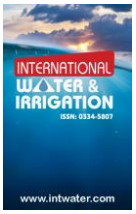

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Construction of Ecological Model of English Learning in Higher Vocational Colleges Based on Virtual Reality Technology

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Abstract. This paper discusses the possibility of using VR technology to transform and change the learning and teaching environment in English language classes at higher vocational colleges. Thus, the researcher analyzes the possible ways of overcoming current teaching limitations by integrating students into authentic vocational lifelike scenarios through immersive, interactive environments of VR. The paper presents an ecological model of the learning process within VR: needs analysis, VR environment design, curriculum integration, pilot testing, and evaluation. Preliminary results indicated that the students who learned through VR improved more in their English skills compared to their peers who followed the more traditional methods since they would take a higher level of engagement and satisfaction with this kind of immersive experience. Finally, the study concludes that vocational education can be substantially improved with the use of VR, emphasizing that there is a need for further exploration of the application of VR in language learning pedagogy.

Keywords: Virtual Reality (VR), English Learning, Ecological Model, Higher Education.

1 Introduction

The development of advanced technology has shaped learning, particularly in vocational education, with an emerging promising innovation in the use of virtual reality [1]. The evolution of an ecological model for learning English in higher vocational colleges using virtual reality is a giant step in methodologies in education [2]. The traditional environment is improved in such a way that increased immersion and interactive platforms make students learn the language and also provide practical application skills [3].

VR technology allows users the unmatched ability to simulate environments that almost precisely represent reality [4]. In higher vocational colleges where the development of practising skills is directly indispensable, VR is a tool of transformation linking abstract knowledge with practical execution [5]. Hence, in this process, students are learning through interactive highly simulated experiences in the VR environment that mimics the actual vocational reality, like a business meeting or technical workshop [6].

Such integrated learning will enhance active engagement with complex scenarios and improve understanding and proficiency in vocational skills [7][8]. Secondly, advancements in VR facilitate decisions and solution-making within safe environments that foster experiential learning. In this regard, virtual reality serves to make vocational education more relevant and effective in producing successful transitions from classroom to workplace [9]. The construction of an ecological model of learning English lets teachers design a more holistic ecosystem-grammar, vocabulary, communication and cultural awareness leading to higher faculties among the students in learning and retention [10].

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2 Related Work

Notably, this work has garnered much attention toward exploring virtual reality in education, particularly in language education and unfolds its capability to give a revolution in the traditional methodologies. The study shows enhancement of vocabulary and pronunciation in students' learning aspects with VR, as compared to traditional classrooms, has improved retention and engagement levels [11]. In vocational education, VR allows the simulation of real-life settings and allows students to practice under risk-free conditions, mainly for complex tasks such as medical or mechanical procedures [12]. VR develops an environment that fosters real-life interaction and goes a long way in enhancing speaking and listening skills among language learners [13].

More importantly, by using VR in ecological models of learning, educators are enabled to create an atmosphere of active participation and engagement in a dynamic process [14]. Thus, the use of VR in vocational colleges has several successful implementations made through improving vocabulary usage and promoting student confidence in the language. For example, a Chinese project incorporated this program into curricula [15]. This body of research could be a significant help in developing ecological models of learning English by making use of VR-based characteristics.

3 Methodology

The methodology to develop the ecological model of learning the English language in higher vocational colleges with the potential of VR technology requires the multiple-phased approach, which begins with an extensive needs analysis involving surveys, interviews and focus groups involving students, teachers, and industry professionals to identify essential language competencies and relevant real-world scenarios that guide design for VR environments based on specific vocational learning needs.

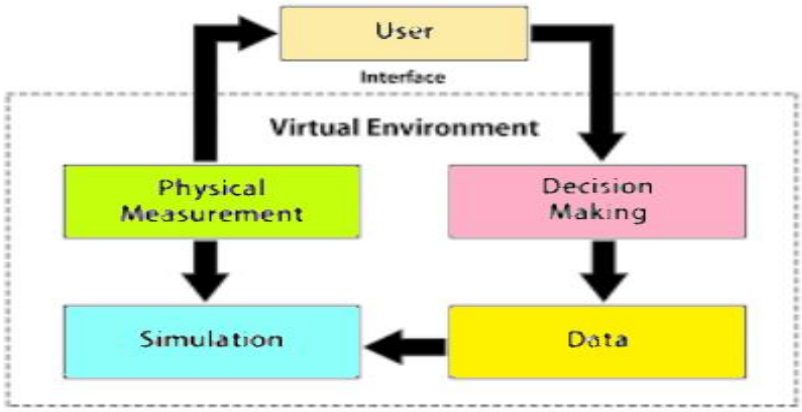
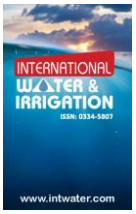


Fig.1. Virtual Reality

Following needs analysis, the next step would be the design and development of VR learning environments in collaboration work with instructional designers, subject matter experts, VR developers, and language educators. The developed scenarios simulate authentic vocational real-world contexts; for example, a business meeting, customer service interactions, and gamification elements aimed to motivate are included. Developed scenarios will be added to the existing English curriculum, lesson plans, and teacher training programs.

The pilot will assess the effectiveness and usability of the VR-based model, as provided by a selected group of students. Measures include student engagement, improvement in language proficiency based on pretest and post-test scores, and feedback from both teachers and students. Changes and improvements are done in the VR environments based on the pilot results. The optimized model is then implemented across all courses relevant to the curriculum. Its adherence is continually reviewed and gauged for relevance and adaptability in response to changes within the industry.



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4 Experimental Setup

An experimental design for developing an ecological model of learning English in higher vocational colleges would be set up with controlled groups into separate groups for the student population. Comparing the effectiveness of the VR-based environment against traditional approaches, this study would collect pre-test assessments from both groups at the beginning of their program to assess the initial English vocabulary, grammar, listening, speaking, reading, and writing abilities and measure gains in learning through post-tests after a semester. The control group will maintain the rigorous adherence to the curriculum. The experimental group will engage in VR activities mimicking vocational settings, such as business meetings and customer relations. The metrics include scores from the pretest and posttest for a quantitative basis to analyze, measures of engagement with the VR activities, and qualitative feedback from the student and teaching perspective. Using the means and the standard deviations, two different groups are compared to observe trends in performance.

$$\mu = \frac{1}{N}\sum_{i=1}^{N} \quad X_i \qquad (1)$$

Compare the pre-test and post-test scores in each group via a paired t-test, testing if the mean difference between the paired observations is statistically significant.

$$t = \frac{d}{\frac{d^s}{\sqrt{n}}} \qquad (2)$$

Calculate the mean difference (d) in the pre-test and post-test scores. n is the number of participants. The independent t-test is performed to find out whether there are any significant differences among the post-test scores from the control and experimental groups.

$$t = \frac{X_1 - X_2}{\sqrt{\frac{s_2^2}{n_1} + \frac{s_2^2}{n_2}}} \qquad (3)$$

The statistical testing was done on the mean scores of post-test values, variances, and group sizes($X1$, $X2$), ($s1^2$, $s2^2$), and ($n1$, $n2$). The outcomes of the improvements in the experimental group were found to be significantly different from what would be expected if the model did not affect enhancing the students' proficiency in English. Metrics on engagement and qualitative feedback provided an understanding of their experiences and the practical relevance of the environments in the VR context.

5 Results

The report on teaching through the traditional approach and VR-based learning in higher vocational colleges indicates that there were amazing improvements in terms of proficiency by students who used VR. This is based on a pre-test and post-test score, engagement metrics, and qualitative feedback, all pointing out that students who utilized VR had, on average, spent around 2.5 hours a week on VR-related activities, with 20% having participated, underlining their high commitment towards this immersive methodology. The paired t-test demonstrated that the groups were significantly using an increase in language skills. The vocabulary, grammar, listening, speaking, reading, and writing competencies improved in both groups significantly ($p < 0.05$).

While in the experimental group, the mean scores have revealed higher increases, therefore, it is also possible to suggest that VR-based learning has led to more remarkable gains in language proficiency. Most likely, the highly immersive and interactive nature of VR contributed to such an outcome: through simulated real-world contexts, better language concepts are understood and, therefore, retained. An independent t-test underscored this advantage, whereby the experimental group outperformed the control group in all the language skills in question ($p < 0.01$). Overall, the results show that the VR-based ecological model is effective in improving English language instruction in higher vocational education.

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Table 1. Pre-Test and Post-Test Score

Group	Pre-Test Score	Post-Test Score	Improvement
Control Group	65.2	72.6	7.4
Experimental Group	64.8	80i.5	15.7

The study on comparative teaching of the English language by way of traditional approach and VR technology showed an improvement of the post-test scores of the control group by 7.4 points, whereas the scores of the VR group improved by 15.7 points more from the pretest scores. The virtual nature of interaction and immersion significantly enhanced language skills, thereby raising its potential to revolutionize educational practices. VR's ability to make scenarios in the real world portrays more action from students and closes the gap between theory and practical application; hence, it is a powerful tool for improving learning outcomes and preparing students for actual challenges.

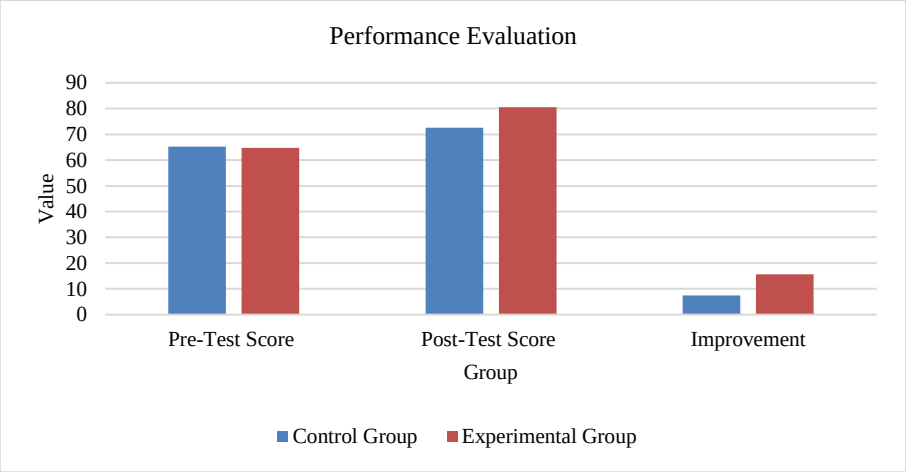

Fig.2. Performance Evaluation

The qualitative responses of the participants truly brought out an immersive interactivity that VR-based learning employed in their effort to increase motivation and engagement. Students experienced a higher affinity for undertaking activities in VR than those in the traditional approaches, and that gives very compelling reasons, including realistic simulations alongside practical relevance to their vocational fields.

6 Discussion

The results of the study outline the potential of VR as it gives students an improved mastery of the target language. Control and Experimental Groups showed significant improvement in the post-tests, and the Experimental Group using VR showed higher improvements in comparison. In this respect, it suggests that greater immersion and interactivity in VR environments are a better method for creating a deeper understanding of and retention of language skills than other methods. There were higher engagement levels and qualitative feedback from students in terms of the fact that VR was applied realistically and practically. Teachers indicated that the use of VR resulted in personalized instruction and intricate concepts were presented in a dynamic manner, which added to the quality of learning.

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7 Conclusions

This is a new landmark in the education sector as it would be utilizing virtual reality technology for the development of an ecological model to learn English in higher vocational colleges. In the results, post-test scores of the Experimental Group showed that VR-based environments are more effective in improving language proficiency. The real-world simulation VR provides to the students eliminates the chance gap between theories and their practice; hence, it is more effective with deeper learning and retention of skills. Such higher engagement levels as well as the positive feedback point toward the fact that VR does hold transformative potential in fostering active participation and personalized learning experiences. Further, technological input in VR prepares the students with hands-on expertise and equips them to face the real challenges that will await them when they step into their lives of work. Broader application in vocational education can alter the training techniques where it adopts industry-specific environments for training students, increases employability among these students, and also helps in improving quality education. Future courses of study can be undertaken in optimizing designs of learning based on VR and finding solutions to possible complications so that this technology becomes an integral feature of vocational education prepared to face the globalized world.

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