Influence of Intelligent Technology Applications on the Learning Effect: Virtual Reality as an Example

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Abstract—With the continuous application of intelligent technology, Virtual Reality (VR) technology has become a hot topic of development. VR has unique advantages in the field of the teaching due to its characteristics of immersion, interaction and sociality. Therefore, it is necessary to pay attention to the influencing factors of VR teaching on learning effect, to improve the quality of courses through improvement of relevant influencing factors and to help to reverse further development of VR technology. A questionnaire survey on influencing factors of teaching application of VR technology on the learning effect of college students was conducted. Through data collection of students of various majors and grades in multiple comprehensive universities, statistical analysis and regression empirical analysis were carried out. Results show that different majors, grades, and students' autonomous learning ability have different influences on the teaching application of VR technology. In addition, there are many influencing factors such as network fluency, situational sense of interaction, teachers' teaching ability and the difficulty of course design, etc. According to the conclusions, some suggestions on improving VR teaching and learning effect are put forward. It is expected to improve the learning effect and efficiency of college students under the application of VR teaching, and promote the further development of VR teaching.

Keywords—VR teaching, learning effect, impact factor, intelligent technology

1 Introduction

In the era of information technology, Internet technology is expanding, especially in the field of intelligent technology. In recent years, Virtual reality (VR) has become one of the hottest topics in the technology industry, and 2016 is known as the "first year of VR". VR-related products are characterized by high risk, high investment and high difficulty, and can provide technical support for education, culture and exhibition, intelligent manufacturing, emergency drill, medical medicine, national defense and other fields. In recent years, more and more attention has been paid to college education, and the immersive, interactive, social, imaginative and exaggerated features of VR

technology also provide unique advantages for teaching. Several universities have built VR-integrated training platforms, which can meet the needs of a large number of VR teaching users for education, learning, evaluation, practice and after-class evaluation. VR resources and multi-dimensional courseware are used to achieve seamless management, and co-construction of auxiliary majors and massive quality course resources are also emerging, all of which are huge strides in realization of VR teaching. Teaching experience design is the core issue of VR teaching. Generally speaking, the stronger the experience effect in VR teaching is, the better the teaching effect of the course will be. Influence factors of the application of VR technology in teaching on learning effect of college students can also drive the improvement. Therefore, it is of great significance to explore influence of application of intelligent technology on learning effect of college students. However, there is a lack of corresponding research content at present. Therefore, this study conducts relevant questionnaire survey on students in comprehensive universities to collect data, carries out relevant basic statistical analysis and empirical analysis to explore influencing factors and their positive and negative effects, and puts forward corresponding suggestions.

2 Literature review and hypothesis development

VR technology was a highly simulated 3D system assisted by computer technology [1], which had been taking shape since 1968. However, VR technology fell into a cooling period from the mid-late 1980s to the end of the 20th century. After the 21st century, VR technology developed rapidly under the background of development of intelligent technology. During this period, more and more enterprises began to participate in development of VR technology. Hardware cost of VR kept decreasing, and service field of VR became more and more extensive. VR began to gradually enter people's life, breaking limitations of space, time and scope, and promoting development of all walks of life.

As for colleges and universities, with continuous expansion of information technology and intelligent technology, college teaching tended to develop intelligently and innovatively, striving for continuous improvement of course education mode and interactive mode. At present, many colleges and universities have built relevant VR teaching laboratories, VR practical training system, etc. VR provided a new opportunity for college teaching. Generally speaking, practical teaching was limited by time and space, teaching conditions and teaching environment. VR technology could well solve limitations of site, equipment loss and time and space, to help users generate a simulation environment, combine specific objects and events organically, and help users to learn anytime and anywhere. It could arrange learning schedule and accuracy reasonably and freely, give play to learning subjectivity and practical enthusiasm, help break through practical teaching content with complex operation, high cost and long cycle, improve efficiency of practical courses [2], achieve multiple sensory stimulation, provide human-computer interaction, sound, text, and improve immersion in the learning process. It could also arouse interest in learning and practice, and construct knowledge framework and system through context. In conclusion, opportunities presented

by VR teaching mainly lay in the virtualization of practical teaching environment, liberalization of teaching space and time, sense of situational teaching experience and enhancement of learners' interest. For example, in recent years, ideological and political elements of the curriculum had been continuously integrated into teaching, and VR technology was also continuously expanded development and application of ideological and political resources [3]. This also showed that VR technology could provide appropriate assistance and resources for course innovation.

Since the early years, VR technology had been able to show real urban street and environmental planning [4], and then expanded from basic reality simulation to application of disciplines, and improved teaching ability of psychiatry [5] And it could be applied to relevant experimental teaching. For example, students could conduct experimental operations using VR technology, thus improving their practical ability and application ability [6]. In recent years, VR education technology had been developing and expanding, especially in dual dimensions of vision and technology, constantly breaking through original technical difficulties and improving application scenarios. In addition, in field of teaching, VR technology had also been extended to psychological education [7]. It had become one of important technical channels for auxiliary psychology education, which was conducive to improving quality of psychology teaching and realizing application and support in psychological trauma education [8]. Through application and development of VR technology in teaching, it could be found that VR technology not only involved science and engineering majors such as medicine, but also social science majors such as psychology and physical education. Therefore, VR technology had realized the overall coverage of all majors in the university education system.

With continuous application of VR technology in teaching, its scope was increasingly broad, such as development and use of corresponding course resources. At present, relevant front-end VR enterprises were involved in development of courses, and continued to provide multi-field and multidisciplinary course support, to continuously promote teaching results. Teaching mode of VR courses also played a certain role in promoting learning effect, which could improve learning efficiency of students and continuously enhance their learning effect [9]. Due to characteristics of immersion, interaction, conception and intelligence of VR, it could bring real scenes and sense of interaction to participants. In addition, interactive information could be delivered, which could also improve teaching effect of VR. Especially, sense of interaction could help students understand difficult courses through explanation of VR classroom teachers [10]. In fact, for high-difficulty courses, one-to-one teaching mode could better improve teaching facilitation and students' concentration, to enhance students' understanding of difficult knowledge points [11]. In addition, learning effect of VR technology would also be influenced by college students' preference and acceptance of courses, and VR technology would also have differences in teaching effect due to individual differences of college students [12]. Relevant researchers, For example, Yang et al. [13] studied factors that have impact on the effect of VR education, verified and analyzed the AHP model, and summarized relevant factors. That was to say, factors that might affect the effect of VR teaching include teachers' ability to teach and answer questions, students' preview and review before and after class, fluency of the Internet, and specificity of VR course design.

To sum up, the following hypotheses are proposed:

H1: Improvement of VR technology's learning effect is related to students' majors.
H2: VR technology can improve students' learning effect.
H3: Multiple factors, such as fluency on the Internet, the learning ability of students, the difficulty of course design, the puzzle-solving ability of teachers, and teaching ability, all have relevant influences on the improvement of learning ability by VR technology.

3 Methodology

3.1 Questionnaire design

The data survey mainly covers students from multiple comprehensive universities, involving majors including science and technology, liberal arts and business, and survey objects are undergraduates and above. In this survey, questionnaire star platform is used to issue electronic questionnaires, which are filled in by anonymous method. A total of 309 questionnaires are issued, and 303 valid questionnaires are collected. This research is mainly aimed at the impact of VR technology on college students' learning in field of intelligent technology under the circumstance of highly developed information technology, and empirically analyzes important factors that affect learning effect under application of VR technology from the perspective of students. Following factors are mainly involved in design of the questionnaire.

The first is investigation of students' personal basic information. Survey of self-learning ability before class involves pre-class process, which involves students' learning ability and reception ability. Among them, 54.14% of the students think their learning ability is average, 24.81% think their learning ability is strong, and 9.77% think their learning ability is strong. And those who think their learning ability is weak or weak accounted for 11.28%.

The second is investigation on factors related to students' receiving knowledge in class. In mid-class stage, the course is usually taught by the teacher, and corresponding interaction with students is completed in the class process. Therefore, relevant students' preference for teachers' teaching style and teaching mode is investigated. For specific arrangement of the course, It is found that preferred order of students is the teacher teaching knowledge points (58.65%) > case analysis (43.61%) > watching videos related to courses (36.09%) > interaction between teachers and students (27.82%) > situational teaching experience (24.81%) > class review and summary of knowledge points (24.06%) > group PPT presentation (18.8%) > group discussion (15.79%) > group debate (6.02%). It indicates that students prefer case explanation and teachers' traditional knowledge teaching scheme to their acceptance of knowledge. However, group debate competition is not preferred by students because of its low efficiency.

The third is students' opinions on using VR technology and related cognition are investigated. It mainly includes whether to support the use of VR technology in the course, whether to believe that VR technology can improve the learning effect and factors that may affect the learning effect of VR from the perspective of students. It is found that average score of students for integrating VR technology into the course is

3.69 (mean), which means that most students are in favor of it. 66.17% of the students agree that integration of VR technology into the course can make the course more interesting. 24.06% believe that whether or not VR technology is integrated into the course has no impact on fun of the course, and 9.77% express a negative attitude, indicating that most of the students still believe that VR technology in the course is conducive to improving interest of the course. In addition, 56.39% of the students think that VR technology can improve the learning effect, 32.33% think that the effect is normal, and 11.28% of the students disagree. By summarizing factors that may affect VR learning effect and taking 20% as the dividing line, it is found that factors that students think will affect VR learning effect mainly include situational experience, fluency of the Internet, sense of picture reality, sense of situational interaction, interest of the course, difficulty of the course design, teaching ability of the teacher and degree of answering questions.

It involves after-class evaluation and feedback. After class, emphasis is on teaching evaluation, which is also an important reference for teachers to improve teaching methods and schemes. As for whether students have mastered content of the course, relevant assessment can be carried out, and students' preferred teaching evaluation mode can be investigated [14]. It is found that the most popular test method for students is simulation practice, that is, actual operation and application of the content learned. The second is for true test, and the third is for writing the relevant report. In class, students asking questions is the least favorite way.

3.2 Modeling and variable selection

At present, more and more innovative technologies are applied to teaching, such as digital robots, online teaching platforms, block-chain, VR, AR technology and so on. Among them, VR technology, as an immersive, interactive and social teaching mode, has unique interest, purpose and functionality in learning process, but also has its educational advantages. With continuous upgrading of VR equipment, continuous investment of research and development technology, continuous establishment of industry standards, virtual teaching is also in process of landing, so it is necessary to explore more influential factors in process of VR teaching, to help VR teaching achieve better landing and development. Therefore, to identify main influencing factors, relevant model regression analysis is carried out.

Through analysis of relevant VR literature and combined with the content shared publicly by relevant VR enterprise technology enterprise symposium, it can be known that factors that may affect teaching effect of VR technology include situational experience, fluency of network, sense of picture reality, sense of situational interaction, interest of course, difficulty of course design, teacher's teaching ability, clarity of answering questions and solving doubts, pre-class review, after-class review and assessment standards, etc. Therefore, this questionnaire is taken as an option for investigation. Main indicators of this analysis are those accounting for more than 20%, that is, situational experience, network fluency, picture realism, situational interaction, course interest, course design difficulty, teacher's teaching ability and clarity of answering questions. This study sets the following econometric model.

$$Y = \alpha x + \beta \sum Control + \varepsilon \tag{1}$$

Dependent variable *Y* is VR learning effect, and corresponding question of the questionnaire is "Do you think VR (situational teaching) technology can improve learning effect?", whose answer includes "strongly disagree (denoted as 1), strongly disagree (denoted as 2), generally (denoted as 3), somewhat agree (denoted as 4), strongly agree (denoted as 5)".

In independent variable *X*, the major studied by college students is investigated. Control variables includes student gender, student grade, and above mentioned indicators of situational experience, fluency of network, realism of picture, situational interaction, interest of course, difficulty of course design, teacher's teaching ability and clarity of answering questions. α and β are parameters to be estimated, and ε is the error term. The major is mainly divided into science and engineering (denoted as 0), social science (denoted as 1, including business, social science and sports and sports). In terms of gender, women are denoted as 0 and men as 1. In the grade, undergraduate record is 1, master's record is 2, and doctoral record is 3. Other problems are divided and measured on a five-level scale. Specific indicators are shown in the following Table 1.

Table 1. Summary of specific variables

Variable	Symbol	Name of Variable	Description of Calculation
Explained variable	*Y*	VR Learning Effect	5 for very agree, 4 for more agree, 3 for generally, 2 for less agree, 1 for very disagree
Variable of explanation	*X*	Professional	0 for Science and 1 for engineering, social science
Variable of control	*G*	Gender	0 for female , 1 for male
	Gra	Grade	1 for undergraduate students, 2 for master's students and 3 for doctoral students
	Sit	Situational experience	5 for very agree, 4 for somewhat agree, 3 for generally agree, 2 for somewhat disagree, 1 for very disagree (questions are whether it will promote the learning effect)
	Flu	Fluency of network	
	Rea	Realism of picture	
	Ile	Situational interaction	
	Inf	Interest of course	
	Cdd	Course design Difficulty	
	Tta	Teacher teaching ability	
	Aqc	Answer questions and clarify questions	

4 Results

4.1 Descriptive analysis

Table 2. Descriptive statistical analysis

Variables	N	Mean	S.D.	Min	Max
Y	303	3.719	1.053	1	5
X	303	0.574	0.495	0	1
G	303	0.386	0.488	0	1
Gra	303	1.244	0.438	1	3
Sit	303	4.030	0.929	1	5
Flu	303	4.129	0.997	1	5
Rea	303	4.059	0.944	1	5
Ile	303	3.970	0.964	1	5
Inf	303	4.040	0.948	1	5
Cdd	303	3.921	0.990	1	5
Tta	303	3.954	1.015	1	5
Aqc	303	3.950	1.036	1	5

As can be seen from Table 2, the mean value of the effect of VR on learning is 3.719, and standard deviation is 1.053, indicating that VR has a certain promoting effect on learning. However, from analysis of the maximum and minimum values, research on effect of VR on learning may also be different due to individual students. For students' majors, most of the questionnaire collection objects are still slightly focused on social sciences, with an average value of 0.574, which also accords with general distribution of majors. In terms of gender, there is more emphasis on women. Grades are mainly undergraduates, with an average value of 1.243, which is in line with current educational structure. Among other influencing factors, it can be found that the greatest influence on VR learning effect is degree of network fluency, with an average value of 4.129. Other top several factors are situational experience, sense of picture reality and course interest, with an average value of 4.040, 4.059, and 4.030 respectively, while average value of the remaining situational interaction is 3.970. Average degree of teachers' answering questions and solving doubts is 3.954, while difficulty of curriculum design and teachers' teaching ability had little influence on control variables, with average values of 3.921 and 3.950 respectively. However, these data all show that surveyed indicators have a promoting effect on learning effect of VR. However, from perspective of the maximum value and minimum value, there is a large gap. The minimum value is 1 and the maximum value is 5, indicating that there is a large difference for different student groups; while for control variables, standard deviation is concentrated around 1.0, indicating a high degree of concentration.

4.2 Correlation analysis

STATA15.0 software is used to conduct correlation analysis on variables of VR influencing factors, and the results were shown in Table 3, showing the relationship between each variable.

Table 3. Correlation analysis

Variables	*Y*	*X*	*G*	*Gra*	*Sit*	*Flu*	*Rea*	*Ile*	*Inf*	*Cdd*	*Tta*	*Aqc*
Y	1.000											
X	0.520*	1.000										
G	–0.046	–0.373***	1.000									
Gra	–0.066	–0.008	0.053	1.000								
Sit	0.110*	0.071	0.077	0.210***	1.000							
Flu	0.038	–0.029	0.095*	0.087	0.690***	1.000						
Rea	0.117*	0.019	0.087	0.229***	0.810***	0.766***	1.000					
Ile	0.073	–0.082	0.130**	0.190***	0.822***	0.700***	0.857***	1.000				
Inf	0.137**	0.078	0.096*	0.184***	0.788***	0.688***	0.823***	0.740***	1.000			
Cdd	0.039	–0.035	0.064	0.205***	0.676***	0.738***	0.749***	0.709***	0.730***	1.000		
Tta	0.031	–0.105*	0.130**	0.197***	0.647***	0.768***	0.725***	0.763***	0.717***	0.787***	1.000	
Aqc	0.045	–0.054	0.169***	0.085	0.652***	0.753***	0.718***	0.731***	0.696***	0.745***	0.882***	1.000

Note: *, ** and *** are significant at the confidence level of 10%, 5% and 1% respectively.

According to the correlation matrix, the correlation coefficient between VR learning effect (Y) and students' learning major (X) is –0.520, showing a negative correlation, which is significant at the 10% confidence level. Among majors, compared with social sciences, science and engineering majors believe that VR technology can effectively enhance earning effect, and results are consistent with or without addition of control variables. For gender, correlation coefficient is –0.046, indicating that compared with male, female students using VR technology can improve learning effect and have higher enthusiasm, which is relatively consistent with prediction. Similarly, in grade variable, effect of VR technology on undergraduates is significantly stronger than that of masters and doctoral students. For other variables, episodic experience and picture realism have positive correlation with VR learning effect, and correlation coefficients are 0.1100 and 0.1170, respectively. And it must be significantly positive at the level of 10%. For influence of interest, correlation coefficient is also 0.137, which is significantly positive at the level of 5%. There is also a positive correlation between other control variables and explained variables, but it is not significant. However, correlation between control variables and explanatory variables, as well as control variables, is not discussed in detail here. Correlation analysis is only a simple analysis of relationship between two variables, and multiple factors need to be considered. Further regression test analysis will be conducted in the following study.

Then, symbiosis test is conducted, and VIF is used as variance expansion coefficient. The larger the value, the smaller the tolerance of independent variable, and the more collinearity problems there would be.

Table 4. Symbiosis test

Variable	VIF	1/VIF
Tta	6.840	0.146
Rea	6.500	0.154
Ile	5.860	0.171
Aqc	5.350	0.187
Sit	4.410	0.227
Inf	4.160	0.240
Flu	3.570	0.280
Cdd	3.460	0.289
X	1.290	0.773
G	1.230	0.815
Gra	1.180	0.849

As can be seen from Table 4, the mean value of VIF is 3.99, less than 5, so there are no serious multiple symbiotic relationships between Y and other indicators.

4.3 Analysis of regression results

Table 5. Regression analysis

Variable	Y	Variable	Y
X	–0.302**	*Ile*	–0.162
	(0.137)		(0.150)
G	–0.213	*Inf*	0.230*
	(0.136)		(0.129)
Gra	–0.253*	*Cdd*	–0.102
	(0.148)		(0.112)
Sit	0.125	*Ttb*	–0.055
	(0.135)		(0.154)
Flu	–0.137	*Aqc*	0.014
	(0.113)		(0.133)
Rea	0.245	*_cons*	3.634***
	(0.161)		(0.324)
N		303.000	
r^2		0.065	
r^2_a		0.029	

Note: * means p<0.1, ** means p<0.05, and *** means p<0.01.

Since data comes from questionnaire survey, the endogeneity related to panel data is not considered, and correlation regression analysis is conducted directly. The content in Table 5 is based on regression analysis. Results show that there is a negative correlation between VR learning effect and students' major at the level of 0.05, and correlation coefficient is –0.302, which means that the stronger the science and technology property of students' major, the stronger effect of VR technology application on the improvement of learning ability level, and there is a correlation between the two. Gender and grade of students are negatively correlated, and grade of students is negatively correlated at confidence level of 0.1, that is, the higher the grade, the worse the learning effect can be improved by using VR, and correlation coefficient is –0.253. Course interestingness also has a significant positive correlation with VR enhanced learning effect, and correlation coefficient is 0.230, indicating that it maintains a positive correlation at the 10% confidence level. Network fluency, situational interaction perception, teachers' teaching ability and course design are negatively correlated with learning effect, indicating that VR technology has higher requirements for situational requirements, which is more effective for difficult courses, and has lower requirements for teachers' teaching ability and network fluency. While sense of situational experience, sense of reality of the picture and clarity of the teacher's question-solving are positively correlated, indicating that VR technology has higher requirements for the teacher's question-solving ability, and the stronger the sense of reality of the picture and the stronger the sense of situational experience, the better the learning effect will be. As a whole, there is a significant correlation, indicating that all have a correlation effect.

4.4 Robustness test

To verify the robustness of the model, students' major is transformed into their own recognized learning ability for analysis, shown in Table 6. According to the analysis, the endogeneity test result is 3.91, less than 5, indicating that there is no endogeneity problem between indicators

Table 6. Robustness test regression

Variable	Y	Variable	Y
Ability	0.117*	*Ile*	–0.114
	(0.061)		(0.148)
G	–0.106	*Inf*	0.198
	(0.126)		(0.128)
Gra	–0.252*	*Cdd*	–0.071
	(0.148)		(0.113)
Sit	0.088	*Ttb*	–0.036
	(0.134)		(0.153)
Flu	–0.130	*Aqc*	–0.009
	(0.113)		(0.133)
Rea	0.214	*_cons*	3.098***
	(0.162)		(0.369)
N		303.000	
r^2		0.061	
r^2_a		0.025	

Note: * means p<0.1, ** means p<0.05, and *** means p<0.01.

According to test results, obtained results are consistent with meta-model except that control variables may have different regression correlations and difference lies in the size and significance level. Students' judgment of their learning ability has a significant effect on learning under VR technology at the level of 10%, and correlation coefficient is 0.117.

To sum up, robust simulation model has a good fitting effect, that is, the conclusions and methods used in this study are robust.

4.5 Discussion

Compared with existing studies, the conclusions of this study verify the findings of Li et al. [15], Akman et al. [16], and Zhou et al. [17]. It shows that VR technology is indeed conducive to improving learning effect, and has different effects on different majors. The difference is reflected in empirical results. The effect of VR technology on learning social sciences is better than that of science and technology, while research results of this study show that effect of science and technology is better than that of social sciences. Reason for the difference may be due to different sample sizes and

different questionnaire groups. Status quo related to VR development has changed, and VR technology can improve students' application ability for experimental courses [18]. In addition, this study also expands relevant influence factors. Compared with research of Tang et al. [19], it adds related learning stage, network fluency, teaching ability of teachers, difficulty of course design and other factors, and obtains positive and negative characteristics of correlation influence, and summarizes course characteristics of VR learning effectiveness. It enriches existing research conclusions and contents.

5 Conclusions and implications

5.1 Conclusions

In this study, through statistical analysis of the questionnaire of current students in various stages of multiple comprehensive universities on the learning effect of intelligent technology VR, and application of STATA software for regression empirical analysis, obtained results verify hypotheses H1, H2, and H3, indicating that VR technology can indeed improve learning effect, and that it is related to students' learning majors. In addition, learning effect of application of VR technology is higher for science and engineering than for social science subjects, and application effect is different for different grades. Application of VR technology is more effective for undergraduate courses to improve learning effect, and for more difficult courses, learning effect is better. In addition, learning effect of VR technology is negatively correlated with network fluency, sense of situational interaction, the teacher's teaching ability and course design, and positively correlated with main factors such as sense of situational experience, sense of reality of the picture and clarity of the teacher's answer to questions. This indicates that for technological development of VR itself, the more immersive the situational function is, the better the learning effect will be, while influence on fluency of the network will be small. In addition, VR technology can reduce teaching and explaining ability of relevant teachers, but improve their ability to answer questions and solve doubts.

5.2 Implications

Firstly, most students have good self-learning ability and can master and learn knowledge points provided by teachers independently. Therefore, in course arrangement and setting, teachers should try to increase exploratory questions in pre-class link, and control task time within a certain range, to ensure quality and efficiency of students' pre-class learning, promote enthusiasm for students' learning, and stimulate potential of students' independent learning.

Secondly, compared with teaching style of teachers, students attach more importance to teaching mode of teachers, and most of them prefer teachers to directly explain knowledge points or use case studies to teach, and hate the form of group discussion and group debate competition. Therefore, group discussion and group debate competition in class should be reduced as far as possible. And in process of implementation, it should reduce "free riding" and "gossiping" of students as much as possible, and increase interesting knowledge point explanation link and enhance application of

case sharing link, to improve interest and integrity of the course, especially for social science majors.

Thirdly, most students believe that application of VR technology in the course can increase interest of the course and support use of VR teaching in the course. Therefore, from a professional point of view, application of VR technology in courses should be improved, including construction of VR learning environment, reasonable connection with courses, presentation of teaching content and improvement of teaching mode, to realize symbiosis of intelligent technology development under diversified development of courses. At the same time, resources of VR and other intelligent technologies should be enhanced. Then, it should strengthen hardware teaching link, create VR teaching space, effectively combine 5G technology, big data and VR, and effectively combine hardware and software resources to realize students' remote classrooms.

Fourthly, most students prefer assessment mode of practical operation and application, or direct examination of real questions, writing reports and other assessment methods, which is more conducive to students' active view of teaching courses. Therefore, from perspective of students, it is more direct and objective to choose mode of real test and report, while practical application of operational test can make students treat the class more seriously and expand depth of learning and application ability. Therefore, it is suggested that teachers of relevant courses make use of VR to let students conduct actual simulation tests in relevant simulation scenarios, to evaluate and score from perspective of students' applied ability, improve quality of courses and students' evaluation, and improve training of applied and composite talents. This also puts forward higher requirements on teachers' ability and requires teachers to master corresponding VR technology. And it also needs the school to delegate power, according to the reason that characteristics of the curriculum can reasonably choose student achievement evaluation method and mode.

Fifthly, among factors that affect learning effect of VR technology, students' major, autonomous learning ability, situational experience, sense of picture reality and course interest are highly influential, and autonomous learning ability, situational experience and course interest are mainly positively correlated. Network fluency, situational interaction, teachers' teaching ability and difficulty of curriculum design are negatively correlated with learning effect. Therefore, it is suggested to increase possibility of integrating VR technology into relevant courses for undergraduates, enhance possibility of integrating VR technology into science and engineering majors, and strengthen exploration of courses and application of VR technology. In addition, it is necessary to continuously strengthen sense of reality of scenes in VR technology, enhance students' sense of situational experience, and enhance interest of courses, especially for courses with complex professional knowledge and improvement of teachers' professional competence, to enhance teachers' professional puzzle-solving ability and improve students' learning effect under VR technology. In addition, from perspective of technology, application of VR technology in task assignment, process control, strategy formulation and feedback should also be improved, and systematic and scientific planning should be carried out to create a new VR teaching ecology.

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