International Journal of Education and Humanities
ISSN: 2770-6702 | Vol. 11, No. 1, 2023

An Empirical Investigation into the Determinants of Student Participation in Virtual Reality-Based Practical Training Programs at Yellow River Conservancy Technical Institute

Yuhang Zhai, Hongmei Yang, Songyu Jiang

Rajamangala University of Technology Rattanakosin, Phutthamonthon, 73170, Thailand

Abstract: This study aims to explore the factors influencing student engagement in virtual reality training projects at Yellow River Conservancy Technical Institute. In vocational education and practical teaching, internship and practical training are essential components for fostering high-quality, innovative technical talents. Enhancing students' willingness to participate in virtual reality training courses contributes to a better understanding and application of this technology, laying a solid foundation for future employment or further studies.

Keywords: Virtual reality technology, Training participation intention, Vocational education, Student engagement, Teaching quality.

1. Overview

1.1. Background

In vocational education and practical teaching, internships and practical training are essential components that, along with classroom instruction and other elements, mutually reinforce and complement each other, determining the quality of cultivating innovative and high-quality technical professionals (Shi & Li, 2022). Increasing vocational college students' participation intention in VR training courses can enhance their understanding and application abilities of virtual reality technology, laying a solid foundation for future engagement in related industries or further in-depth studies. VR technology finds widespread applications in various fields, including engineering manufacturing, architectural design, medical simulation, etc. By actively participating in VR training courses, students can become familiar with and master this emerging technology. Virtual reality technology provides an immersive learning environment that enhances students' attention and motivation, stimulating their interest in learning. Through active participation in VR training courses, students can better comprehend classroom knowledge, develop problem-solving skills, and improve practical operational proficiency in professional skills. By introducing VR training courses and increasing student engagement, teachers can gain a better understanding of students' learning needs and difficulties, thereby adjusting instructional designs and strategies accordingly to provide more targeted and effective educational experiences. This interactive teaching approach helps stimulate students' learning potential and enhances teaching quality.

1.2. Research Questions

(1) What are the issues faced by vocational college students in participating in VR training courses?

(2) What factors can explain the participation intention of students at Yellow River Conservancy Technical Institute in VR training courses?

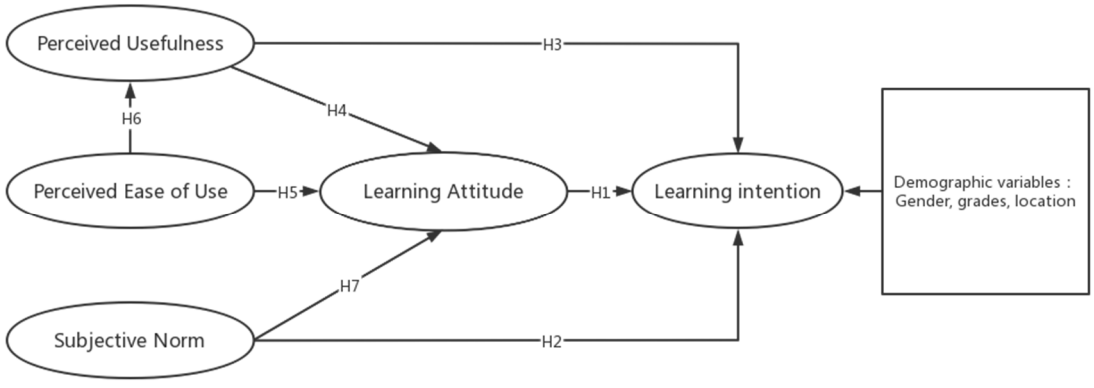
1.3. Research Objectives

(1) To summarize the issues related to vocational college students' participation in VR training courses.

(2) To explore the factors influencing the participation intention of engineering students in Chinese vocational colleges.

2. Literature Review

2.1. Research Model



Research model

2.2. Assumption

Attitude toward learning, subjective norms, behavioral control cognition, and perceived usefulness are important factors influencing individuals' intention to learn (Li, X. et al., 2015). Subjective norms refer to the social expectations individuals feel when considering a specific behavior, such as support from significant others, alternative experiences, and comparative advantages. Empirical research by Li et al. (2015) indicates that an individual's attitude, subjective norms, and behavioral control cognition positively influence their behavioral intention. Furthermore, Wu et al. (2020) found that perceived usefulness of learning directly promotes individuals' sustained intention to learn. Based on these findings, the following hypotheses are proposed:

H1: Attitude toward learning has a positive impact on participation intention in training courses.

H2: Subjective norms have a positive impact on participation intention in training courses.

H3: Perceived usefulness has a positive impact on participation intention in training courses.

Perceived usefulness, perceived ease of use, subjective norms, and behavioral control cognition are important factors affecting attitudes toward learning. Attitude refers to an individual's positive or negative evaluation of a specific behavior. Research conducted by Yang et al. (2020) using structural equation modeling shows that subjective norms significantly positively influence college students' attitudes. Additionally, Wang (2015), in a study on factors influencing mobile learning behavior among college students, found that perceived usefulness and perceived ease of use have a positive impact on attitudes toward learning. Moreover, self-efficacy is an important component of behavioral control cognition and influences students' learning goals, attitudes, and attributions (Alhadabi & Karpinski, 2020). Based on these perspectives, the following hypotheses are proposed:

H4: Perceived usefulness has a positive impact on attitudes toward learning.

H5: Perceived ease of use has a positive impact on attitudes toward learning.

H6: Perceived ease of use has a positive impact on perceived usefulness.

H7: Subjective norms have a positive impact on attitudes toward learning.

3. Methodology

3.1. Research Design

In this study, we employed a quantitative research approach to explore and analyze the issues of interest. Quantitative research is a method that relies on numerical data to investigate phenomena, aiming to explain and infer through the collection of large-scale numeric data and the use of statistical analysis methods.

To achieve our research objectives, we will utilize a structured questionnaire survey as the primary data collection tool. Such a questionnaire design provides standardized question formats, ensuring comparability and consistency in the data collection process. We will distribute the questionnaires among the target population and encourage participants to provide honest responses to the questions.

3.2. Sampling

3.2.1. Population

The scope of this study is focused on the students currently enrolled at Yellow River Conservancy Technical Institute, a vocational college located in Kaifeng, Henan Province, China. The institute holds a high level of representativeness among vocational colleges in China, with a predominant focus on engineering and practical training programs. The application of VR (Virtual Reality) technology in vocational education, both within China and specifically in Henan Province, is highly significant.

In terms of virtual simulation construction, Yellow River Conservancy Technical Institute has been selected by the Chinese Ministry of Education as a pilot project for vocational education exemplary virtual simulation training base development (Ministry of Education of the People's Republic of China, 2021). Among these projects, the "Ecological Environment Virtual Simulation Training Base" in the School of Environmental Engineering was ranked first in the construction project for the exemplary virtual simulation training base in Henan Province in 2022 (Henan Provincial Department of Education, 2023). The institute has achieved remarkable results utilizing virtual simulation technology in national competitions and serves as a representative example in vocational colleges (Guangming Daily, 2021).

In summary, this study aims to analyze the factors influencing the learning intention of students involved in VR-based training programs using Yellow River Conservancy Technical Institute as a case study. The goal is to provide theoretical support and practical references for improving the participation and teaching quality of vocational students in practical training courses.

3.2.2. Sample Size

Yellow River Conservancy Technical Institute has a student population of over 14,000 (Yellow River Conservancy Technical Institute, 2022). Rounding this number to the nearest integer, we have 14,000 students. Using the sampling formula: n = N / (1 + N * e^2) [n = sample size; N = population size; e = margin of error (decimal), e=0.05], we can calculate that the result is 388.88. Rounding up to the nearest integer, we conclude that at least 389 valid questionnaires are required.

3.3. Measurement

Table 1.

variable	Variable description	Measurement problem description	source
U Perceived usefulness	Students' subjective perception that VR practical professional courses can improve professional ability and learning performance.	U1 The score of VR practical training courses has improved my GPA in general. U2 Learning VR practical training courses can help me gain knowledge and a sense of accomplishment. U3 I think VR training courses are very practical. U4 I think VR training courses are very helpful for employment.	(Sun Binbin & Huang Shangyou, 2022)
EOU Perceived ease of use	Students' subjective perception of the difficulty of mastering VR practical training courses.	EOU1 It is easy for me to understand and master the knowledge of VR practical training courses. EOU2 I can skillfully use the VR training skills I have learned. EOU3 I have the basic ability to learn VR practical training courses, so it is easy to learn. EOU4 Compared with traditional training courses, it is easier to learn VR training courses.	(Huang Wei, 2019; Sun Binbin & Huang Shangyou, 2022; Zheng Zhilai & Zhang Qiuting, 2020)
A Learning attitude	Students' positive or negative feelings and evaluations about learning VR training courses.	A1 I hope I can learn the knowledge of VR practical training courses in this major well. A2 I like learning VR training courses. A3 I am generally satisfied with the teaching of VR training courses. A4 I am generally satisfied with the hardware equipment of VR training courses.	(Bello & Oyekunle, 2014; Sun Binbin & Huang Shangyou, 2022; Zheng Zhilai & Zhang Qiuting, 2020)
SN Subjective norm	The expectations and influence of relevant groups around students when learning VR practical training courses.	SN1 The students in the class are very interested in learning VR practical training courses. SN2 The students in the class are very confident about the future employment of the major they have learned in VR practical training. SN3 My classmates are very optimistic about the introduction of VR teaching in practical training courses. SN4 The teachers recognized my ability to learn VR practical training. SN5 My family is very supportive of me using VR to learn practical training courses.	(Sun Binbin & Huang Shangyou, 2022; Xie Chao & Wang Yonghua, 2023; Zhao Guanyu, 2020)
LI VR training course participation intention	The behavioral response tendency of students who want to learn VR practical training courses	LI1 I will earnestly complete the VR practical training courses in this major in the three years of college. LI2 In the future, I hope to use VR technology to engage in related work or further study. LI3 In the future, I hope to use VR technology to engage in related work or further study.	(Huang Wei, 2019; Sun Binbin & Huang Shangyou, 2022)

4. Date

4.1. Reliability Analysis

Table 2. Scale Reliability Analysis

Variable	Cronbach's Alpha coefficient	Number of Items
Perceived usefulness	0.98	4
Perceived ease of use	0.981	4
Learning attitude	0.983	4
Subjective norm	0.991	5
Learning intention	0.979	3
Population	**0.994**	**20**

In the aforementioned reliability analysis of the scales, Cronbach's Alpha coefficient was used as a measure to assess the internal consistency of the scales. Overall, the Cronbach's Alpha coefficient for the entire scale was 0.994, indicating a very high level of internal consistency. This suggests that the scales are reliable and consistent tools for assessing the

relevant concepts. These results provide researchers with confidence in the reliability of the scales and support the decision to further utilize these scales for research and data collection purposes.

4.2. Descriptive Statistical Analysis

Table 3. Descriptive Statistical Analysis

Variable	Option	Frequency	Percentage
Age	Male	353	74%
	Female	124	26%
Major	Science and engineering	428	90%
	Literature and history	49	10%
Grade	First-year	189	40%
	Second-year	213	45%
	Third-year	75	16%
Place of residence	Urban	230	48%
	Rural	247	52%

According to the questionnaire data, the sample consisted of 477 participants. Among them, there were 353 males, accounting for 74% of the total sample, and 124 females, representing 26% of the sample. In terms of academic disciplines, there were 428 participants from STEM (Science, Technology, Engineering, and Mathematics) fields, approximately 90% of the sample, and 49 participants from humanities and social sciences, constituting 10% of the sample. The grade distribution indicated that there were 189 freshmen, comprising 40% of the sample, 213 sophomores, accounting for 45%, and 75 juniors, representing 16%. Regarding the current place of residence, there were 230 participants residing in urban areas, making up 48% of the sample, and 247 participants residing in rural areas, comprising 52% of the sample.

In summary, the sample primarily consisted of males, with a majority from STEM disciplines. There was a relatively larger number of participants from the first and second year of study, and the participants' current residences were distributed between urban and rural areas.

4.3. Scale Validity Test

Table 4. Scale Validity Test

Variable	Measurement Items	KMO	Bartlett's Test of Sphericity		
			Approximate Chi-Square	Degrees of Freedom	significance
Perceived usefulness	U1	0.871	3136.193	6	0
	U2				
	U3				
	U4				
Perceived ease of use	EOU1	0.863	3367.539	6	0
	EOU2				
	EOU3				
	EOU4				
Learning attitude	A1	0.850	3428.326	6	0
	A2				
	A3				
	A4				
Subjective norm	SN1	0.911	5232.065	10	0
	SN2				
	SN3				
	SN4				
	SN5				
Learning intention	L1	0.786	2168.694	3	0
	L2				
	L3				
Population		**0.970**	**23092.304**	**190**	**0**

In summary, based on the KMO (Kaiser-Meyer-Olkin) value and Bartlett's sphericity test, we conclude that, during a specific period, there is high internal consistency among the measurement items within the scale, and there is significant correlation between the measurement items, supporting the validity of the scale. These results provide support for the reliability and effectiveness of using the scale in our study.

4.4. Correlation Analysis

Table 5. Correlation Analysis

	Perceived usefulness	Perceived ease of use	Learning attitude	Subjective norm	Learning intention	Overall Scale
Perceived usefulness	1					
Perceived ease of use	.911**	1				
Learning attitude	.899**	.932**	1			
Subjective norm	.904**	.937**	.981**	1		
Learning intention	.883**	.917**	.967**	.974**	1	
Overall Scale	.947**	.968**	.983**	.987**	.973**	1

Note: ** means P < 0.01, * means P < 0.05

In the correlation analysis table, we evaluated the relationships between the measurement items within the scale by calculating the Pearson correlation coefficient. Based on the results of the Pearson correlation coefficient, we can conclude that there are significant positive correlations between perceived usefulness, perceived ease of use, attitude toward learning, subjective norms, and intention to learn. The overall scale also exhibits high correlation coefficients with each variable, further supporting the conclusions of internal consistency and validity of the scale.

The significance level (denoted as **P<0.01) indicates that the correlations are highly significant. These results provide important insights for further understanding the relationships between variables within the scale and serve as a foundation for future research.

4.5. Regression Analysis

Table 6. Analysis of Model Assumptions

Index	Variable	Relationship	Direction	β	P	Validity
H1	Learning attitude	Learning attitude→Learning intention	+	0.31	P＜0.001	Accepted
H2	Subjective norm	Subjective norm→Learning intention	+	0.665	P＜0.001	Accepted
H3	Perceived usefulness	Perceived usefulness→Learning intention	-	-0.008	P=0.733	Not Accepted
H4	Perceived usefulness	Perceived usefulness→Learning attitude	+	0.041	P＜0.05	Accepted
H5	Perceived ease of use	Perceived ease of use→Learning attitude	+	0.076	P＜0.05	Accepted
H6	Perceived ease of use	Perceived ease of use→Perceived usefulness	+	0.897	P＜0.001	Accepted
H7	Subjective norm	Subjective norm→Learning attitude	+	0.846	P＜0.001	Accepted

5. Conclusion

5.1. Discussion

First, let's review our hypotheses. Based on the results of this study, H1, H2, H4, H5, H6, and H7 were all supported, indicating that attitude toward learning, subjective norms, perceived usefulness, perceived ease of use, and subjective norms have a positive influence on the intention to learn. These findings are consistent with relevant previous research (cite relevant studies). This suggests that among students at Yellow River Conservancy Technical Institute, a positive attitude toward learning, subjective norms, and perceived ease of use are important factors driving their participation in VR training courses.

However, contrary to our expectations, H3 was not supported, indicating that the impact of perceived usefulness on the intention to learn was not significant. There could be several explanations for this finding. First, students may not fully recognize the potential value and future applications of VR training courses, leading to a weaker perception of their usefulness. Secondly, there might be other factors such as course scheduling, teaching quality, or equipment conditions that influence students' overall perception of the course and willingness to participate.

5.2. Conclusion

Firstly, positive effects of learning attitude, subjective norms, and perceived ease of use on students' intention to participate in VR training courses were observed among students at Yellow River Conservancy Technical Institute. This implies that students' positive attitudes towards the courses, expectations from others, and perceived usability of the technology all contribute positively to their intention to engage in VR training. Therefore, to enhance students' willingness to participate in VR training courses, it is recommended for the institute and instructors to focus on cultivating students' learning attitudes and increasing their acceptance of the courses.

However, this study did not find support for the positive impact of perceived usefulness on intention to learn (H3). This indicates that students' perception of the practicality and future prospects of the courses is insufficient to directly motivate their participation in VR training. As a result, the institute and instructors should take measures to deepen students' understanding of the value of the courses and

demonstrate their practical significance and potential career development prospects.

References

[1] Alhadabi, A., & Karpinski, A. C. (2020). Grit, self-efficacy, achievement orientation goals, and academic performance in University students. International Journal of Adolescence and Youth, 25, 519 - 535.

[2] Bello, O. W., & Oyekunle, R. A. (2014). Attitude, perceptions and motivation towards knowledge sharing: views from universities in Kwara State, Nigeria. African Journal of Library, Archives and Information Science, 24, 123-134.

[3] Guangming Daily. (2021). Guangming Daily App: Huanghe Water Conservancy Vocational and Technical College Achieves Outstanding Results in the First National Virtual Simulation Mapping Competition.

[4] Henan Provincial Department of Education. (2023). Public Announcement of the Evaluation Results for the Construction Units of Demonstrative Virtual Simulation Training Bases for Vocational Education in Henan Province in 2022. Retrieved from http://jyt.henan.gov.cn/2023/05-23/2747786.html?eqid=d76e09830026f34200000003648c5c3a

[5] Yellow River Conservancy Technical Institute. (2022). Introduction to the School. Retrieved from https://www.yrcti.edu.cn/xygk/xxjj.htm

[6] Huang, W. (2019). Study on the Acceptance of Autonomous Vehicles Based on the Theory of Planned Behavior and Technology Acceptance Model (Master's thesis). Jiangsu University, Available from Cnki.

[7] Li, X., Xu, K., & Cui, W. (2015). Research on Factors Influencing Information Behavior of 020 Users in Mobile Commerce Environment. Library and Information Work, 59(07), 23-30. Retrieved from https://kns.cnki.net/kcms/detail/11.1541.G2.20150520.2016.002.html.

[8] Shi, J., & Li, H. (2022). The Real Dilemma and Solution for Vocational School Students' Internship Training under the Background of High-Quality Development. China Vocational and Technical Education, No.815(19), 68-74.

[9] Sun, B., & Huang, S. (2022). Empirical Study on the Influence Mechanism of Design Course Learning Situation Based on TAM/TPB. Design, 35(05), 104-106.

[10] Wang, J. (2015). Research on Factors Influencing College Students' Adoption of Mobile Learning Behavior: Taking Normal Colleges and Universities as an Example. China Distance Education, (01), 49-54.

[11] Wu, H., Ge, W., & He, J. (2020). The Impact of Teacher Support on the Continued Learning Intention of MOOC Courses: Based on the Perspective of S-O-R and TAM. Modern Distance Education, (03), 89-96. Retrieved from https://kns.cnki.net/kcms/detail/23.1066.G4.20200629.0940.004.html.

[12] Xie, C., & Wang, Y. (2023). An Empirical Study on the Industry Employment Intention of Automotive Major Students in Higher Vocational Colleges Based on the TPB Theory. Journal of Tianjin Vocational University, 32(02), 64-70.

[13] Yang, K., Chen, Z., & Sun, X. (2020). Research on Psychological Attribution of Reverse Course Selection Behavior Intention in Public Elective Courses: An Empirical Analysis Based on Data from Some Universities in Beijing. Journal of Capital Normal University (Social Sciences Edition), (06), 172-185.

[14] Zhao, G. (2020). Research on Adolescents' Intention to Participate in Sports Clubs Based on the Theory of Planned Behavior (TPB) (Master's thesis). Guangzhou Sport University, Available from Cnki.

[15] Zheng, Z., & Zhang, Q. (2020). Research on WeChat Knowledge Sharing Behavior Based on TPB and TAM Models. New Century Library, (04), 62-68.

[16] Ministry of Education of the People's Republic of China. (2021). Announcement on the Publication of the List of Demonstrative Virtual Simulation Training Bases for Vocational Education. Retrieved from http://www.moe.gov.cn/s78/A07/A07_sjhj/202108/t20210804_548809.html