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Factors and gender differences in virtual reality adoption in English learning among vocational college students

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ABSTRACT

Virtual reality (VR) has been adopted in the education field, providing students with innovative methods to acquire and practice skills. With the increasing importance of English education in vocational colleges, learning method (LM) should be transformed and improved to enhance learning efficiency. VR is recognized as a valuable tool to improve learning outcomes, yet its application in English education for vocational colleges remains in the early stages. This study investigates the factors affecting VR adoption and examines whether gender difference among students impacts its practical application. Quantitative research method was conducted utilizing questionnaire to examine the factors affecting vocational students' VR adoption in their English learning. Total 520 vocational students were selected as respondents to complete the questionnaire, and the data were analyzed using descriptive statistics (mean and standard deviation) and inferential statistics (independent sample t-test) to identify the differences between gender. The findings revealed that identified factors moderately influence VR adoption and no significant gender differences regarding the challenges vocational students face when using VR to learn. This study contributes to promoting VR adoption in English learning and helps to stimulate students' interest in actively using VR, thereby enhancing learning outcomes and driving the transformation of educational methods.

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1. INTRODUCTION

Virtual reality (VR) technology has been developed over a period and garnered significant attention across various fields, including education. The immersive, interactive and imaginative features of VR provided are beneficial for enhancing learning outcomes by creating realistic environments and engaging students in the learning process [1]. In the context of English education, VR technology has emerged as a useful tool to address traditional teaching disadvantages, such as limited opportunities for practice and lack of authentic language contexts. By simulating real-world scenarios, VR offers vocational college students with practical, interactive opportunities to improve their English proficiency [2].

Despite the benefits and growing interest in VR implementation in English education, its utilization remains uneven, influenced by various factors, including technological infrastructure, students' readiness to embrace innovation, and institutional support [3]. Notably, gender difference in technology adoption have been widely explored in previous studies, suggesting that males and females exhibit different attitudes, motivations and usage patterns when engaging with VR for learning purposes [4]. Given the distinct

educational objectives of vocational college students, who are often overlooked in educational technology research and preparing for the workforce and learning English as communication skills for job markets, the VR implementation in their English learning is particularly significant [5]. Therefore, it is crucial to explore the factors influencing the adoption of VR in English education among vocational college students. Additionally, identifying gender differences in their acceptance of VR can help design more effective educational strategies. This study also aims to provide guidance on leveraging VR technology to enhance English education in vocational colleges and promote effective learning experiences. Unlike previous studies that primarily focus on general or university education, this research highlights the distinct needs of vocational students and examines potential gender differences in VR adoption. The findings contribute to optimizing VR integration in vocational English learning, providing insights to enhance student engagement and improve learning outcomes.

2. LITERATURE REVIEW

The features of VR technology enable it to play an important role in education, allowing students to immerse themselves in a virtual environment and obtain information from such an environment [6]. As Parmaxi [7] mentioned in his study, advances in VR technology have provided more opportunities for learning in virtual learning environments. Understanding the effective ways and influencing factors of VR incorporation into English education is essential for modern English teaching, given the growing popularity and continuous development of VR technologies, alongside increasing interest in their implementation for English education [8]. However, the current status of VR adoption in education confronts several challenges, as observed by Monteiro *et al.* [9] which suggested that VR adoption in educational settings is influenced by factors like institutional support, students' acceptance and technical conditions.

The purpose of integrating VR into English education is to enhance students' learning outcomes by leveraging the benefits of VR to address disadvantages of traditional education, such as lack of personalized education and insufficient language practice environments. The benefits of VR were also verified in the study of Dhimolea *et al.* [8] which found that VR is necessary for effective language learning, particularly in contextual vocabulary acquisition, and that perceptions of language learning in VR environments are generally positive. Unlike other technological tools, VR offers contextualized experiential learning in authentic spaces, helping improve students' communicative abilities, fostering students' active learning, enhancing language learning outcomes and strengthening cultural competence [10]. Student-focused learning, coupled with increased motivation and interest, was identified as the most significant advantages of VR language learning in the study by Symonenko *et al.* [11]. Meanwhile, additional benefits outlined include context dependent knowledge construction through providing context-rich content, personalized learning achieved by offering case-based and real-world learning environments, cultivation of problem-solving abilities through placing students in various task contexts, and fostering reflective practice by immersiving students in a virtual learning environment. Moreover, Yu [12] highlighted the irreplaceable role of VR in education, emphasizing its ability to direct students' attention and its superiority over traditional teaching methods, because VR enables students to experience scenarios, situations and subjects that cannot be replicated in a traditional classroom.

Aside from that, the research conducted by Symonenko *et al.* [11] suggested that VR remains a relatively new technology in language learning, which attributed to lack of literacies among both teachers and students possess. This suggestion aligns with the study of Ustun *et al.* [13] which identified the early stages of VR utilization in language education and predicted its growing popularity due to its potential to enhance learning effectiveness. Similarly, Kim *et al.* [14] concluded that VR is beneficial for vocational education and provides unique opportunities for situated learning experiences, helping students to connect their practical skills to the workplace within virtual learning environment. The advantages of VR in vocational education also verified in the study by Liu *et al.* [15] where they found that VR offers new ways to innovate teaching methods, advance vocational education and develop students' both theoretical knowledge and practical abilities. Generally speaking, VR has potential to improve learning outcomes, stimulate learning motivation and attitude, and encourage the transformation of teaching method.

3. METHOD

3.1. Research design

The quantitative research design was utilized in this study and descriptive research was chosen to obtain findings based on the study's objective. The aim of this study is to examine the factors influencing vocational students in adopting VR for their English learning and whether gender moderates the effects of factors. Thus, descriptive research is an appropriate approach to help achieve the research objectives as it can provide objective and neutral reality [16].

3.2. Research questions

This study formulates specific research questions to investigate the key factors influencing vocational students in the process of adopting VR for English learning. It aims to identify the challenges these students encounter and examine the underlying reasons behind these obstacles. Additionally, the study seeks to compare and highlight any gender-based differences between male and female students in their attitudes and behaviors toward VR integration in English education. The questions are shown as:

- What are the factors affecting vocational college students implementing VR in English learning?
- What is the difference in the factors confronted by male and female students when implementing VR in English learning?

3.3. Sampling

The population for this study consists of students studying in vocational colleges in Jilin Province in China. The total number of enrolled students is 202,800. According to Rahman *et al.* [17] stratified sampling method was commonly used for research investigations at low cost and with more precise results, since the every single individual in the sampling framework has an equal opportunity to be selected as sample. Therefore, stratified sampling method was conducted to narrow down the population, resulting in final 520 respondents were selected in the same proportion from the stratified population across 28 vocational colleges. The population was stratified based on the characteristics of different disciplines or subjects. Based on Krejcie and Morgan table, the commonly employed sample sized determined method [18], 520 respondents are sufficient to complete the research.

3.4. Hypothesis

To examine the differences between genders regarding the influencing factors of VR adoption in English learning among vocational college students, this study proposed the null hypothesis as H0: there is no statistically significant difference between gender on the factors to VR adoption in English learning among vocational colleges.

3.5. Research instruments

The questionnaire was used as instrument in this study since it was seen as an useful data collection tool with specific questions that can receive responses directly [19]. The questionnaire used in this study consists of nine constructs closely related to research topic. Each construct was measured through several items. Table 1 shows the item distribution for each construct.

Table 1. Item distribution for each construct

No.	Construct	No. of items
1	Motivation (M)	5
2	Attitude (A)	5
3	Learning method (LM)	5
4	Course design (CD)	5
5	Previous experience (PE)	4
6	Related training (RT)	5
7	Policy (P)	4
8	Perceived cost (PC)	5
9	Technically (T)	5

3.6. Data analysis

The questionnaire was distributed to students at vocational colleges and the collected data were measured to help understand the challenges associated with VR adoption in English learning process. Both descriptive and inferential statistics were used to analyze the collected with the help of the software IBM SPSS version 27 throughout the study. Descriptive statistics, including mean and standard deviation, were employed to describe findings in this research. The five-point Likert scale data were transformed before analyzation and inferential statistical analysis would proceed smoothly. For inferential statistics, independent sample t-test was conducted to identify the gender differences on the factors that affecting VR adoption in English learning process among vocational college students.

3.7. Mean interpretation

In this study, the mean score levels are interpreted based on the data presented in Table 2. The scores are categorized into three levels: low, moderate, and high, corresponding to the range of 1.00 to 5.00. As shown in the Table 2, these levels reflect the relative intensity of the responses. The low range represents

values closer to 1.00, indicating weaker agreement or less frequent occurrence of the measured factors. The moderate range, centered around 3.00, suggests neutral or average responses. Finally, the high range, approaching 5.00, signifies stronger agreement or frequent occurrence. This categorization helps to provide a clearer understanding of the distribution and intensity of the responses across different variables.

Table 2. Mean interpretation [20]

Level	Mean score
High	3.68-5.00
Moderate	2.34-3.67
Low	1.00-2.33

4. RESULTS AND DISCUSSION

4.1. Descriptive analysis on the factors affecting VR adoption among vocational college students

The objective of this study is to identify the factors affecting VR adoption in English learning among vocational colleges. To achieve this, the descriptive statistics were calculated and displayed to interpret the findings. Table 3 displayes the results, including mean, standard deviation, and level of each construct in instrument. These statistical measures offer a comprehensive view of data distribution and variability. The mean scores reflect the trends and central tendencies within the responses. The standard deviation further informs the degree of dispersion and consistency of data. The levels of each construct provide a clearer understanding of how each factor contributes to the overall adoption of VR in English education.

From Table 3, the results show that most items of the constructs in this study fall in the range of moderate levels. Among the total 43 items, 14 items are at low level and others are all at moderate level. Obviously, there is no item that reaches the high level at all. Although most items show moderate results, the distributions in each construct are varied. From Table 3, the construct nine contains 5 low level items, making it only construct with a total low-level result. The remaining low-level items are roughly evenly distributed in other eight constructs.

As shown in Table 4, the factors affecting vocational students' adoption of VR in their English learning is multi-aspected, as indicated by the mean scores for constructs, including attitude, LM course design (CD), related training (RT), and policy support. Although there is no significant difference among the mean scores of contributing factors, the factors influence VR adoption in English learning among vocational students to varying degrees. The results demonstrate that LM, CD, and attitude are the most influential factors with mean scores of 2.36, 2.35, and 2.34, respectively. The remaining two moderate factors, RT and policy share the same mean score of 2.33. Motivate (M=2.23), perceived cost (PC=2.31) and technically (T=2.25) are factors that have no significant impact on VR adoption.

VR is a useful tool for enhancing students' learning outcomes, but its adoption in real learning situations confronts some obstacles [21]. The findings of the study suggest that LM is one of important factors in the incorporation of VR, which aligns with the idea of Alqahtani and Rajkhan [22]. The LM is related to the objective of institution, including the learning content, content quality, learning strategies, and learning objectives. In detail, VR utilization can be promoted when the learning content is consistent with VR learning environment [23]. Learning content refers to the materials that students adopt through VR environment, which can directly stimulate or hinder students' interests [22]. Content quality is similar to the former, as it also relates to learning materials but highlights the adaptability of learning content and language proficiency [24]. Learning content and content quality together impact students' willingness toward VR adoption. Additionally, learning strategies are also components of the LM and are considered important elements for monitoring students' cognition and motivation [25]. Learning strategies should be innovated to align with the VR learning environment, otherwise, unchanging conventional LM will not only fail to reflect advantages of VR learning but will hinder its use in English learning. Furthermore, learning objective plays a role in the VR learning environment, as it focuses more on the practical ability rather than academic knowledge, learning objectives should be adjusted accordingly [26]. Generally, the LM is a crucial factor affecting students' implementation of VR in their English learning.

CD was identified as a factor influencing VR adoption at a moderate level, meaning it sways students' intentions but with limited power. CD in the virtual learning environment should consider the difficulty of course content, learning content arrangement, and learning effect feedback [27]. Since VR learning environment emphasizes independent learning and provides interactive settings, the course should be designed in a clearer, coherent and comprehensive manner, which is different from the traditional course structures [28]. Additionally, VR technology is mostly used by students to practice their communication skills, thus, the course should be practical to meet the demands of VR learning environment, otherwise,

it could fail to promote VR adoption and even hinder the promotion [29]. As mentioned above, VR learning environment relies more on students' independent learning and engagement [30]. The adoption of VR technology in students' English learning is influenced by whether the course content arrangement aligns with students' learning ability and knowledge foundations and whether the learning outcomes can be effectively feedback to students [29]. Therefore, CD appears to be one of influencing factors that provide a well-structured CD within VR learning environment, encouraging students to adopt VR technology in their English learning.

Table 3. Factors to VR adoption among vocational college students

No	Item	Mean score (M)	Standard deviation (SD)	Level
Construct 1: motivation (M)				
1	I am willing to enhance the English learning outcomes by using VR technology.	1.82	1.030	Low
2	I am willing to practice English skills by using VR technology.	2.36	.792	Moderate
3	I am willing to learn English through VR technology using the immersive learning environment.	2.31	.811	Low
4	I am willing to learn English through VR technology using the student-centered LM.	2.36	.839	Moderate
5	I am willing to learn English through VR technology using the interactive LM.	2.34	.813	Moderate
Construct 2: attitude (A)				
6	I believe that using VR technology will be helpful in English learning.	2.16	1.163	Low
7	I believe that VR technology will further enhance the outcomes of my English learning.	2.39	.829	Moderate
8	I believe the immersive learning environment that VR technology provided will be enjoyable.	2.40	.775	Moderate
9	I believe the student-centered LM that VR technology provided will be satisfying.	2.36	.819	Moderate
10	I believe the interactive LM that VR technology provided will not be boring.	2.40	.813	Moderate
Construct 3: LM				
11	I can participate in English learning activities by adapting VR.	2.22	1.229	Low
12	I can engage myself in solving authentic problem by adapting VR.	2.42	.868	Moderate
13	I can adapt VR in English learning that create better learning environment.	2.40	.861	Moderate
14	I can adapt VR in English learning that help intercultural understanding.	2.39	.884	Moderate
15	I can adapt VR in English learning that enhance learning outcomes.	2.42	.864	Moderate
Construct 4: CD				
16	I can obtain academic knowledge through English course in VR learning environment.	2.20	1.217	Low
17	I can learn better in English course with authentic language resources in VR learning environment.	2.38	.881	Moderate
18	I can keep using English in VR learning environment.	2.40	.842	Moderate
19	I can enhance intercultural awareness through English course in VR learning environment.	2.39	.815	Moderate
20	I can practice practical knowledge through English course in VR learning environment.	2.38	.872	Moderate
Construct 5: previous experience (PE)				
21	I have clear understanding of using VR in English learning based on my experience.	2.19	1.161	Low
22	I am confident about using VR in English learning based on my experience.	2.40	.831	Moderate
23	I think using VR in English learning is easy based on my experience.	2.33	.839	Moderate
24	I think my experience can facilitate the use of VR in English learning.	2.34	.816	Moderate
Construct 6: RT				
25	I have a better understanding of using VR in English learning with the help of RT.	2.17	1.145	Low
26	I can adapt the use of VR technology to English learning after receiving RT.	2.39	.815	Moderate
27	I can use VR technology effectively in English learning after receiving RT.	2.38	.831	Moderate
28	I think RT has promoted the use of VR technology in English learning for me.	2.38	.805	Moderate
29	I think not having RT has impact on the use of VR technology in English learning for me.	2.33	.834	Moderate
Construct 7: policy (P)				
30	The college supports the use of VR in English learning.	2.22	1.183	Low
31	The use of VR is an important evaluation learning outcome indicator.	2.39	.849	Moderate
32	The guidelines proposed by college led me to actively use VR.	2.39	.815	Moderate
33	The policy influences my thinking that I should use VR in English learning.	2.35	.823	Moderate
Construct 8: PC				
34	VR is not expensive to me in general.	2.17	1.191	Low
35	VR doesn't cause financial burden on me to use it in English learning.	2.35	.823	Moderate
36	VR is reasonable enough for support English LM considering the effectiveness of learning outcomes.	2.34	.852	Moderate
37	VR did not impose extra learning burden on me during English learning process.	2.37	.846	Moderate
38	VR is worthwhile for me compared to the required effort (time spent, preparation, energy consumption).	2.36	.858	Moderate
Construct 9: technically (T)				
39	The device of VR is user friendly in general.	2.07	1.076	Low
40	The design of VR is suitable for English learning.	2.31	.782	Low
41	The system of VR can be applied to English learning.	2.27	.795	Low
42	The user interface (UI) of VR technology is efficient for English learning.	2.30	.817	Low
43	The characteristics of VR technology leads me to participate actively engaging with content.	2.30	.804	Low

Table 4. Average mean score for constructs on factors to VR technology adoption

Constructs	Average mean	Level
M	2.23	Low
A	2.34	Moderate
LM	2.36	Moderate
CD	2.35	Moderate
PE	2.31	Low
RT	2.33	Moderate
P	2.33	Moderate
PC	2.31	Low
T	2.25	Low

Other than that, attitude plays a role in the effective implementation of VR technology as a useful assisted learning tool. Different from the objective factors, attitude is more subjective and refers to cognition toward language learning, feelings about VR devices and acceptance of VR in improving language learning efficiency [31], [32]. For vocational students, although the importance of English is valued, their motivation and enthusiasm for English learning are relatively low [32]. Therefore, VR adoption in English learning is sometimes restricted by students' attitude towards language learning itself. Additionally, students' willingness to use VR in their language learning is influenced by their feelings, like some students have positive attitude and enjoy using technological tools, like VR, while others remained negative feelings, including fear of using VR and low acceptance of VR as an assisted learning tool [33]. In other words, among vocational students, the adoption VR is affected by their feelings and perceptions of VR device itself. Furthermore, VR is employed to facilitate effective learning and has been shown to provide learners with in-time interaction to increase learning engagement and deepen learning experience [34]. However, some students remain skeptical about VR's ability to positively improve learning outcomes and are reluctant to learn through virtual learning environment [29]. Therefore, fostering students' confidence in VR utilization and guiding them to adopt positive attitude toward VR positive can promote its adoption in English learning.

The additional factor identified in this study is RT, which was carried out at a moderate level, indicating the VR adoption in vocational students' English learning is not significantly influenced by it. The training aims to improve students' understanding of educational application of VR and cultivate their interest in VR-assisted instruction, especially for those who fear using or have had unpleasant experiences with VR [35]. Previous studies show that students avoid using VR due to limited digital skills or prefer their familiar tools [35]. In this regard, providing the VR RT and exposing new digital tools might encourage students to employ VR technology in their English learning.

The last factor identified in this study is policy. From students' perspective, the policy mainly focuses on the support from school setting [9]. The adoption of VR in English learning is mainly influenced by the LM that identified in this study above, and the policy plays a role in promoting its adoption [36]. Schools can highlight the benefits of VR assisted learning and encourage students, as students' behavior and cognition always shaped by their surroundings, with schools being the most authoritative institutions among students [37]. In addition, students would use VR in their learning even if they do not like it if institutions issue relevant encouraging policies. Overtime, students would gain benefits and improve their learning outcomes, thus VR technology adoption was promoted. Therefore, this study suggested policy as one of factors affecting students' utilization of VR technology.

4.2. Gender differences on the behavioral intention toward VR adoption among vocational college students

The results of the independent sample t-test are presented in Table 5. The results display the statistical comparisons between the groups, highlighting significant differences. The findings provide valuable insights into the factors influencing VR adoption in English learning among vocational college students.

From the Table 5, the findings of mean value and standard deviation between male and female on the influencing factors to VR adoption among vocational students indicates a small difference in general. In detail, the slightly higher value in female group shown in the factors previous experience (PE) (M=2.2536, SD=0.77005) among male students and female students (M=2.3796, SD=0.84386) and policy (M=2.2791, SD=0.77562) and female students (M=2.3965, SD=0.84567). In total, the small difference between male students (M=2.28, SD=0.768) and female students (M=2.35, SD=0.814).

Table 6 displays the gender differences on the factors to VR adoption in English learning among vocational students using independent sample t-test. The findings indicate no statistically significant difference between genders regarding the factors when implementing VR in English learning (M=-0.072, p=0.345>0.05), which means the null hypothesis cannot be rejected in this study. The deduction above aligns with the findings of Yu [38], which suggested that no significant gender differences are revealed in technology adoption in general. Meanwhile, the conclusion was further confirmed in the work of Korlat *et al.*

[39], which declared that no sex differences were found regarding technology assisted learning. This study suggests that gender differences have no significant impact on VR adoption in English learning among vocational students. However, gender differences in PE and policy factors are worth noting. The study by Grassini and Laumann [40] investigated gender differences in technology acceptance from several aspects and concluded that while there is no significant difference in technology implementation caused by gender, but it does have a certain impact on usage experience, emotional stimulation, and cognitive abilities. The study by Park and Kim [41] indicated that the interactivity in promoting communication skills is stronger for male students than for female students, but female students show greater perseverance and engagement compared to males. This phenomenon can be attributed to the fact that males tend to employ learning strategies and possess better technical skills, whereas female students focus more on learning outcomes using VR and demonstrate stronger self-regulation, which leads them more immersed in the VR learning environment [40]. However, these gender differences do not significantly affect VR adoption in students' learning.

Findings in this research indicate that there are no gender differences in terms of vocational students' ability to incorporate VR into their learning, suggesting that both genders are influenced by the same factors. According to Gnambs [42], the gender difference in information and communication technology literacy that existed in the past but have diminished in recent years. This change can be attributed to the economic and technological development, which have provided people with equal opportunities to access and use VR. Another investigation has also revealed that the gender differences have no significant impact on the technological capabilities [43]. The widespread use of technology and its continuous development have made platforms simpler and easier to master, allowing students to adopt them more easily. Korlat *et al.* [39] pointed out that the popularization of higher education is also a reason for narrowing gender difference in technology cognition [44]. Therefore, this study suggests that the gender differences are not a major concern for VR adoption in educational settings. To promote VR implementation in English learning, transforming LM, innovating CD, supplementing practical training, and stimulating interest are appropriate approaches.

Table 5. Independent sample t-test

Constructs	Gender	N	Mean	Std. deviation	Std. error mean
M	Male	206	2.1825	.73284	.05106
	Female	218	2.2899	.75446	.05110
A	Male	206	2.3320	.73839	.05145
	Female	218	2.3514	.80346	.05442
LM	Male	206	2.3922	.84573	.05892
	Female	218	2.3477	.83076	.05627
CD	Male	206	2.2971	.79110	.05512
	Female	218	2.4000	.85588	.05797
PE	Male	206	2.2536	.77005	.05365
	Female	218	2.3796	.84386	.05715
RT	Male	206	2.3010	.75760	.05278
	Female	218	2.3606	.78729	.05332
P	Male	206	2.2791	.77562	.05404
	Female	218	2.3956	.84567	.05728
PC	Male	206	2.2971	.79455	.05536
	Female	218	2.3358	.82847	.05611
T	Male	206	2.1854	.69786	.04862
	Female	218	2.3110	.76920	.05210
Total	Male	206	2.28	.768	.054
	Female	218	2.35	.814	.055

Table 6. Independent sample t-test

	T-test for equality of means						
Constructs	t	df	Sig. (2-Tailed)	Mean difference	Standard error difference	95% confidence interval of the difference Lower	Upper
M	-1.485	422	.138	-.10738	.07230	-.24949	.03472
A	-.258	422	.797	-.01934	.07507	-.16689	.12821
LM	.547	422	.585	.04453	.08143	-.11554	.20459
CD	-1.284	422	.200	-.10291	.08017	-.26049	.05467
PE	-1.603	422	.110	-.12595	.07859	-.28043	.02854
RT	-.793	422	.428	-.05958	.07511	-.20722	.08806
P	-1.476	422	.141	-.11652	.07894	-.27168	.03865
PC	-.490	422	.624	-.03869	.07892	-.19381	.11643
T	-1.757	422	.080	-.12557	.07146	-.26603	.01489
Total	-.955	422	.345	-.072	.077	-.224	.079

4.3. Recommendation for the future

The objective of this study is to identify the factors that affecting the use of VR technology in English learning by students in vocational colleges, and to explore whether the gender difference will have an impact on the VR utilization with the same factors' affection. Nevertheless, the influencing factors have different degrees of impact on diverse individuals, which may be attributed to their diverse education levels and experiences with advanced technologies such as VR. This study mainly explains the influencing factors based on the data collected from all entities involved in this study but fails to comprehensively address all the issues related to the integration of advanced technology into English education in vocational colleges. This study suggests that a comprehensive investigation be conducted to explore the factors associated with the integration of advanced technology (VR) into English education in the vocational colleges.

5. CONCLUSION

As one of advanced technologies, VR has applied and played an important role in educational field for a period, as it can transform traditional teaching methods into personalized education models and improve learning efficiency. In the vocational education context, VR technology can fulfill the students' requirements for English learning by focusing on practical communication abilities and their personalized needs. However, the application of VR in real English education confronts many obstacles. According to the results obtained, it can be inferred that the gender of students does not influence their final decision in the process of promoting VR utilization. To promote the VR application in English education, the CD and LM should be adjusted to fit VR learning environment. High-quality VR equipment should be provided to meet students' usage needs, and the corresponding technical training should be offered to eliminate students' fear and unfamiliarity with technology learning. Furthermore, incentive policies should be proposed to encourage students to actively apply VR in their English learning process. Improving the use of VR in English education within vocational colleges is not only conducive to cultivating talents that align with the requirements of employment market but also promotes the modernization and development of vocational education. By addressing this unique educational context, this study offers valuable insights for optimizing VR integration in vocational English education, helping educators design more effective learning environments. The findings not only contribute to theoretical discussions on technology adoption in language learning but also provide practical recommendations for improving student engagement and learning outcomes through VR.

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AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
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D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

DATA AVAILABILITY

- The data that support the findings of this study are openly available in Scopus at https://www.elsevier.com.
- The data that support the findings of this study will be available in http://edulearn.intelektual.org.
- The data that support the findings of this study are available on request from the author, [MO]. The data, which contain information that could compromise the privacy of research participants, are not publicly available due to certain restrictions.
- Derived data supporting the findings of this study are available from the corresponding author [MO] on request.

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