

# Augmenting Office Automation Skills Through Virtual Reality–Based Instruction Among Business Education Students in Nigerian Universities

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## ABSTRACT

This study investigated the effect of Virtual Reality–Based Instruction (VRBI) on Business Education students' achievement in office automation in selected state universities in Ekiti and Ondo States, Nigeria. A quasi-experimental pretest–posttest non-equivalent control group design was adopted. The population comprised 759 Business Education students across three state universities offering Business Education programmes in the two states. A sample of 198 students was drawn from one randomly selected university in Ekiti State and the only state university offering Business Education in Ondo State. Intact classes were assigned to experimental ( $n = 113$ ) and control ( $n = 85$ ) groups. The intervention lasted five weeks. Data were collected using the Office Automation Achievement Test (OASAT), which yielded a KR-20 reliability coefficient of .86. Research questions were answered using mean and standard deviation, while hypotheses were tested using Analysis of Covariance (ANCOVA) at a .05 level of significance. Results revealed a significant effect of VRBI on students' achievement,  $F(1,195) = 82.23, p < .001, \text{partial } \eta^2 = .297$ . Gender had no significant influence on achievement among students exposed to VRBI,  $F(1,110) = 1.38, p = .243, \text{partial } \eta^2 = .012$ . The study concludes that VRBI significantly enhances office automation achievement irrespective of gender. It is recommended that VR technology be integrated into Business Education curricula in Nigerian universities to bridge the graduate employability gap.

**Keywords:** Virtual Reality–Based Instruction, Office Automation, Business Education, ANCOVA, Gender.

## Introduction

Modern workplaces have radically transformed due to the rapid advancement of digital technologies, making graduates with strong office automation abilities more in demand. Employers today demand university graduates to be adept in digital record management, word processing, spreadsheet analysis, electronic communication, and presentation design. The requirement for business education programs to produce graduates who are technologically proficient, practically talented, and theoretically sound has increased as a result. Office automation is the process of automating routine managerial and administrative tasks in the workplace using computer-based technology to boost productivity, accuracy, and efficiency [4]. In the context of business education, office automation skills are crucial employability skills that prepare students for modern professional environments.

However, evidence indicates that a large number of Nigerian university graduates still lack sufficient practical skills in office applications, mostly as a result of instructional methods that prioritize lecture-based delivery over experiential learning [1;9]. Nigerian higher education institutions often employ traditional teaching methods that restrict students' access to repeated practice, contextual learning, and authentic task performance. Consequently, students may learn concepts without gaining the functional skills needed in real workplace environments.

This disconnect between what students are taught in the classroom and what they encounter in the workplace has continued to worry teachers, legislators, and business owners.

Virtual Reality (VR) is one of the most promising of the new instructional technologies for overcoming this problem. VR is an immersive technology that allows learners to engage with computer-generated environments that replicate real-world scenarios. Virtual reality facilitates experiential learning by offering three-dimensional, interactive experiences that let students complete assignments, get immediate feedback, and improve their skills through repeated practice in a secure setting [8]. Meta-analytical research has shown that, in comparison to traditional instructional methods, VR-based education greatly improves learning outcomes, motivation, and skill development [5].

The instructional value of VR in higher education is supported by recent empirical findings. According to [12] VR-based training is especially successful for teaching skills and procedures, while [3] found that immersive virtual environments enhance learner engagement and real-world proficiency. These results indicate that VR has a great deal of promise in improving office automation training by replicating real-world workplace settings where students may learn document preparation, spreadsheet operations, electronic filing, and professional communication.

In the African environment, technology-enhanced learning has been shown to enhance student participation and skill development [4-5]. Research, particularly in Nigeria, suggests that ICT-supported education has a beneficial impact on students' academic performance and employability skills [1;9]. In spite of this proof, the integration of immersive technologies like virtual reality into business education is still restricted, mostly as a result of infrastructural challenges, insufficient instructor training, and a paucity of empirical research to support its efficacy.

The current research was carried out in Ekiti State and Ondo State, two adjacent states in southwest Nigeria that have similar educational and historical features. As a result of the establishment of Ekiti State in 1996 from the old Ondo State, the two states now have comparable cultural, administrative, and educational systems. The study of education benefits from these similarities as a valuable comparative background. In addition, the two states provide three state universities with Business Education programs, with two campuses in Ekiti State and one in Ondo State, which makes them suitable locations for researching educational advancements in similar institutional settings.

Gender is another crucial factor in technology-based learning. Earlier research on gender differences in technology-supported achievement has produced conflicting results, with some studies favouring males and others finding no notable variations. Recent VR research suggests that immersive environments can lessen gender disparities by minimizing traditional classroom biases and providing equal access to learning opportunities [7]. Nonetheless, there is little empirical evidence regarding the impact of gender in Business Education supported by VR in Nigeria. In light of the increasing significance of digital literacy, the ongoing skill deficits among grads, and the restricted use of immersive technologies in Nigerian business education, empirical research into creative teaching approaches is clearly necessary. In light of this, the current study looked at the impact of Virtual Reality-Based Instruction on the development of office automation skills among business education students at chosen Nigerian colleges, as well as gender differences in performance.

### Statement of the Problem

Even with practical training included in the curriculum, many Business Education graduates in Nigeria are still not proficient in office automation tools like electronic filing, spreadsheet operations, and document processing. Employers are still complaining about skill shortages that hurt graduate employability. It seems that conventional teaching approaches are not adequate for fostering these abilities. In Nigeria, the effect of virtual reality on gender performance gaps and workplace automation skills among Business Education students is still understudied, despite its proven effectiveness in other fields. As a result, this study investigated whether VR-based teaching increases office automation skills and if there are gender differences in the performance of students who are exposed to VRBI.

### Purpose of the Study

The purpose of the study was to examine the impact of virtual reality-based education on the office automation abilities of business education students.

Specifically, it aimed to:

1. determine differences in achievement between students taught using VRBI and those taught using conventional methods;
2. examine the effect of gender on students' achievement when taught with VRBI.

### Research Questions

1. What are the mean achievement scores of students taught office automation skills using VRBI and those taught using conventional methods?
2. What difference exists between male and female students' achievement when taught using VRBI?

### Null Hypotheses

H<sub>01</sub>: There is no significant difference in the achievement of students taught using VRBI and those taught using conventional methods when pretest scores are controlled.

H<sub>02</sub>: There is no significant difference between male and female students' achievement when taught using VRBI.

### Methodology

#### Design of the Study

In this investigation, a quasi-experimental approach was employed. The study employed a pre-test, post-test, nonequivalent control group design. When it is not feasible for the researcher to randomly select the participants and allocate them to treatment groups without interfering with the academic programs of the schools participating in the study, a quasi-experimental design can be utilized, according to [2]. Additionally, [2] argued that all groups could receive treatments in a non-equivalent control group design. This design was deemed appropriate for the research since the two distinct groups in this study—the Virtual Reality-based instructional and control groups—were given whole classes (non-randomized groups).

E<sub>G</sub>: O<sub>1</sub> x O<sub>2</sub>

C<sub>G</sub>: O1 O2

Virtual Reality-Based Instruction

Where

- O1 = Pretest
- O2 = Posttest
- X = VRBI treatment

### Population and Sample

The population consisted of 759 Business Education students across three state universities in Ekiti and Ondo States. The sample comprised 198 students. One university in Ekiti was selected via random sampling, and one in Ondo was selected purposively. The experimental group (n=113) and control group (n=85) were based on existing class structures.

### Instrumentation

The instrument for data collection for this study was the Office Automation Skills Achievement Test (OASAT), which the researcher created. The OASAT instrument consisted of 30 multiple-choice questions with five choices that were divided into two versions (A) and (B). As previously mentioned, the OASAT A has 30 test questions, while the OASAT B has all the questions from A but with all the options and items rearranged for each of the 30 questions.

The purpose of this change is to reduce students' excessive familiarity with an arrangement model. The pre-test was conducted using the OASAT (A) version, whereas the posttest was conducted using the OASAT (B) version. The research's test questions focused on word processing, spreadsheets, presentations, digital file management, and electronic communication. The class instructor, who is also the research assistant at the experimental school, employed the Office Automation lecture handbook to instruct the experimental group, whereas the control group received instruction utilizing traditional lecture-demonstration techniques. Two Business Education and one test and measurement specialists validated the instrument. A university that was not involved in the experiment served as the location for the OASAT pilot trial. Internal consistency reliability of the OASAT was established using KR-20, yielding  $r = .86$ .

### Experimental Procedure

The experimental procedure was planned in accordance with the study's objectives, the chosen areas of office automation, the Virtual Reality-Based Instruction (VRBI) lesson guides, the research instruments, and the overall execution of the study. The research took place throughout regular lab sessions at the participating universities. The experiment utilized complete classes, so the number of students in the experimental and control groups may not have been the same. The Office Automation Skills Achievement Test (OASAT) was given to both groups as a pretest before the start of classes to determine a baseline of equality. Instructional activities utilizing a prepared laboratory guide for both groups began right after the pretest.

### Instructional Activities for the Experimental Group (Virtual Reality-Based Instruction)

Students in the experimental group were taught office automation skills using Virtual Reality-Based Instruction through the following steps:

#### 1. Choosing subjects and creating virtual reality material

In partnership with the course instructors, the researcher chose fundamental office automation subjects like word processing, spreadsheet manipulation, presentation creation, and basic database activities. Realistic office environments and practical task scenarios were mirrored in the previously created virtual reality training modules and simulations.

#### 2. Orientation and Familiarization Session

The students in the experimental group were given an introduction to the virtual reality gear and learning environment before the start of therapy. The emphasis of this orientation was on teaching participants how to use the VR headsets, navigate virtual interfaces, utilize simulated office equipment, and adhere to safety regulations.

#### 3. The Learning Environment and Learner Organization

To guarantee efficient access to virtual reality equipment, students were divided into manageable subgroups within the whole class. While some subgroups were engaged in guided practice utilizing additional resources, others took part in rotational VR sessions. With this setup, every student had access to the virtual simulations during each lesson period.

#### 4. The Use of Virtual Reality in Instruction

Students learnt real-time skills like document formatting, spreadsheet calculations, slide development, and file

management in realistic virtual office environments during instruction. The VR environment supported skill development through interactive feedback, demonstrations, and step-by-step instructions. The lecturer acted as a facilitator, directing students, explaining ideas, and helping students who struggled with technical or conceptual challenges.

### 5. Surveillance and Documentation

The instructor kept a diary of students' engagement, participation, and task completion. Special emphasis was placed on pupils' proficiency with virtual instruments, the precision of their actions, and their methods of problem-solving. With the use of these records, it was possible to track the pace of learning and pinpoint areas where more help was needed.

### 6. Sessions for guided Reflection and Feedback

Brief reflection periods were held at the conclusion of each class, during which students shared their experiences in the virtual world. The instructor encouraged students to use their new skills, reinforced proper methods, and offered constructive criticism. This method increased student confidence and helped them learn more effectively.

The Laboratory guide designed for VR-based instruction was comprehensive and clearly outlined objectives, learning activities, assessment strategies, and required resources for each session.

### Instructional Activities for the Control Group (Conventional Method)

Students in the control group were taught the same office automation topics using conventional teaching methods, which involved lectures, demonstrations on whiteboards or projectors, and limited hands-on practice using standard computer laboratory facilities. Instruction followed the regular departmental lesson plans without exposure to VR simulations.

### Duration of Treatment and Posttest

Each instructional session lasted between one and two hours depending on the institutional timetable. The treatment spanned five weeks.

At the end of the treatment period, the OASAT was re-administered to both experimental and control groups as a posttest. The scores obtained were used to determine differences in achievement between the two groups.

### Data Analysis

The data collected from the pre-test, and post-test administration analyzed using the mean to address the research questions. The research hypotheses were evaluated using Analysis of Covariance (ANCOVA) at a significance level of 0.05. This is because the initial disparities between groups were eliminated by ANCOVA as a statistical approach, allowing the selected or pre-tested groups to be treated as equal or equivalent by statistically adjusting posttest scores for initial pretest differences in the pre-test performance across groups and reducing the between-group source variation [8].

## RESULTS AND DISCUSSION

### Research Question 1

1. What are the mean achievement scores of students taught office automation skills using VRBI and those taught using conventional methods?

Table 1

| Group               | N   | Pretest Mean | Pretest Posttest SD Mean | Posttest SD | Mean Gain |
|---------------------|-----|--------------|--------------------------|-------------|-----------|
| Experimental (VRBI) | 113 | 41.98        | 6.14 79.51               | 6.54        | 37.53     |
| Conventional        | 85  | 42.31        | 6.27 69.84               | 7.02        | 27.53     |

Table 1 indicates that the treatment group taught with Virtual Reality-Based Instruction had a mean score of 41.98 in the pretest and a mean score of 79.51 in the posttest. The posttest mean gain in the group taught with Virtual Reality-Based Instruction is 37.53. The group taught with conventional method had a mean score of 42.31 in the pretest, a posttest mean of 69.84 and a mean gain of 27.53. Thus, students taught with Virtual Reality-Based Instruction have higher mean gain.

## 2 What difference exists between male and female students' achievement when taught using VRBI?

### Pretest and Posttest Mean Achievement Scores of Male and Female Students Taught with VRBI

Table 2

| Gender | N   | Pretest Mean | Pretest Posttest SD Mean | Posttest SD | Mean Gain |
|--------|-----|--------------|--------------------------|-------------|-----------|
| Male   | 43  | 42.16        | 6.24 78.42               | 6.85        | 36.26     |
| Female | 70  | 41.87        | 6.09 80.17               | 6.31        | 38.30     |
| Total  | 113 |              |                          |             |           |

Table 2 reveals that male students recorded a pretest mean score of 42.16 (SD = 6.24) and a posttest mean of 78.42 (SD = 6.85), resulting in a mean gain of 36.26. Female students had a pretest mean of 41.87 (SD = 6.09) and a posttest mean of 80.17 (SD = 6.31), yielding a mean gain of 38.30.

Although female students showed a slightly higher mean gain than their male counterparts, the difference is marginal. This suggests that both genders benefited substantially from Virtual Reality-Based Instruction. The slight difference observed in favour of female students necessitated further inferential analysis using ANCOVA to determine whether the difference was statistically significant.

## Hypothesis 1

H<sub>01</sub>: There is no significant difference in the achievement of students taught using VRBI and those taught using conventional methods when pretest scores are controlled.

Table 3: ANCOVA Summary of the Effect of VRBI on Students' Achievement

| Source of variation  | Sum of squares | DF  | Mean square | F     | Sig of F Partial η <sup>2</sup> |
|----------------------|----------------|-----|-------------|-------|---------------------------------|
| Pretest (Covariate)  | 518.42         | 1   | 518.42      | 13.16 | .001 .063                       |
| Instructional Method | 3240.56        | 1   | 3240.56     | 82.23 | .001 .297                       |
| Error                | 7684.13        | 195 | 39.41       |       |                                 |
| Total                | 11443.11       | 197 |             |       |                                 |

Significant at  $p < .05$

An Analysis of Covariance (ANCOVA) was conducted to examine the effect of instructional method on students' posttest office automation achievement while controlling for pretest scores. The result revealed a statistically significant main effect of instructional method,  $F(1,195) = 82.23, p < .001, \text{partial } \eta^2 = .297$ , indicating a large effect size. This suggests that approximately 29.7% of the variance in posttest achievement was attributable to the instructional method. The covariate (pretest score) was also statistically significant,  $F(1,195) = 13.16, p < .001, \text{partial } \eta^2 = .063$ , indicating that prior knowledge significantly influenced students' posttest performance.

## Hypothesis 2

H<sub>02</sub>: There is no significant difference between male and female students' achievement when taught using VRBI.

This hypothesis was tested using Analysis of Covariance (ANCOVA) with pretest scores as a covariate.

Table 4: ANCOVA Summary of Male and Female Students' Achievement in VRBI Group

| Source of variation | Sum of squares | DF  | Mean square | F    | Sig of F |
|---------------------|----------------|-----|-------------|------|----------|
| Pretest (Covariate) | 412.36         | 1   | 412.36      | 9.74 | .002     |
| Gender              | 58.47          | 1   | 58.47       | 1.38 | .243     |
| Error               | 4507.92        | 110 | 40.98       |      |          |
| Total               | 5214.83        | 112 |             |      |          |

Significant at  $p < .05$

The ANCOVA result revealed no significant gender effect on students' achievement in the VRBI group ( $F(1,110) = 1.38, p = .243$ ). This implies that Virtual Reality-Based Instruction enhanced office automation skills of both male and female students comparably, indicating that the strategy is gender-neutral in its instructional effectiveness.

## Discussion of Findings

The finding for Research Question One revealed that, when compared to the conventional teaching method, Virtual Reality-Based Instruction (VRBI) significantly improved students' performance in office automation. Students subjected to VRBI outperformed others, indicating that immersive educational settings foster procedural learning by realistically mimicking workplace activities. Conventional lecture-based instruction might not be sufficient to develop the necessary skills in office automation, which calls for repeated practice and task-based mastery in addition to conceptual comprehension. VRBI addresses this shortcoming by providing experiential interaction with virtual office systems, hence enhancing cognitive integration, skill retention, and performance confidence. The discovery is theoretically in line with constructivist learning theory, which holds that people actively create knowledge by engaging with their environment. Additionally, it supports empirical data reported by [6] and [11] who found that immersive virtual environments enhance learning outcomes, presence, and engagement in instruction that focuses on skills.

After accounting for pretest performance, the outcome of Hypothesis One provided additional evidence that the instructional strategy had a substantial impact on students' achievement. The significant impact size attained (partial  $\eta^2 = .297$ ) suggests that, in addition to its statistical significance, VRBI also had significant practical value. This degree of impact implies that the instructional intervention was responsible for about 30% of the variation in post test performance. In educational intervention studies, where many uncontrolled environmental and learner-related variables often affect results, the magnitude of such an effect is especially significant. Recent meta-analytical research [3;6] has discovered significant learning impacts linked to immersive instructional technologies, and the results are consistent with these findings. Additionally, the result supports the notion that competency-based vocational education benefits especially from experiential learning environments that are supported by technology.

The research found no significant differences in the performance of male and female pupils who were exposed to VRBI for Research Question Two.

The similarity in performance results suggests that immersive virtual learning environments may offer fair access to chances for skill development. In the Nigerian educational environment, where gender differences in technology-related learning have been documented in several conventional instructional environments, this conclusion is especially noteworthy. The findings imply that VRBI may lower the sociocultural and instructional obstacles that occasionally affect engagement in tech-mediated learning. Recent literature suggests that immersive technologies foster inclusive participation by delivering uniform learning experiences regardless of learner gender characteristics, and the result is in line with this. The test of Hypothesis Two demonstrated that the impact of gender on performance among pupils taught using VRBI was not statistically significant. This suggests that Virtual Reality-Based Instruction is a gender-neutral teaching method for learning office automation skills. By offering interactive, learner-centered experiences, immersive learning environments may lessen historical gender inequalities in technological education, as indicated by the lack of a significant gender effect. [12] noted that immersive instructional systems can improve practical acquisition.

### Conclusion

The office automation abilities of business education students in the states of Ekiti and Ondo were greatly improved by virtual reality-based instruction. Gender had no discernible effect on accomplishment, but VR-trained students scored better than those taught traditionally. VR is consequently a useful teaching method for enhancing business education students' practical competency.

### Recommendations

Based on the findings, it is recommended that:

1. VR-based instructional approaches be integrated into Business Education curricula.
2. Universities and government agencies provide VR facilities and technical support.
3. Lecturers receive training in VR-supported pedagogy.
4. Further studies to examine long-term retention and broader vocational applications of VR be carried out.

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