Determinants of Virtual Reality Technology Adoption in Higher Vocational College Teaching

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Abstract

Purpose: This study investigates vocational college teachers' intention to adopt virtual reality (VR) technology in teaching, aiming to identify key influencing factors and reveal how organizational and personal variables shape their willingness to use VR. **Research design, data and methodology:** A quantitative design was employed with 546 valid responses collected through structured questionnaires. Structural equation modeling was used to test the proposed model based on the Technology Acceptance Model and the Theory of Reasoned Action. Measurement scales were adapted from established instruments, and reliability and validity analyses confirmed sound psychometric properties. **Results:** The findings show that perceived usefulness (C.R.=2.832, P=0.005), perceived ease of use (C.R.= 2.304, P=0.021), and organizational impact (C.R.= 4.116, P<0.001) significantly and positively affect teachers' intention to adopt VR. Job relatedness (C.R.=3.994, P<0.001), simulation quality (C.R.=2.100, P=0.036), and VR self-efficacy (C.R.=4.763, P<0.001) significantly enhance perceived usefulness, while VR self-efficacy (C.R.=2.986, P=0.003) and user satisfaction (C.R.=3.299, P<0.001) significantly improve perceived ease of use. Indirect effects further demonstrate the significant mediating roles of perceived usefulness and ease of use. **Conclusions:** The study provides evidence that organizational support and teacher self-efficacy are critical drivers of VR adoption. Practical implications include targeted interventions to strengthen infrastructure, training, and maximizing the pedagogical potential of VR in vocational education.

Keywords: Higher Vocational Teachers, Virtual Reality Technology, Technology Acceptance Model 3, Intention of Use, Influencing Factors

JEL Classification Code: I21, I23, O33, L67, C93

1. Introduction

In current vocational education, students need to master professional skills through training in a real practical environment. Virtual reality (VR) technology can create a lifelike, multi-sensory 3D virtual environment for students, enabling natural interaction with virtual objects through hardware devices, generating an immersive real experience, and intuitively perceive artistic conceptions that are difficult to express through words and images. Integrating virtual reality technology into teaching can stimulate students'

learning motivation and interest, while also avoiding dangerous operations during learning. It enables students to acquire new knowledge and skills more intuitively, promotes the development of traditional teaching models, provides an intuitive and interactive learning environment for traditional teaching models, enhances the learning experience, and enables learning in a virtual context and promotes knowledge transfer(Xie et al., 2022).

In addition, the role of virtual reality technology in vocational education serves as a complement to traditional teaching methods, rather than a replacement. Virtual reality teaching incorporates traditional teaching methods(S. Diaz,

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2018). Of course, whether virtual reality technology can truly play a role in improving classroom teaching effectiveness hinges on whether teachers can adopt and effectively use this technology. Teachers must undergo a complex adaptation process to effectively integrate VR technology into classroom teaching. This process not only involves the mastery of technical operation skills but also includes the reconstruction of teaching design and the updating of teaching concepts. In this process, teachers' willingness to adopt technology is jointly influenced by various internal and external factors, including individual cognition and ability, as well as external conditions, such as organizational environment and technical support(Ali Geriş, 2025; Yang et al., 2023). However, existing studies rarely explore the application mechanism and influencing factors of VR technology in teaching from the individual perspective of teachers in vocational colleges. Based on this research gap, this study takes higher vocational teachers with the research focusing on, focuses on the current application status of VR technology in teaching, systematically analyzes the key factors that affect teachers' intention of use VR technology in vocational colleges, and reveals the interaction between these factors(Ali Geriş, 2025; Du W, 2024). Therefore, promoting the application of virtual reality technology in vocational education requires paying attention to the current situation of vocational college teachers' use of virtual reality technology in teaching(Matthias Conrad, 2024). Based on this, focusing on vocational college teachers, we attempt to explore the practical factors that influence their use of virtual reality technology in teaching within the theoretical model framework of "external variables-internal perception-Intention of use", aiming to enhance their willingness to use virtual reality technology in teaching. We anticipate providing a new perspective for relevant theoretical research and further enriching the theoretical contribution to the mechanism of information technology-based teaching impact on vocational college teachers.

2. Literature Review

Drawing from the literature review, this chapter explores the factors affecting and the interrelationships of teachers' intentions to use virtual reality technology for instruction in vocational colleges, guided by the theory of rational behavior and the technology acceptance model. It presents a hypothetical model outlining the connections among the influencing factors and introduces 13 hypothetical questions for this study based on the analysis of these factors.

2.1 Theory Relating to the Research Treatment

2.1.1 Theory of Reasoned Action

The Theory of Reasoned Action (TRA) originated in sociology and psychology and has recently evolved into a fundamental model for explaining individuals' behaviours regarding technology use (Hew & Kadir, 2016). In TRA, any individual's behaviour is explained and predicted through three main cognitive components: Attitudes, Social Norms (SN), and Behavioural Intention (BI). Attitudes reflect individuals' positive or negative judgments about technology use; social norms about the extent to which a user perceives that influential others desire or disapprove of specific behaviour, along with the motivation for one's opinion to align with those of others. After a thorough analysis, behavioural intention denotes the individual's choice to perform or refrain from a specific behaviour.

2.1.2 Technology Acceptance Model

Davis proposed the TAM model in 1989 by combining self-efficacy and expectation theories while integrating external environmental variables and excluding social norm variables from rational behaviour theory (Fokides & Antonopoulos, 2024). The TAM explains users' motivation to adopt new technology through three factors: perceived usefulness, perceived ease of use, and usage attitude.

2.2 Variable determination and research hypothesis

2.2.1 Organizational Impact

Organizational Impact refers to various factors in the organizational environment that can affect organizational operations, performance, or member behavior. The behavioral perceptions are attributed to individuals by the group pressures within which the teacher finds themselves. In other words, it relates to how teachers at vocational colleges perceive the recommendations—or lack thereof—from leaders, fellow teachers, and peers within the same organization regarding using a particular technology. Numerous domestic and international scholars have shown that organization influence significantly and positively affects teacher trainees' intentions to utilize technology when examining factors influencing teachers' learning behavior in virtual environments. Gorla(Gorla et al., 2010) et al. model the relationship between information systems (IS) quality and organizational impact. hypothesize a more significant organizational impact when system, information, and service quality are high. Furthermore, the results of a meta-analysis showed that the correlation coefficients between Organizational Impact and perceived usefulness, as well as intention to use, were 0.552 and 0.422, respectively, indicating a high correlation. Based on this evidence, this paper proposes the following hypotheses:

H1: Organizational impact has a significant effect on the perceived usefulness of teaching virtual reality technology.

H2: Organizational impact significantly affects the intention to utilize virtual reality technology for instruction.

2.2.2 Job Relatedness

Job relatedness is recognized as a characteristic of an information system, referring to the extent to which an individual perceives the relevance of a particular information system to their job. It serves as one of the predictor variables for the user's perceived usefulness of the information system. Venkatesh (Viswanath Venkatesh, 2000) et al. argued that job relatedness is a cognitive judgment that directly influences perceived usefulness. In this study, job relatedness denotes the degree to which vocational college teachers believe that the content of virtual reality teaching resources should align with the subjects they teach. Since virtual reality technology can simulate real objects and environments to present virtual teaching aids and scenarios, a greater relevance of these teaching resources to the curriculum enables teachers to effectively utilize virtual reality by leveraging their existing course knowledge. Consequently, the following hypotheses are proposed:

H3: Job relatedness significantly affects the perceived usefulness of teaching with virtual reality technology.

H4: Job relatedness significantly the perceived ease of using virtual reality technology for teaching.

2.2.3 Simulation Quality

High simulation quality, which reflects the realism of a VR application, is fundamental to realizing the technology's teaching potential. Kim et al., in their exploration of factors influencing learners' behavioral intentions toward augmented reality, demonstrated that visual fidelity impacts the intention to use by affecting perceived usefulness, immersive experience, and enjoyment (DeLone & McLean, 2002). Paquay et al. (Paquay et al., 2022) also argued that as the fidelity of a VR system increases, the connection between VR manipulation exercises and real-world exercises strengthens. Therefore, in high-fidelity practical training sessions, teachers and students are likelier to engage in the virtual teaching environment and transfer their pedagogical knowledge and skills to that context. In summary, the closer the fidelity of the virtual system is to reality, the better the application and transfer of knowledge, resulting in teachers and students perceiving greater usefulness while feeling immersed and satisfied in the VR teaching environment. Hence, the following hypotheses are proposed:

H5: Simulation quality significantly affects the perceived usefulness of teaching with virtual reality technology.

H6: Simulation quality significantly affects the perceived ease of teaching virtual reality technology.

2.2.4 Self-efficacy of VR technology

Virtual reality technology self-efficacy (hereafter referred to as Self efficacy of VR technology) is often considered a self-efficacy component (Peterson & Brown, 2005). The meta-analysis results indicate that the correlation coefficient between self-efficacy, perceived usefulness, and ease of use exceeds 0.4, highlighting a significant relationship among these variables. The TAM3 theory suggests that individuals with a strong sense of self-efficacy are less likely to be discouraged by challenges. They are more likely to overcome obstacles to accomplishing learning tasks, reinforcing their intention to utilize the technology. Grandon et al. (Grandon et al., 2005) noted that an individual's self-efficacy directly influences perceived ease of use. Teachers who believe they possess strong technological skills are more inclined to use virtual reality systems. This increased productivity can enhance teachers' perceptions of technology's usefulness. Abdul Hamid and Corbitt (2017) found in his study on factors influencing students' acceptance and attitudes toward using 3D virtual learning spaces that self-efficacy positively impacts perceived usefulness; as a teacher's belief in their ability to perform instructional tasks in virtual reality strengthens, so does the cognitive effort they invest, affirming the technology's usefulness. Furthermore, numerous studies have demonstrated the effects of self-efficacy on achievement experiences. Belén et al. (Mesurado & Richaud ,2016) suggested that high self-efficacy is crucial for triggering achievement experiences. Cai and Wang (2020) showed that self-efficacy positively predicts achievement experiences in online learning environments. Consequently, college teachers are more likely to experience a sense of achievement when they recognize their ability to complete teaching tasks using virtual reality devices and computers. Based on the above, the following hypotheses are proposed:

H7: Self-efficacy of VR technology significantly affects the perceived usefulness of teaching with virtual reality technology.

H8: Self-efficacy of VR technology significantly affects the perceived ease of use in teaching virtual reality technology.

2.2.5 User Satisfaction

Integrating information technology in higher education enhances its application in classroom teaching, which can be categorized into three dimensions: educational information technology infrastructure, resources, and services. When teachers utilize VR technology in their teaching experiences, support from bystanders and conducive conditions facilitate a smoother knowledge transfer process and better tool usage, fostering a sense of immersion and reinforcing their intention to engage with the technology. Xie et al. (Xie et al., 2022) demonstrated the positive impact of a university's information construction system on perceived ease of use in an experimental VR environment, exploring its effects on learners' self-efficacy, immersion, and intention to use. Xu et

al.(Xu Tao, 2018) found that students' satisfaction with educational information in higher education varies by major, revealing significant differences in satisfaction levels across disciplines. Notable disparities exist in satisfaction regarding educational informatization among science, liberal arts, and engineering students. Xue et al. (Xue et al., 2024) empirically established that the extent of informatization construction in colleges and universities directly influences perceived quality, value, and user expectations; a higher level of satisfaction with informatization correlates with more excellent perceived user value. Therefore, this paper proposes the following hypotheses:

H9: User satisfaction significantly affects the perceived ease of use of virtual reality technology in teaching.

H10: User satisfaction significantly affects the intention to use virtual reality technology in teaching.

2.2.6 Perceived Usefulness and Perceived Ease of Use

Perceived usefulness refers to the degree to which an individual believes using specific technology will enhance job performance. Perceived ease of use generally reflects how user-friendly a system is perceived to be; both are central variables in the TAM3 technology acceptance model. The TAM3 theory suggests that perceived usefulness is a mediating link between external variables and intentions to use technology, with perceptions of usefulness significantly affecting a user's intent to engage with information technology or systems. Additionally, numerous studies have shown that perceived ease of use is a key predictor of the intention to use, following perceived usefulness(Cao, 2025). The meta-analysis results indicate that the correlation coefficients for perceived usefulness and perceived ease of use regarding usage exceed 0.4, demonstrating a strong correlation. At the same time, the correlation coefficient of perceived ease of use to perceived usefulness also reaches 0.516. Some IT researchers and experts from other fields have shown that users' perceived ease of use positively influences their perception of the usefulness of information systems when examining the intentions of pre-service teachers and learners to use IT (Teo, 2011). Similarly, when teachers employ VR technology in their teaching, their perception of its helpfulness and ease of use reduces cognitive load; the less time and experience they invest, the more likely they are to continue using it. Thus, this paper proposes the following hypotheses:

H11: The perceived usefulness significantly impacts the use of virtual reality technology in teaching and learning.

H12: The perceived ease of use significantly influences the usefulness of teaching with virtual reality technology.

H13: The perceived ease of use influences the intention to utilize virtual reality technology for teaching.

2.3 Research model

By sorting through the literature, based on the determination of research variables and the proposal of research hypotheses, centering around the logical thinking of "external variables - internal perception -Intention of use" in the TAM3 model, construct a theoretical model of factors influencing the willingness of teachers in vocational colleges to use virtual reality technology in teaching, as shown in Figure 1.
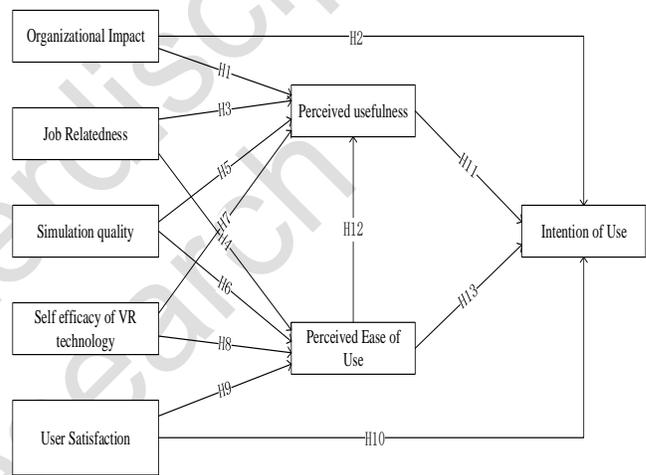
Figure 1: Theoretical Model

3. Research Methods and Materials

3.1 Questionnaire Design

Based on the theoretical model presented in this article and referencing mature scales, the Likert 5-point scoring method is adopted. To ensure good reliability, each variable must contain at least 3 or more measurement items (Wu Minglong, 2010). The specific scale is shown in Table 1. The data is collected in the form of electronic questionnaires, and there are two main ways to distribute the questionnaires: one is to collect the questionnaires through the data mart of the Wenjuanxing platform; The second is to forward the questionnaire link on social media platforms (such as WeChat groups, QQ groups, etc.) and invite friends to answer. The survey targets teachers engaged in higher vocational education.

The measurement items were adapted from validated instruments in prior studies, and we conducted the pilot test before performing extensive empirical analysis to verify the

rationality of the survey questionnaire. The questionnaires were distributed and 40 questionnaires collected from teachers at Huaibei Vocational College. Afterwards, the reliability of the data from these 40 questionnaires has been analyzed and the results demonstrate high reliability. Specifically, the variables and their corresponding items are as follows:

Organizational Impact: This variable was measured by four items, including whether respondents would use VR resources if colleagues and friends around them were using them; if the teaching and research department suggested their use; if school leaders encouraged them; and if teachers or friends from other colleges recommended them. These items were adapted from Venkatesh and Bala (2008) and Venkatesh (2000) and Gorla et al. (2010).

Job Relatedness: Three items measured the degree to which respondents perceived VR teaching resources as relevant to their teaching work, such as whether the knowledge points presented in VR teaching resources match the teaching content, whether VR teaching is important for their work, and whether it is related to their teaching tasks. These items were derived from Venkatesh et al.(Venkatesh & Bala, 2008).

Simulation Quality: Three items assessed the fidelity of VR teaching resources, including whether the simulated environment resembles real environments, whether the teaching aids are highly similar in appearance and function to those in real environments, and whether VR resources can achieve operational effects similar to real scenarios. The items were adapted from Pan et al. (Pan et al., 2024).

Self-efficacy of VR Technology: Four items evaluated teachers' confidence in using VR technology, such as their belief in being able to smoothly use VR technology for teaching, their ability to master VR technology given sufficient time, their confidence when a demonstration is provided, and their ability to use VR technology even without much help. These items were adapted from Venkatesh et al. (Venkatesh & Bala, 2008).

User Satisfaction: Four items measured teachers' satisfaction with the informatization construction of their schools, including whether smooth network conditions facilitate the use of VR, whether a rich VR teaching resource library attracts them to use it, whether training makes it easier to adapt to VR, and whether timely assistance is available when problems occur. These items were derived from Yue Shen (Shen & Lei, 2024).

Perceived Usefulness: Three items evaluated the extent to which teachers believed that VR teaching can enhance efficiency, solve problems encountered in teaching, and generally be helpful for their work. The items were adapted from Davis (Davis, 1989) and Venkatesh et al.(Venkatesh & Bala, 2008).

Perceived Ease of Use: Four items assessed the ease with which teachers believed they could use VR teaching, including whether it is easy to complete teaching tasks, whether the operation of VR equipment is clear and straightforward, whether using VR resources requires little effort, and whether VR teaching is easy to conduct. These items were derived from Davis (Davis, 1989) and Hrtoňová (Hrtoňová et al., 2015).

Intention of Use: Three items measured teachers' willingness to use VR technology in the future, including whether they are willing to continue using VR if conditions permit, whether they actively look forward to its promotion, and whether they would recommend it to others. The items were adapted from Davis (1989) and Liu Yajuan (2018).

The questionnaire design ensured both reliability and validity by drawing on established measurement scales, while tailoring the items to the specific context of vocational college teachers' use of VR technology in teaching. These variables formed the foundation for the subsequent data collection and empirical analysis.

3.2 Sample and sampling techniques

First, a priori power analysis was conducted using G*Power 3.1 software. Based on the complexity of the structural equation model, the expected effect size, and the predetermined significance level (α=0.05) and statistical power (1-β=0.80), the minimum required sample size was calculated to be 626 participants.

The quota sampling has been employed to proportionally select the sample from each university. To calculate, the total sample is 5,109 teachers, the required size is 626. Therefore, 5,109/626 = 8.16, which is approximately 8.20%. Therefore, each university teacher will be selected at 8.20 of the total population.

3.3 Data Collection

A total of 626 questionnaires were distributed this time. After collection, questionnaires with excessively long or short answer times, as well as those with obvious regularity in the options, were excluded, resulting in 546 valid questionnaires with a collection rate of 87.22%. According to scholar Tinsley and Tinsley (1987), the number of valid questionnaires is "5 to 10 times the number of measurement items". Specific distribution of sample data: In terms of gender composition, there were 256 males and 290 females among the study subjects, with females accounting for 53.11%. The proportion of males was slightly lower than that of females. In terms of age composition, the group aged 26 to 35 has the highest number of people, with 236, accounting for 43.22%. The group aged 25 and below has 210, accounting for 38.46%. The group aged 36 to 45 has 60,

accounting for 10.98%. The group aged 46 and above has the lowest proportion, with only 40 people, accounting for 0.73%. In terms of education level, the highest proportion of students is undergraduate, accounting for 49.97%, followed by master's and above, with 141 students, accounting for 25.82%; There are 154 people with specialized degrees, accounting for 28.20%, indicating that most of the surveyed individuals have received a high level of education. From the perspective of teaching courses, the information technology category has the highest proportion, with 176 students, accounting for 32.23%; There are 158 people in the professional training category, accounting for 28.93%; There are 121 people in the field of science and engineering, accounting for 2.20%; The category with the lowest proportion is literature, history, finance, and economics, accounting for only 1.57%. In terms of professional titles, including intermediate, there are 310 people, accounting for 56.77% of the total; Next is the junior level, with 102 people, accounting for 18.68% of the total; There are 78 deputy senior level personnel, accounting for 1.42% of the total; It can be found that the lowest number of people is the senior level, with only 56 people, accounting for 1.02%. From the perspective of teaching experience, the highest proportion is 6-10 years, with 219 people, accounting for as much as 40.10%; Next is those under 5 years old, with 136 people, accounting for 24.90%; Among them, there were 122 people in 11-20 years, accounting for 22.34%; The smallest proportion is over 20 years old, with 69 people, accounting for only 1.26%. From the statistical data, it can be seen that there are more female teachers interviewed, which is in line with the gender ratio characteristics of the education system; The age range is mainly between 26 and 35 years old, which is relatively young; Most of the interviewed teachers have a bachelor's degree or above in education; Teaching experience mainly ranges from 6 to 10 years, with some teaching experience; The main courses taught are information technology courses and professional practical training courses. These teachers have more opportunities to be exposed to emerging technologies and have more opportunities to understand and use virtual reality teaching. Overall, this sample has good representativeness.

4. Results and Discussion

4.1 Measurement model validation

4.1.1 Reliability analysis

Reliability refers to the consistency, stability, and reliability of test results. When the reliability coefficient is greater than 0.8, it indicates that the reliability of the scale is very good; If the reliability coefficient is between 0.7 and 0.8, it indicates that the scale has good reliability; When the

reliability coefficient is between 0.6 and 0.7, it indicates that the reliability of the scale is average; If the reliability coefficient is below 0.6, it indicates that the reliability of the scale is unacceptable.

4.1.2 Validity analysis

Validity refers to the degree to which a measuring tool can accurately measure the object being measured. This study conducted aggregation validity and discriminant validity tests on the questionnaire through confirmatory factors. Aggregation validity refers to the fact that test indicators measuring the same underlying trait will fall on a common factor. When the combined reliability value is greater than 0.6, the standardized factor loading value is greater than 0.6, and the average variance extraction (AVE) is greater than 0.5, it can indicate good aggregation validity; Discriminant validity refers to the test having discriminant validity if it can be statistically proven that indicators that should not be correlated with the predetermined construct are indeed not correlated with this construct. When the square root of AVE between two factors is greater than the correlation coefficient between the two construct factors, it indicates good discriminant validity.

Table 1: Reliability and Validity Testing

Latent variable	Measure term	Factor loading	CR	AVE	Cronbach'α value
Organizational impact	1	0.711	0.829	0.548	0.828
	2	0.746			
	3	0.725			
	4	0.776			
Job relatedness	5	0.815	0.772	0.532	0.771
	6	0.687			
	7	0.679			
Simulation quality	8	0.719	0.797	0.568	0.795
	9	0.762			
	10	0.778			
VR technology efficacy	11	0.858	0.864	0.615	0.860
	12	0.794			
	13	0.803			
	14	0.678			
User satisfaction	15	0.708	0.822	0.536	0.820
	16	0.712			
	17	0.719			
	18	0.787			
Perceived usefulness	19	0.739	0.863	0.559	0.861
	20	0.792			
	21	0.722			

Latent variable	Measure term	Factor loading	CR	AVE	Cronbach'α value
	22	0.739			
	23	0.753			
Perceived ease Of use	24	0.796	0.842	0.623	0.840
	25	0.757			
	26	0.805			
	27	0.759			
Intention of use	28	0.816	0.810	0.661	0.808
	29	0.835			
	30	0.769			

The results of confirmatory factor analysis are shown in Table 2. The standardized factor loadings for all items are above 0.6, the CR values for all 8 variables are above 0.7, and the AVE values are above 0.5. This indicates that the measured variables have good convergent validity.

Discriminate validity is obtained by calculating the square root of AVE and comparing it with its corresponding correlation coefficient to obtain Table 3. The values on the diagonal are the square root of AVE, and the remaining values are the correlation coefficients. The square root of AVE for each factor is greater than the maximum absolute value of its relationship with other factors, indicating good discriminant validity between variables.

Table 2: Distinguished Validity Results

Variable	1	2	3	4	5	6	7	8
Organizational impact	0.740							
Job relatedness	0.230	0.729						
Simulation quality	0.225	0.136	0.754					
VR technology efficacy	0.128	0.034	0.372	0.784				
User satisfaction	0.229	0.494	0.379	0.178	0.732			
Perceived usefulness	0.300	0.437	0.417	0.531	0.423	0.769		
Perceived Ease of Use	0.321	0.342	0.344	0.352	0.504	0.454	0.756	
Intention to use	0.493	0.418	0.363	0.320	0.359	0.465	0.470	0.767

Note: *: $P < 0.05$, **: $P < 0.01$, ***: $P < 0.001$.

4.2 Structural model validation

4.2.1 Model fitting test

Fitting tests are an important part of evaluating structural equation models. Using AMOS 26.0 software, a fitting test was conducted on the initial model of factors influencing the intention of vocational college teachers to use virtual reality technology in teaching to verify whether the initial model is suitable for the collected sample data. The fitting test results are shown in Table 4. CMIN/DF is 1.323, less than 3, which

meets the fitting criteria. RMSEA of 0.040 is less than 0.08, which meets the fitting criteria. CFI, IFI, and TLI are 0.956, 0.957, and 0.949, respectively, all of which are greater than 0.9 and meet the fitting criteria. The GFI value is 0.877, which is less than the fitting standard of 0.90 but greater than 0.85, and is considered an acceptable level (Doll et al., 1994). Some scholars have also proposed that when the model is complex, that is, when there are three or more latent variables in the structural equation model and each latent variable is composed of three or more measurement variables, RMSEA can be used to measure the fit of the model (Collier, 2020). Therefore, it can be considered that the model of factors influencing the intention of vocational college teachers to use virtual reality technology in teaching has an acceptable fit.

Table 3: Model Fit Test

Fitting index	Fitting standard	Test result data	Model fitting judgment
CMIN/DF	<3	1.323	Yes
RMSEA	<0.08	0.040	Yes
GFI	>0.90	0.877	Acceptable
CFI	>0.90	0.956	Yes
IFI	>0.90	0.957	Yes
TLI	>0.90	0.949	Yes

4.2.2 Path analysis of influencing factor model

The structural equation model (SEM) was applied to analyze the impact of factors on the teaching intention of vocational college teachers using virtual reality technology, and to test the hypotheses of the relationships between the proposed variables. The results of the path analysis between variables are shown in Table 4. The path coefficients of job relatedness, self-efficacy of VR technology, and simulation quality on perceived usefulness are 0.361, 0.413, 0.174, respectively, all greater than 0. The critical ratios are 3.994, 4.763, 2.100, 3.212, and the P-values are all less than 0.05, reaching a significant level. This proves that job relevance, simulation quality, self-efficacy of VR technology, organizational influence, and perceived ease of use have a significant positive impact on the perceived usefulness of virtual reality technology application for vocational college teachers, which is in line with the research hypothesis.

The path coefficients of simulation quality, job relatedness, self-efficacy of VR technology, and user satisfaction on perceived ease of use are 0.183, 0.163, 0.246, and 0.343, all greater than 0. The critical ratios are 2.211, 2.654, 2.986, and 3.299, with P values less than 0.05, reaching a significant level. This proves that simulation quality, job relevance, self-efficacy of VR technology, and user satisfaction have a significant positive impact on the perceived ease of use of virtual reality technology by vocational college teachers, which is consistent with the research hypothesis.

The path coefficients of organizational impact, user satisfaction, perceived usefulness, and perceived ease of use on usage intention are 0.338, 0.257, 0.259, and 0.222, all of which are greater than 0. The critical ratios are 4.116, 2.830, 2.832, and 2.304, with P values less than 0.05, reaching a significant level. This proves that organizational influence, user satisfaction, perceived usefulness, and perceived ease of use have a significant positive impact on the usage intention of vocational college teachers in virtual reality technology applications, which is consistent with the research hypothesis.

Table 4: Path Analysis Results

Path	Standardization coefficient	S.E.	C.R.	P	significance
Organizational impact ---> Perceived usefulness	0.279	0.078	3.212	<0.001***	Significant
Organizational impact ---> Intention of use	0.338	0.079	4.116	<0.001***	Significant
Job relatedness --->Perceived usefulness	0.361	0.097	3.994	<0.001***	Significant
Job relatedness ---> Perceived ease of use	0.163	0.097	2.654	0.008**	Significant
Simulation quality ---> Perceived usefulness	0.174	0.074	2.100	0.036*	Significant
Simulation quality ---> Perceived ease of use	0.183	0.077	2.211	0.022*	Significant
Self-efficacy of VR technology ---> Perceived usefulness	0.413	0.077	4.763	<0.001***	Significant
Self-efficacy of VR technology---> Perceived ease of use	0.246	0.070	2.986	0.003**	Significant
User Satisfaction---> Perceived ease of use	0.343	0.101	3.299	<0.001***	Significant
User Satisfaction ---> Intention of use	0.257	0.105	2.830	<0.001***	Significant
Perceived usefulness ---> Intention of use	0.259	0.102	2.832	0.005**	Significant
Perceived ease of use ---> Perceived usefulness	0.247	0.089	2.161	<0.001***	Significant
Perceived ease of use ---> Intention of use	0.222	0.113	2.304	0.021*	Significant

Note: *: P < 0.05, **: P < 0.01, ***: P < 0.001.

Based on the analysis of the path above, it can be concluded whether the hypotheses proposed in the initial theoretical model are valid. The hypothesis test results indicate that all hypotheses have been validated and passed the test.

After empirical research and validation of the influencing factor model, a simplified path diagram of the factors influencing the intention of vocational college teachers to use virtual reality technology in teaching has been formed, as shown in Figure 2
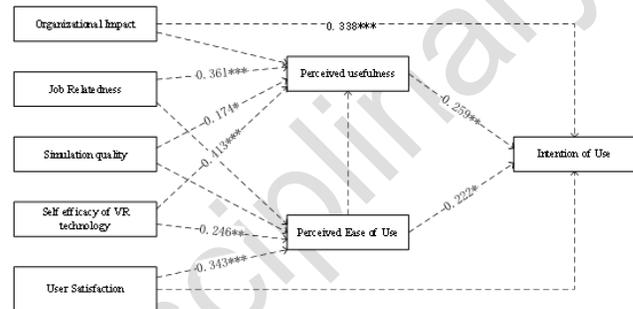
Figure 2: Path Coefficient
Note: *: P < 0.05, **: P < 0.01, ***: P < 0.001.

4.2.3 Mediating effect analysis

Bootstrap method is a method of repeated sampling from a sample, in which the estimated values of the coefficient product obtained are sorted in descending order of value. The 2.5th percentile and 97.5th percentile form a confidence interval with 95% confidence level. If the confidence interval does not contain 0, it indicates that the coefficient product is significant (Rijnhart et al., 2021).

This study used Bootstrap method to test the mediating effects of perceived usefulness and perceived ease of use variables, and the test results are shown in Table 5. The mediating effect value of perceived usefulness between job relevance and usage intention is 0.094, with a confidence interval of [0.016, 0.213], excluding 0. The mediating effect is significant, indicating that job relevance has an indirect and significant positive impact on usage intention through perceived usefulness. The mediating effect value of perceived usefulness between simulation quality and usage intention is 0.045, with a confidence interval of [0.003, 0.135], excluding 0. The mediating effect is significant, indicating that simulation quality has an indirect and significant positive impact on usage intention through perceived usefulness. The mediating effect value of perceived usefulness between VR technology efficacy and usage intention is 0.107, with a confidence interval of [0.024, 0.218], excluding 0. The mediating effect is significant, indicating that VR technology efficacy has an indirect and significant positive impact on usage intention through perceived usefulness. The mediating effect of perceived ease of use on the relationship between VR technology efficacy and usage intention is 0.055, with a confidence interval of [0.004, 0.158], excluding 0. The mediating effect is significant, indicating that VR technology efficacy has an indirect and significant positive impact on usage intention

through perceived ease of use. The mediating effect value of perceived ease of use on the User satisfaction and intention of use is 0.076, with a confidence interval of [0.005, 0.193], excluding 0. The mediating effect is significant, indicating that user satisfaction has an indirect and significant positive impact on intention to use through perceived ease of use.

Table 5: Bootstrap test for mediating effects

Path	Effect size	SE	Bias-corrected 95%CT		
			Lower	Upper	P
Organizational impact → Perceived usefulness → Intention of use	0.121	0.050	0.021	0.216	0.008**
Job relatedness → Perceived usefulness → Intention of use	0.094	0.050	0.016	0.213	0.010**
Job relatedness → Perceived ease of use → Intention of use	0.046	0.048	0.012	0.155	0.021*
Job relatedness → Perceived ease of use → Perceived usefulness → Intention of use	0.051	0.046	0.027	0.114	0.022*
Simulation quality → Perceived usefulness → Intention of use	0.045	0.031	0.003	0.135	0.029*
Simulation quality → Perceived ease of use → Intention of use	0.044	0.047	0.038	0.209	0.014*
Simulation quality → Perceived ease of use → Perceived usefulness → Intention of use	0.103	0.049	0.024	0.156	0.030*
Self-efficacy of VR technology → Perceived usefulness → Intention of use	0.107	0.049	0.024	0.218	0.009**
Self-efficacy of VR technology → Perceived ease of use → Intention of use	0.055	0.038	0.004	0.158	0.035*
Self-efficacy of VR technology → Perceived ease of use → Perceived usefulness → Intention of use	0.056	0.042	0.002	0.128	0.012*
User Satisfaction → Perceived ease of use → Intention of use	0.076	0.047	0.005	0.193	0.038*
User Satisfaction → Perceived ease of use → Perceived usefulness → Intention of use	0.109	0.051	0.006	0.159	0.032*

Note: *: $P < 0.05$, **: $P < 0.01$, ***: $P < 0.001$.

4.2.4 Total effect analysis

The path coefficient can reflect the degree of influence of the independent variable on the dependent variable, which can be represented by the direct effects, indirect effects, and total effects output by AMOS26.0. The direct effect refers to the degree to which the independent variable directly affects the dependent variable, and its path coefficient is the effect value; Indirect effect refers to the degree to which the independent variable indirectly affects

the dependent variable through one or more mediating variables, and its effect value is the product of the coefficients of each relevant path; The total effect refers to the degree of influence of the independent variable on the dependent variable, which is the sum of the values of direct and indirect effects.

The larger the value of the total effect, the greater the impact of the factor on usage intention. The specific degree to which each variable affects usage intention is shown in Table 6, with organizational impact being the most influential factor.

Table 6: The degree to which each influencing factor affects usage intention

Variable	Direct effect	Indirect effect	Total effect
Organizational impact	0.338***	0.022	0.360
Job relatedness	-	0.132*	0.132
Simulation quality	-	0.072*	0.072
Self-efficacy of VR technology	-	0.168*	0.168
User Satisfaction	0.077	0.085*	0.162
Perceived usefulness	0.259**	-	0.259
Perceived ease of use	0.222*	0.026	0.248

Note: *: $P < 0.05$, **: $P < 0.01$, ***: $P < 0.001$.

4.3 Results and Discussion

The verification results indicate that the fitting degree of the influencing factor model is good; Perceived usefulness, perceived ease of use, and organizational impact have a significant positive impact on usage intention; Job relevance, simulation quality, and VR technology efficacy have a direct and significant positive impact on perceived usefulness, and an indirect and significant positive impact on usage intention; The sense of technological efficacy and user satisfaction have a direct and significant positive impact on perceived usability, and an indirect and significant positive impact on usage intention.

(1) Research Question 1

What factors affect the willingness of vocational college teachers to use virtual reality technology?

Based on the validation results, the influence of each factor on usage intention is ranked as follows: organizational Impact (0.360) > perceived usefulness (0.259) > perceived ease of use (0.248) > Self efficacy of VR technology (0.168) > User Satisfaction (0.162) > Job relatedness (0.132) > simulation quality (0.072).

(2) Research Question 2

What are vocational college teachers' perceptions of using virtual reality technology?"

In the model of factors influencing vocational college teachers' Intention of use virtual reality technology in teaching, the path coefficient between perceived usefulness and Intention of use is 0.259, which is significant at the 0.01 level. This indicates that the stronger vocational college teachers perceive the usefulness of virtual reality teaching, the stronger their Intention of use virtual reality teaching. When vocational college teachers believe that virtual reality teaching can help them improve teaching efficiency and address issues encountered during the teaching process and perceive virtual reality teaching as beneficial for teaching work, their intention of use virtual reality teaching is also enhanced.

The path coefficient for the relationship between perceived ease of use and Intention of use is 0.222, which is statistically significant at the 0.05 level. This indicates that the stronger the perception of ease of use of virtual reality teaching among vocational college teachers, the stronger their Intention of use virtual reality teaching. This suggests that vocational college teachers currently perceive virtual reality teaching as not easily implementable, with certain limitations for themselves. If vocational college teachers perceive virtual reality teaching equipment as easier to use and virtual reality teaching resources as more accessible, this would significantly enhance their Intention of use virtual reality for teaching.

The path coefficient for organizational Impact on Intention of use virtual reality teaching is 0.338, which is statistically significant at the 0.001 level and has the largest total effect value among all paths. This indicates that vocational college teachers are significantly influenced by organizational factors in their Intention of use virtual reality teaching. Based on the content of the measurement items, when vocational college teachers' leaders, colleagues, and friends all believe that virtual reality teaching is useful or are currently using virtual reality teaching, teachers will increase their Intention of use virtual reality teaching, regardless of whether they perceive the usefulness of virtual reality teaching.

The path coefficient for Job relatedness and perceived usefulness is 0.361, which is statistically significant at the 0.001 level, with a total effect on usage intention of 0.132. This indicates that the stronger the perception of Job relatedness of virtual reality teaching among vocational college teachers, the stronger their perception of the usefulness of virtual reality teaching, and the greater their Intention of use it. This suggests that when most vocational college teachers perceive virtual reality technology as having a certain degree of relevance and importance to the courses they teach, their Intention of using virtual reality teaching increases.

The path coefficient between simulation quality and perceived usefulness is 0.174, which is significant at the

0.05 level, with a total effect on usage intention of 0.072. The path coefficient between Self efficacy of VR technology and perceived usefulness is 0.413, and the path coefficient between Self efficacy of VR technology and perceived ease of use is 0.246, which is significant at the 0.001 level, with a total effect on usage intention of 0.168. In the view of vocational college teachers, the simulation quality of the virtual reality teaching resources currently available has certain limitations. When vocational college teachers perceive that the virtual reality teaching resources they use have a high degree of similarity to actual teaching aids or scenarios, their perceived usefulness of virtual reality teaching increases, thereby strengthening their Intention of use virtual reality teaching. Additionally, when vocational college teachers lack confidence in their ability to effectively utilize virtual reality teaching, their Intention of use virtual reality technology for teaching decreases. Conversely, the stronger the confidence vocational college teachers have in using virtual reality technology, the more they perceive its ease of use, which in turn enhances their willingness to adopt virtual reality teaching.

In the model of factors influencing vocational college teachers' Intention of using virtual reality technology in teaching, the path coefficient between User Satisfaction and perceived ease of use is 0.343, which is statistically significant at the 0.001 level, with a total effect on Intention of use of 0.162. This indicates that the stronger the perception of satisfaction with university information technology infrastructure among vocational college teachers, the stronger their perception of the ease of use of virtual reality teaching, and the greater their Intention of use it. In other words, with User Satisfaction directly has a positive impact on the perceived ease of use among vocational college teachers and indirectly has a positive impact on their Intention of use it. The mean value of the with user satisfaction variable is relatively low among all variables, indicating that the schools where the surveyed vocational college teachers are employed have not yet provided sufficient information technology infrastructure support for virtual reality teaching. When vocational college teachers perceive that the university's information technology resource platform adequately supports their learning and use of virtual reality technology for teaching, their Intention of using virtual reality technology for teaching will be enhanced. Therefore, the level of university information technology infrastructure plays a significant role in ensuring support and services for vocational college teachers in virtual reality technology teaching, as well as in creating an atmosphere conducive to virtual reality technology teaching.

User satisfaction, to a certain extent, reflects the external conditions of informatization teaching in colleges and universities, such as informatization training and incentive policies. External conditions can effectively mobilize the

enthusiasm of vocational college teachers and have a positive impact on their innovation in informatization teaching. At the same time, as the external environment, the informatization reward policies, training systems, and guiding policies of colleges and universities have a positive correlation with the informatization teaching awareness of vocational college teachers and directly promote the enhancement of their knowledge in informatization teaching. However, the external environment cannot directly prompt vocational college teachers to apply virtual reality technology in teaching. Only when they continuously strengthen their positive awareness of informatization teaching and possess the knowledge of informatization teaching, will they consider carrying out informatization teaching. Therefore, user satisfaction can promote their awareness and interest in teaching virtual reality technology, mobilize their enthusiasm to improve their knowledge of virtual reality technology, and indirectly promote their willingness to teach virtual reality technology through interest and knowledge accumulation. However, if colleges and universities formulate certain reward policies for teaching or innovation with virtual reality technology, they will have a direct positive effect on teachers' Intention of use virtual reality technology in teaching. Eva Moreira-Fontán et al., (2019) pointed out that institutional support for the use and innovation of information technology in universities significantly affects teachers' autonomous motivation to use information technology and their job engagement. Incentive policies related to information-based teaching formulated by universities can guide vocational college teachers to actively learn information-based teaching skills.

5. Limitations and Future Directions

This study also has serval limitations, firstly, sample limitations, the data collected primarily from vocational colleges within specific regions, which may restrict the generalizability of the findings. Future studies should increase the sample size and include teachers from different provinces and disciplines to improve representativeness. Secondly, measurement constraints, although the measurement scales were adapted from mature literature, potential measurement bias may still exist due to self-reported data. Future research could adopt mixed methods, combining quantitative surveys with qualitative interviews to capture deeper motivational and contextual factors. Thirdly, model extension, future studies may further expand the research framework by integrating theories such as Expectation Confirmation Theory, Channel Expansion Theory, Self-Determination Theory, and Motivation Theory, thereby forming a more comprehensive model for understanding teachers' continuous intention to use VR

technology. Lastly, contextual considerations, the integration of technology and teaching ability among vocational college teachers remain in its early stages. As AI and educational technologies evolve, future work should investigate how intelligent teaching environments and precision learning frameworks influence teachers' innovation and adoption behavior.

6. Conclusions

Based on the perspectives of theory and practice, this study supplements and improves the research on the intention of vocational college teachers to use virtual reality technology in teaching. Based on the research results, improve the virtual reality teaching environment and resource library functions, and promote the construction of smart campuses and resource sharing. Organize virtual reality technology teaching and training guidance, collaborate in developing virtual reality teaching resources, and enhance teachers' ability to integrate teaching and technology. Ensure support and services for virtual reality teaching, create a virtual reality teaching atmosphere, actively promoting the use of competitions to promote teaching and combining teaching with competitions, and promote educational teaching innovation driven by "AI+".

Although the determination of research variables in the influencing factor model of this study was based on previous research on technology acceptance, the applicability of the research model to the study of acceptance of emerging technologies in vocational education still needs to be verified. Therefore, in subsequent research, it is necessary to further refine the factors that affect the willingness of vocational college teachers to use virtual reality technology, For instance, by considering multiple factors such as vocational college instructors' personal interests, intrinsic motivation, and discomfort caused by virtual reality technology, Build a relatively complete the influencing factor model of vocational college teachers' willingness to continue using VR technology, making the research results more representative and universal.

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