity for research studies that explore how VR might contribute to enhancing the professional development of school leaders, particularly in regions like Delta State, where educational challenges are unique.

Previous research on VR in educational settings has shown promise; however, much of it has focused on student-centered learning rather than leadership training (Okojie & Reitano, 2018). Furthermore, while VR has been utilized to enhance cognitive and behavioral skills in various fields, its application in educational leadership is still in its early stages of development. A study by Cai and Lin (2020) highlights how VR has been successfully used to develop decision-making skills in leadership contexts, but such applications remain sparse in the literature concerning secondary school principals, especially in Nigerian settings. The demand for research on VR-based leadership training is particularly urgent in Delta State, where principals face challenges such as limited resources, high teacher turnover, and ongoing needs for professional development (Eze & Okonkwo, 2019).

The potential of VR to enhance educational leadership training is a timely and relevant topic. Studies have shown that VR provides distinct benefits in enhancing engagement and offering hands-on learning experiences (Vines et al., 2021). By immersing principals in lifelike simulations, VR can enable them to engage with complex leadership tasks, make real-time decisions, and receive feedback on their actions. However, despite the promising findings in other areas of education, the use of VR to support the development of educational leaders in Nigeria, particularly in Delta State, remains underexplored. The integration of VR into leadership training for principals could offer a new, effective approach to professional development, ensuring that school leaders are better equipped to meet the challenges of the 21st century.

Given this context, it is evident that research is needed to explore the effect of VR on leadership training for secondary school principals in Delta State. Such a study could offer valuable insights into how VR can be incorporated into leadership development programs and whether it leads to improved engagement, decision-making abilities, and overall learning outcomes for principals. The findings will contribute to the existing knowledge on the role of VR in educational leadership and provide crucial evidence for policymakers and educators seeking to enhance the professional development of school leaders.

1.2 Statement of the Problem

Strong leadership in secondary schools is essential for enhancing student performance, teacher effectiveness, and overall school administration. In Nigeria, principals hold a key responsibility in guiding the direction and development of educational institutions. However, many principals in Delta State, like those in other regions of the country, face numerous challenges, including limited resources, high staff turnover rates, and the pressure of implementing educational reforms. Traditional methods of leadership training, such as seminars and workshops, often fail to provide principals with the practical, immersive experiences necessary to tackle these complex challenges. These conventional approaches focus largely on theoretical knowledge, leaving principals without adequate opportunities to develop the hands-on skills required for real-world decision-making and crisis management. The need for more effective, innovative training methods to prepare school leaders for these challenges is therefore undeniable.

Given these constraints, emerging technologies, especially VR, present a promising approach to improve leadership training for secondary school principals. VR can create realistic, immersive environments where principals can engage in simulations of leadership scenarios, such as conflict resolution, resource allocation, and staff management. This technology has been successfully implemented in other fields, such as business and healthcare, to improve decision-making and leadership skills. However, the application of VR in educational leadership training, especially in Nigeria, remains relatively underexplored. Despite the growing interest in integrating technology into education, there has been limited research on the ability of VR to meet the unique training needs of secondary school principals in Delta State. This gap in the literature represents a significant opportunity for research that could potentially revolutionize the way educational leaders are trained and developed.

Given the increasing emphasis on digital technologies in education and the clear limitations of traditional training methods, it is essential to explore how VR could improve the leadership capabilities of secondary school principals in Delta State. The lack of empirical research on the effects of VR-based leadership training in this context is a critical issue that warrants attention. It is essential to understand how VR can impact engagement, decision-making abilities, and overall leadership performance to advance educational leadership in the area. This study seeks to address this gap by examining the effectiveness of VR in improving the leadership development of principals. The findings aim to provide valuable evidence that could guide policy-making and contribute to the creation of more effective, technology-enhanced leadership training programs for secondary school principals in Delta State.

1.3 Purpose of the Study

The main purpose of this study is to explore the potential of Virtual Reality (VR) in enhancing educational leadership training. Specifically, the study aims to:

1. Examine the effect of VR on the engagement of educational leaders during leadership training
2. Investigate how VR-based simulations impact the decision-making skills of educational leaders; and

3. Assess the influence of personalized VR training on the learning outcomes of novice educational leaders.

1.4 Research Questions

The research is framed on these key questions:

1. What is the effect of Virtual Reality (VR) on the engagement of educational leaders during leadership training?
2. What effect does VR-based simulation have on the decision-making skills of educational leaders?
3. How does personalized VR-based leadership training affect the learning outcomes of novice educational leaders?

1.5 Hypotheses

The following hypotheses were also tested in the study:

1. There is no significant difference in the levels of engagement between educational leaders who participate in VR-based leadership training and those who undergo traditional leadership training.
2. There is no significant difference in the decision-making skills of educational leaders who undergo VR-based simulations compared to those who receive conventional leadership training.
3. There is no significant difference in the learning outcomes of novice educational leaders who receive personalized VR leadership training and those who participate in standardized leadership training programmes.

2. Methods

The study utilized a quasi-experimental design with pre-test and post-test assessments to evaluate changes in principals' leadership skills following exposure to either VR-based or traditional leadership training. The experimental group underwent VR-based training, while the control group participated in conventional leadership training. Both groups were evaluated before and after the training sessions. The pre-test aimed to measure baseline leadership abilities, while the post-test assessed any changes in engagement, decision-making skills, and leadership outcomes resulting from the respective training methods. This design was effective in assessing the impact of VR training compared to conventional training by directly measuring changes in leadership skills and behaviors.

A quasi-experimental design was selected due to the study's practical limitations, particularly the inability to randomly assign participants to different groups. The two groups were pre-established, with one group receiving VR-based leadership training and the other undergoing traditional training. The pre-test and post-test assessments enabled the evaluation of the interventions' effectiveness, while acknowledging the constraints imposed by the lack of random assignment. This design enabled a clear comparison between the VR-based training and traditional training, isolating the effects of the type of training on principals' skills.

The study's population consisted of all secondary school principals in Delta State, Nigeria, which comprised 25 Local Government Areas (LGAs). To ensure a representative sample, a stratified random sampling method was used. This approach ensured that principals from both urban and rural areas were included, capturing a broad range of leadership experiences. A total of 120 principals were selected to take part in the study, with 60 assigned to the experimental group (VR-based leadership training) and 60 to the

control group (traditional leadership training). The larger sample size was chosen to enhance statistical power and reduce potential sampling errors. All selected principals were invited to participate on a voluntary basis, with comprehensive details about the study, the type of training, and the time commitment required provided in advance.

Data were collected using a structured, self-administered questionnaire, which was administered to both groups before and after the training. The questionnaire assessed three key constructs related to the study's objectives: engagement in leadership training, decision-making abilities, and leadership competencies. The items were all close-ended and were rated using a 5-point Likert scale, ranging from "Strongly Disagree" to "Strongly Agree", providing purely quantitative data. To ensure the instrument's validity, it was reviewed by experts in educational leadership and measurement to verify that the items accurately measured the intended constructs. Additionally, a pilot test was conducted with a small group of principals from a neighboring state to assess the clarity, relevance, and suitability of the questionnaire items. Based on feedback from the pilot, modifications were made to improve the instrument before it was administered to the full sample.

To assess the reliability of the instrument, a Cronbach's alpha coefficient was computed for the scale items in the questionnaire. The resulting reliability coefficient of 0.85 indicated a strong level of internal consistency, suggesting that the instrument was dependable for measuring the intended constructs. The reliability of the instrument was further supported by the consistent administration of the tool by trained research assistants, ensuring that the data collection process was standardized and reliable.

The questionnaire was administered by the researcher, with the support of trained research assistants, to ensure consistency in the study's administration. The research assistants helped distribute the questionnaires, collect completed ones, and ensure that the data collection process ran smoothly. They also provided clarification to the participants when necessary to ensure that the responses were accurate and reliable.

Prior to the administration, the research assistants underwent training to familiarize them with the research process, including how to approach participants, ensure informed consent, and address any questions or concerns that might arise during data collection. The research assistants were instructed to maintain a professional and neutral stance while administering the questionnaire, ensuring that the principals' responses were not influenced by external factors. The data collection occurred over the course of one month, during which the pre-test and post-test questionnaires were distributed to the principals in both groups.

The quantitative data gathered from the pre-test and post-test questionnaires were analyzed using descriptive statistics, which helped summarize the data and compute mean scores and standard deviations. To test the hypotheses, Analysis of Covariance (ANCOVA) was employed to adjust for any baseline differences between the groups and to evaluate the effect of VR-based training on leadership skills while considering pre-existing variations.

The study adhered to ethical guidelines, and approval was obtained from the appropriate educational authorities in Delta State. All participants were provided with detailed information about the study's objectives, the procedures involved, and their right to withdraw at any point without facing any adverse consequences. Informed consent was obtained from all participants, who were also assured that their responses would remain confidential. To safeguard participants' privacy, the data were anonymized, and the results were presented in aggregate form to ensure that no individual could be identified.

3. Results

What is the effect of VR on the engagement of educational leaders during leadership training?

Table 1: Descriptive Statistics for Engagement

Group	N	Pre-Test Mean	Post-Test Mean	Mean Difference	Pre-Test SD	Post-Test SD
VR	60	2.85	4.35	1.50	0.45	0.55
Traditional	60	2.90	3.25	0.35	0.50	0.60

Table 1 illustrates that the experimental group (VR training) experienced a substantial increase in engagement, with a mean difference of 1.50, whereas the control group showed a smaller increase of 0.35. The VR group had a higher mean score on the post-test, suggesting that VR training had a more significant impact on engagement compared to traditional training methods. The standard deviations indicate some variability in both groups, but the experimental group exhibited a more considerable improvement in post-test scores. This suggests that VR-based training positively influences the engagement of educational leaders during leadership development.

What effect does VR-based simulation have on the decision-making skills of educational leaders?

Table 2: Descriptive Statistics for Decision-Making Skills

Group	N	Pre-Test Mean	Post-Test Mean	Mean Difference	Pre-Test SD	Post-Test SD
VR	60	3.00	4.00	1.00	0.40	0.50
Traditional	60	3.10	3.60	0.50	0.45	0.55

Table 2 shows that the experimental group (VR-based simulation) had a mean difference of 1.00, indicating a larger improvement in decision-making skills compared to the control group, which had a mean difference of 0.50. The VR group's higher post-test mean suggests that VR training was more effective in enhancing decision-making skills. The standard deviations for the post-test further highlight the variability in scores, with the experimental group showing more diverse responses, indicating varying levels of improvement. This implies that VR-based simulation positively impacts the decision-making skills of educational leaders.

How does personalized VR-based leadership training affect the learning outcomes of novice educational leaders?

Table 3: Descriptive Statistics for Learning Outcomes

Group	N	Pre-Test Mean	Post-Test Mean	Mean Difference	Pre-Test SD	Post-Test SD
VR	60	2.80	4.25	1.45	0.55	0.60
Traditional	60	2.75	3.15	0.40	0.60	0.65

Table 3 shows that the experimental group (personalized VR-based training) experienced a notable improvement in learning outcomes, with a mean difference of 1.45. In contrast, the control group demonstrated a smaller improvement, with a mean difference of 0.40. The higher post-test mean for the experimental group highlights the effectiveness of VR-based training in enhancing learning outcomes. While the standard deviations indicate some variability within both groups, the VR group displayed a more

substantial and noticeable improvement. This suggests that personalized VR-based leadership training positively impacts the learning outcomes of novice educational leaders.

There is a significant difference in engagement levels between educational leaders trained using VR and those trained using traditional methods, after controlling for baseline differences.

Table 4: ANCOVA Results for Engagement

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	105.20	2	52.60	70.91	0.000
Intercept	22.15	1	22.15	30.21	0.000
Pretest	10.80	1	10.80	14.54	0.001
Methods (VR vs. Traditional)	45.60	1	45.60	55.60	0.000
Error	24.80	118	0.21		
Total	70.40	120			
Corrected Total	130.00	119			

The ANCOVA results for engagement reveal a significant difference between the experimental group (VR-based training) and the control group (traditional training), with an F value of 55.60 and a p-value of 0.000. This indicates that VR-based training has a significantly greater impact on engagement than traditional training methods. The significant Pretest term further confirms that baseline engagement levels were effectively controlled. These findings imply that VR-based training positively influences the engagement of educational leaders when compared to traditional methods.

There is a significant difference in decision-making skills between educational leaders trained using VR and those trained using traditional methods, after controlling for baseline differences.

Table 5: ANCOVA Results for Decision-Making Skills

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	55.50	2	27.75	37.16	0.000
Intercept	12.00	1	12.00	18.50	0.000
Pretest	8.30	1	8.30	12.61	0.001
Methods (VR vs. Traditional)	20.10	1	20.10	27.05	0.000
Error	16.80	118	0.14		
Total	36.90	120			
Corrected Total	72.30	119			

The ANCOVA results for decision-making skills show a significant effect for Methods (VR vs. Traditional), with an F value of 27.05 and a p-value of 0.000. This indicates that VR-based simulation significantly improves decision-making skills compared to traditional methods. The Pretest term is also significant, ensuring that baseline differences in decision-making skills were properly controlled for. This implies that VR-based simulation positively impacts the decision-making skills of educational leaders.

There is a significant difference in learning outcomes between educational leaders trained using VR and those trained using traditional methods, after controlling for baseline differences.

Table 6: ANCOVA Results for Learning Outcomes

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	145.20	2	72.60	93.52	0.000
Intercept	18.50	1	18.50	22.75	0.000
Pretest	25.60	1	25.60	31.45	0.000
Methods (VR vs. Traditional)	58.75	1	58.75	65.82	0.000
Error	52.80	118	0.45		
Total	111.55	120			
Corrected Total	198.00	119			

The ANCOVA results for learning outcomes show a significant difference between the VR-based training group and the traditional training group, with an F value of 65.82 and a p-value of 0.000. This shows that VR-based leadership training leads to significantly better learning outcomes. The Pretest term is also significant, confirming that baseline learning outcomes were properly controlled for in the analysis. This implies that personalized VR-based leadership training significantly improves learning outcomes for novice educational leaders.

5. Discussion

The study revealed a significant difference in engagement levels between educational leaders who received training through Virtual Reality (VR) and those who underwent traditional training methods. The VR group exhibited significantly greater engagement, suggesting that VR-based training captured participants' attention more effectively than traditional methods. This finding aligns with previous research suggesting that immersive and interactive technologies, such as VR, are more engaging than traditional, lecture-based learning methods. One probable reason for this enhanced engagement is the immersive nature of VR, which creates a hands-on, interactive learning environment. Unlike traditional training, which often relies on passive instruction, VR allows participants to actively engage with the content, making learning more dynamic and stimulating. Previous studies, such as those by Makransky et al. (2019), support this conclusion by demonstrating that VR can significantly enhance learner engagement through a rich, interactive experience that traditional methods cannot provide. Similarly, Freeman et al. (2017) also found that VR-based learning environments, through their immersive and participatory nature, enhanced engagement compared to more conventional, non-interactive training methods. Roussou (2020) further supported this, demonstrating that VR learning environments foster engagement by providing opportunities for direct interaction and decision-making in realistic scenarios.

Additionally, the study found that VR-based simulation significantly improved the decision-making skills of educational leaders compared to those who underwent traditional training. The experimental group demonstrated a greater improvement in decision-making abilities, indicating that VR-based simulations offer a more effective platform for practicing and refining these skills. The interactive nature of VR allows participants to make decisions within a controlled, risk-free environment, where they can experience the consequences of their actions in real-time. This ability to engage with and learn from simulated scenarios likely contributed to the development of stronger decision-making skills. Several studies have supported this finding. Slater et al. (2017) concluded that VR experiences enhance decision-

making skills by providing realistic, interactive simulations that require individuals to utilize critical thinking and problem-solving abilities. McMahon et al. (2015) found that VR simulations significantly improve decision-making by allowing participants to practice in environments that mimic real-world situations, which is consistent with the current study's results. Choi et al. (2016) also highlighted that VR-based training allows learners to develop decision-making skills in a controlled environment, where they can repeatedly practice and refine their choices without facing real-world consequences.

Moreover, the study found that VR-based leadership training led to significant improvements in learning outcomes for novice educational leaders. The VR group demonstrated better learning outcomes, suggesting that the interactive and immersive aspects of VR-based training provided a more effective learning platform than traditional methods. One of the probable reasons for this finding is the ability of VR to offer personalized, experiential learning opportunities. Traditional training methods often rely on passive learning through lectures, which may not provide sufficient opportunities for active practice and skill application. In contrast, VR-based training enables learners to interact with virtual environments and simulate real-world scenarios, thereby deepening their understanding and enhancing their ability to apply what they've learned. This finding is supported by recent studies. Mikropoulos and Natsis (2018) demonstrated that VR enhances learning outcomes by creating an engaging and immersive environment that allows learners to apply their knowledge in realistic scenarios. Anderson and Lawton (2020) also found that VR learning environments significantly improve the application of knowledge, suggesting that immersive experiences help learners better retain and apply what they have learned. Dede (2021) further supports this, noting that VR-based training environments provide learners with unique opportunities for experiential learning, which is crucial for improving learning outcomes in complex fields such as leadership.

6. Conclusion

This study concluded that Virtual Reality (VR)-based training is highly effective in improving the engagement, decision-making skills, and learning outcomes of educational leaders. The findings clearly indicate that VR outperforms traditional methods by providing an immersive, interactive learning environment that actively engages participants. The VR-based training led to significant improvements in all three key areas, showing that it offers a more effective approach to leadership development for educational leaders compared to conventional, passive training methods.

7. Recommendations

From the findings, the study offers the following recommendations:

1. Educational institutions and organizations should incorporate VR into their professional development programs for educational leaders to enhance engagement and improve key leadership skills.
2. Policymakers and educational administrators should invest in the infrastructure necessary to implement VR-based training, including the acquisition of VR equipment and software.
3. Educators and trainers should receive training on how to effectively integrate VR into leadership development programs to maximize its benefits.
4. Educational institutions should work with technology providers to make VR platforms accessible and affordable for a broad range of participants, ensuring that all educational leaders can benefit from this innovative training method.

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