

A Study on Virtual Reality, Raspberry Pi and 3D Printing Technology towards the Interior Design Specialty Teaching in China

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Abstract: This study aimed to make a contribution to the research on the education and teaching of the Interior Design Specialty courses in local higher vocational colleges. And this study helps to try to find the possible solutions so as to improve the teaching effect, to improve students' understanding of professional knowledge, deepen students' cognition of professional knowledge. Virtual Reality, Raspberry Pi, and 3D printing technology are emerging fields, and applying these new technologies to teaching is also a teaching method that adapts to the development of the times, which can improve teaching effects and stimulate students' enthusiasm for learning. This study investigates the application of these technologies in teaching and related research literature at home and abroad, and explores the impact of these technologies on interior design course education and teaching. This research will benefit other teacher to understand the teaching effect and could be referenced or guideline for other researcher who is interested to study the teaching satisfaction in another organization.

1. Introduction

Young people play an important role in the society as the level of professional knowledge they have has a direct impact on the construction and development of the whole country. College students are the main representatives of the youth and the backbone of future social construction. College students in this age group are in the critical period of systematic learning of professional knowledge, so it is very important to pay attention to the teaching methods in this period. Understanding age is the key to analyzing young people's study habits. This study investigated the degree of cognition and application on New Media Applications, such as Virtual Reality, Raspberry Pi and 3D Printing Technology, in the vocational college students aged between 18 and 21 years old, and the influence and function of these factors on the study of Interior Design Specialty. These students are basically "the generation after 00s". They pay attention to the stimulation of images and videos and the simplicity of operational skills, and have higher requirements on the quality of the course. Their learning is highly personalized, fragmented, and often accompanied by non-linear reading features. To note, Guangzhou City Construction College (hereafter, GZCCC) students are the sample of study. In brief, the new enrolment at GZCCC is 7,618 for the first semester of

2020/2021 academic session. In term of gender differences, as about two third construction college students in GZCCC are male and this trend was constantly been maintained since 2015 till year 2020 (Report on Study status data of Guangzhou City Construction College, 2021). This research needs to identify that gender is one of the factors in New Media Applications. This is because, previous researchers found that gender difference is the result of comprehensive factors. The effective way to improve the level of college students' deep learning is to carry out gender research on college students' deep learning and to carry out in-depth teaching according to gender difference [1].

The society has a high demand for interior design talents, but the teaching methods in higher vocational colleges are traditional and unitary, and teachers mainly impart professional textbooks, which limits students' innovative thinking. Interior design is a highly professional discipline, but it is only explained through textbook cases, and students' thinking is limited to books, which has been out of touch with society, and it is difficult to quickly adapt to enterprises' demand for technology. Virtual Reality has such technical characteristics as immersion, interactivity and conception, which brings important historical opportunities for the development of educational informatization and the reform of classroom teaching [2]. Domestic researches on Raspberry Pi are mostly focused on engineering design and technology research and development, and there are few researches on teaching application. Classroom teaching based on Raspberry Pi is no longer the cramming teaching based on knowledge acquisition in the past, but will be more exploratory, problem-solving and project-based learning, which can be said to realize the effective integration of Raspberry Pi and classroom teaching. The application of 3D printing technology in education will become a student-centered application model and provide a brand-new perspective for educational innovation.

Therefore, the purpose of this study aims to explore the Interior Design Specialty among the respondents and the correlation between Virtual Reality, Raspberry Pi and 3D Printing Technology.

2. Problem Statement

Focusing on Interior Design Specialty, this study aims to achieve the goal of determining GZCCC students' understanding of the application of new media in interior design teaching. First of all, respondents' characteristics are considered as an important domain of research within Teaching and research. Profiling their age, gender, family background and the classroom environment, would help us to identify and evaluate their cognition and preference for interior design courses. Miao Guisong studied the learning willingness of college students born after 2000, and the research results showed that most students prefer behavioral-participatory teaching and selective learning [3]. They hoped that teachers should adopt the incentive teaching, such as bonus points in competitions and activity awards, and increase interaction and practical activities. Gender is one of the factors that influence the learning effect of interior design major. Peng Xiaoyan found that in the case of the same learning objectives and liking degree of the course, male and female college students have great differences in understanding of the importance of the course, attendance rate and influencing factors, and satisfaction with teaching methods and concepts, and female students' final grades are far better than male students' [4]. The educational level of family members is one of the important factors to improve the learning effect of respondents' interior design major. Family background still has an influence on the educational harvest of college students, which is mainly reflected in the positive influence of subjective family background on the development improvement degree of college students. Zhu Lianhua believes that the construction of colleges classroom environment has a direct impact on the development of college students, and it plays an important role in promoting the learning achievements of college students [5]. Hence, is that the personal's and the classroom environment's characteristics determining the learning effect of the respondents' interior design courses?

Each new multimedia technology will promote the progress of teaching methods and means in education. The introduction of virtual reality technology has changed the traditional single teaching

mode of interior design. It greatly improves the initiative and enthusiasm of students in class, which is helpful to stimulate and excavate students' interest in learning and their own potential [6]. Virtual reality technology has the characteristics of multi-perception, interactivity and conception, which can make up for the deficiency of traditional teaching. Teachers can make some abstract art knowledge visualized and vivid by using Virtual Reality technology, so as to help students understand relevant knowledge and concepts more perceptually. Therefore, what is the application degree of Virtual Reality Technology among GZCCC college students in the study of Interior Design Specialty?

Smart home begins to replace part of the traditional home into the daily life. One of the important factors limiting the development of smart home industry today is the high price. However, Raspberry Pi is used to make the traditional home intelligent, and the server controls multiple Raspberry Pi to manage the household equipment of the whole family, thus greatly reducing the cost of smart home equipment. Interior Design teaching should also keep up with the trend, combine technology with art, and develop corresponding intelligent teaching reform [7]. How about the Raspberry Pi involvement level among GZCCC college students in the study of Interior Design Specialty?

Xiao Jie found that the teaching organization of the major courses in similar colleges and universities mostly adopts the method of closed design theme and superficial design, and the teaching activities only stay in the classroom and virtual design space, with almost no connection with the real society and the market [8]. This teaching method makes students lack of keen cognition of the market, lack of relevant practical knowledge, and lack of the ability to accurately position products. The application of 3D Printing Technology in professional courses can effectively make up for the drawbacks of traditional teaching, show the three-dimensional effect of the most real images in front of students, and improve the teaching effect. During 3D printing production, students' learning enthusiasm and creativity will be constantly stimulated. How about the 3D Printing Technology involvement level among GZCCC college students in the study of Interior Design Specialty?

Virtual Reality technology enhances users' on-the-spot experience, improves user experience and stimulates users' subsequent adoption willingness by enhancing user participation, scene effectiveness, vividness, entertainment and operability. Raspberry Pi is used to analyze the weak knowledge points existing in students' learning, so that teachers can make more targeted teaching explanations. On the other hand, with Raspberry Pi, students can conduct hands-on operation in person, which is conducive to improving students' interest in learning [9]. From decorative parts to functional parts of architecture, 3D can be used to print parts of any form and has strong applicability. The application of 3D printing in teaching can improve students' interest in learning professional knowledge and skills, stimulate students' thirst for knowledge, enrich the classroom atmosphere and improve the classroom teaching effect. Thus, is there correlation between Virtual Reality, Raspberry Pi, 3D Printing Technology, and their summation score towards Interior Design Specialty?

2.1. Interior Design Specialty

There have many definitions to define interior design specialty. According to the research of Wang Wei, interior design specialty is a new comprehensive art system engineering, is an interdisciplinary comprehensive professional, it involves the art, craft decoration, building foundation, human body engineering, material science, color science, and many other fields, both in the breadth of professional theory and on the diversification of professional skill has a certain number of times [10].

Another definition is that Higher vocational interior design is a specialty that combines art with science and technology, mainly for the design and decoration of people's living space. The students will face the designer of the major requirements of post professional ability, it must have a keen

spatial perception, spatial planning ability, aesthetic, and creative ability, cooperation, coordination, communication and service ability, and strong ability of self-study and so on, only have the ability to better based on the designer late jobs and career development, which is the ultimate goal of talent training [11].

Wang Yihong pointed out that interior design major is a comprehensive applied major integrating operational skills and artistic accomplishment, and its curriculum system is mainly composed of basic design courses, design scheme and performance courses, design software courses and comprehensive practical training courses [12]. The teaching content of interior design major in higher vocational colleges covers a relatively wide range. Teachers should not only teach theoretical knowledge, but also cultivate students' innovation ability. At the same time, they should integrate design practice into it to help students master the necessary practical skills.

Liao Fenghua believes that the curriculum system of interior design major education is a curriculum system that organically integrates art and technology [13].

Wang Weilu believes that in the current interior design teaching in higher vocational colleges, how teachers choose the teaching mode has always been an important issue, and whether mixed teaching mode can be applied in interior design courses in higher vocational colleges is a subject to be studied [14]. Starting from the actual situation of interior design teaching in higher vocational colleges, she discussed how to apply the mixed teaching mode in interior design teaching practice.

2.2. Virtual Reality

This research was conducted to find the factors which could influence virtual reality towards interior design specialty in GZCCC.

In a broad sense, virtual reality technology includes all methods and technologies that use media means to visualize the existence in reality or only in imagination.

In a narrow sense, the rise and development of virtual reality technology is mainly a computer simulation technology gradually developed with the birth of computers.

Essentially, it is an advanced computer user interface technology, through the provide users with visual, hearing, touch, smell, taste and other intuitive and natural, real-time perception of interactive methods, maximum convenient man-machine interactive operation, and the need for frequent keyboard input, so as to create a virtual reality scene.

Dai Ming pointed out the application method of virtual reality technology in interior design renderings [15]. Is the use of 3D technology, give the design model specific material, and the use of sound and light to create the background, adjust the shooting Angle, rendering the target effect. Then the panorama tool software is used to make the virtual reality model, and the effect is uploaded to the computer. The designer or user controls the viewing Angle and distance through the mouse, and obtains a new unique experience based on the goal design. This kind of panoramic design can realize multi-angle and multi-context viewing, which breaks through the limitation of single perspective effect in traditional interior design. It can also make dynamic adjustment in the process of observation by combining user experience and demand, providing diversified, multi-level and multi-dimensional visual experience, and further improving the service effect and quality of interior design. They point out that the virtual reality technology can also be in the process of interior design to disassemble the whole space, the indoor space of each unit based on the comprehensive reconstruction goal design, can show different reconstruction effect, also can show the details based on a particular aspect of change of the effect of different display and present a style change, allowing users to make comparison and selection in different style.

2.3. Raspberry Pi

The Raspberry Pi is a minicomputer designed by Eben Upton's team at the non-profit Raspberry Pi Foundation. It was unveiled at the University of Cambridge in 2012. It is small in size, similar to

a piece of card, but it is very powerful, it can be used as a computer host, its Chinese translation is "Raspberry Pi". Raspberry Pi is equipped with CPU based on ARM architecture, and can use fast flash saving card as a hard disk, but also can carry out video output, with a standard HDMI to VGA interface, can easily connect the touch control screen.

Raspberry Pi is a single computer board, which is aimed at teaching, encouraging and helping students to learn programming better [16].

It is also an important starting point for developing projects related to the Internet of Things. They can be purchased at a very low price and are extremely easy to use "plug and play". These characteristics determine its application value, rich interface can connect a lot of external devices, but also can access the Internet. It can also be used as a research tool in the laboratory. With Raspberry Pi, we can use it as a desktop computer, media centre, server or home monitoring/security device [17]. The operating system of Raspberry Pi is similar to Linux in that they are operated by input instructions, and some software can be downloaded and installed through instructions.

Cai Yanmin found that by applying "Raspberry Pi" technology to teaching, teachers can operate demonstration experiments and exploratory experiments more conveniently [18]. The sharing of teaching resources improves the efficiency of teachers' cooperative lesson preparation. The "Raspberry Pi" technology is used to analyze the weak knowledge points existing in students' learning, so that teachers can make more targeted teaching explanations. On the other hand, by using "Raspberry Pi" technology, students can easily operate experiments by themselves and share experimental data, which is conducive to enhancing students' interest in learning and cultivating their core qualities.

2.4. 3D Printing Technology

3D printing is a rapid prototyping technology that uses the digital model as the driving source and the adhesive material to construct the object shape by printing layer by layer. It first describes the 3D printing materials, working principle and future development trend. Then, it focuses on the application of 3D printing technology in indoor furnishings, and puts forward corresponding theoretical suggestions and improvement schemes by analyzing the current situation and existing problems of 3D printing technology in indoor furnishings [19].

Students can convert their 3D solid model into the format required by 3D printing software, print out the parts of the model in the 3D printer, and then assemble them to obtain the product entity. By comparing with the printed entity, students can more intuitively find the defects in their designs. By comparing the design defects and finding out the reasons, students can improve their works again, so as to create better works. Students can also choose some excellent works to participate in the Internet works competition. In this process, students can acquire more abilities, broaden their horizons, increase their knowledge and accumulate experience for finding jobs after graduation. Flexible application of 3D printing technology can improve the teaching effect of higher vocational colleges, increase students' motivation for learning, and inject vitality into the teaching of abstract professional courses. By analyzing the characteristics of 3D printing technology, Zhai Yanfei combined with the institutions of higher learning product design professional teaching course, logic, system and so on, to optimize the cohesion and combination between the two. Especially in such aspects as content analysis, integrated curriculum design and system optimization, engineering practice and project practice. Her research has certain demonstration value for the training of 3D printing high-tech talents in universities [20].

3. Conclusions

This study aimed to make a contribution to the research on the education and teaching of the Interior Design Specialty courses in local higher vocational colleges. And this study helps teacher to

try to find the possible solutions so as to improve the teaching effect, to improve students' understanding of professional knowledge, deepen students' cognition of professional knowledge. After identification then, it is to explore the impacts of these factors affecting the education and teaching of interior design courses. Also, this study to examine which factors have a greater marginal impact on the education and teaching of the Interior Design Specialty courses. Finally, this study will recommend the teacher on how to improve the education and teaching of the Interior Design Specialty courses. The importance of why this research needs to be conducted is as follows. The researcher hopes that this study will contribute to numerous benefits in terms of theoretical, management as well as academic perspectives.

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