



REVIEW

Application Principle of Digital Animation Technology in Experimental Teaching

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ABSTRACT

With the continuous development and improvement of social science and technology, the “learning-oriented” teaching method is proposed, the traditional experimental teaching methods in colleges and universities are insufficient to meet the needs of experimental teaching. By studying the role and advantages of digital animation technology in experimental teaching, analyzing the application principle of digital animation in laboratory teaching, it is proposed to strengthen the application of digital animation technology in experimental teaching, give full play to the advantages of digital animation technology, and improve the quality of experimental teaching to promote students’ learning efficiency in experimental teaching.

1. Introduction

Experimental teaching is a key part of engineering teaching in colleges and universities, which plays an important role in improving teaching quality and cultivating students’ practical ability and innovation ability. The experimental platform in experimental teaching is an important guarantee to achieve experimental teaching, its quality can directly determine the teaching quality^[1]. In traditional experimental teaching, the investment of experimental equipment’s and resources, as well as the cultivation of talents, are the bottleneck problems restricting the development of experimental teaching in colleges and universities^[2]. With the fast development of digital animation technology and virtual reality technology, the experiment platform, experiment content and teaching method of practice teaching are improving

gradually, schools are focusing now more than ever on the construction of digital laboratory for experimental teaching by using digital animation technology and virtual reality technology. At present, China is increasing investment in education of regular colleges, and pushing hard on teaching reform methods such as MOOCs, micro-classroom, and flipped classrooms. These reforms have created a good foundation and environment for the construction of digital platform for experimental teaching.

2. “Study-oriented” is the Basis of Experimental Teaching Reform

“Student-centered learning” is the core concept of higher education teaching reform of the Bologna process in Europe, and is also an important proposition of teaching reform in European universities^[3]. With the development

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of science and technology, China's higher education is constantly reforming and developing. In 2001, China launched a new round of basic educational reform ("new lesson mark" for short), the tasks of reforming the traditional teaching content presentation methods, teacher teaching methods, student learning methods, and teacher-student interaction methods were presented [4]. The "teaching-centered" teaching method is based on teachers' teaching, teachers are the main subject. "Learning-oriented" is a way of teaching which emphasizes students' dominant position in the teaching process, cultivate students' learning autonomy, initiative, creativity, comprehensively raise students' learning literacy, cultivate students' innovative spirit as well as practical ability, enhance students' thinking ability and operate ability. Teaching methods as well as teaching thinking have changed. The teaching thought of "learning-oriented" has led to a series of reforms in teaching activities such as teaching purpose, teaching form and teaching process.

Along with the rapid development of information technology, mobile networks, smart phones, and tablet PC have gained rapid popularity. The fast development of this kind of information technologies have a huge impact on the traditional classroom teaching mode [5]. For instance, "MOOC" and "micro-classroom", which are becoming mature and constantly promoted in recent years, they subdivide the professional knowledge in teaching, miniaturized and fragmented professional knowledge so that it can be better stored on mobile devices and the internet, this is consistent with the time characteristics and life style of students, greatly facilitates student's learning needs, and makes up for the lack of pertinence in traditional classroom teaching and the limitation of teaching activities by time, place and materials, etc.

"MOOC" is a new online education mode based on big data technology and covering the whole process of teaching, it highlights the teaching value orientation of "learning-oriented" in concept [6]. Micro-classroom or micro-course is a new curriculum resource mode developed by means of multimedia, network, video facilities and animation video [7]. They are based on the open education of network learning, where students can learn and know professional knowledge independently online, so that they not only can learn the interpretations of well-known domestic universities and teachers, but also learn about foreign teaching resources through the network according to their learning progress and depth, and seek appropriate teaching resources. The implementation and promotion of "MOOC" and "micro-class" rely on advanced information technologies and image technologies, such as internet technology, computer technology, digital animation tech-

nology, film&TV editing technology, and so on.

3. The Application Advantages of Digital Animation Technology in Experimental Teaching

For the time being, experimental teaching has always been an important means to consolidate teaching effect and cultivate students' practical and innovative ability in colleges and universities [8], it is also an important part in the teaching of science and technology disciplines. With the quick development of science and technology, the demand of practical abilities for graduates in the industry has become increasingly urged, the current experimental teaching methods in colleges and universities cannot meet the needs of the industry, it poses higher requirements for the methods and teaching environment of experimental teaching. The construction and application of experimental teaching digital platform can make up for the deficiency of traditional teaching.

Nowadays, the teaching platform of experimental teaching in colleges and universities is mainly laboratory, and relies on experimental equipment to complete experimental teaching as well as experimental practice exercises. There are many practical difficulties in the traditional experiment teaching in experiment practice, teaching demonstration and equipment maintenance, which restricts the development of experiment teaching in colleges and universities. 1), Experimental equipment failed to keep pace with the development of experimental teaching content, and the lack of effective teaching equipment and venue, makes it cannot meet the requirements of experimental teaching development, the refurbishment of experimental classrooms and the replacement of experimental equipment cost enormous funds which results in a serious waste of resources. 2), Experimental materials are expensive and cannot be used repeatedly. Experimental practice is one-way operation, experimental materials are expensive and cannot be reused, which seriously restricts the development of experimental teaching and the improvement of teaching level. 3), Experiment is single operation, experiment operation cannot be played back, experimental results cannot be reviewed and compared in time, and experimental process is short, the experimental changes and data changes cannot be observed immediately.

In May 1995, the UNESCO defines "virtual laboratory" as an electronic collaboration group that uses scattered information and communication technologies for remote cooperation and experiment in scientific research and other creative activities for the purpose of creating and obtaining results [9]. In recent years, the fast development of internet technology and computer image processing

technology has supplied a useful condition for the construction of virtual laboratories, as the core technology of visual display in virtual laboratory, digital animation has been attached more attention by various disciplines and gradually being applied in practical teaching activities. The virtual laboratory platform based on digital animation technology has the characteristics of visibility, repeatability and timeliness. The promotion and use of the experimental platform are based on the network platform, which has good expansibility, wide range and flexible ways of use, and can deepen the teaching effect of the experimental course. Its visualization and reversibility allow students to intuitively understand the changes in the experiment during the operation of the experiment, and continuously enhance their knowledge of the experiment content.

4. Application Principle of Digital Animation Technology

Human vision is the superposition of time and speed, the continuous overlapping of information, by relying on timeline, digital animation could integrate image, sound and words to convey information to audience. In the process of information transmission, the audience will first notice the movement of the graphics, according to eye storage characteristic, they will keep pay attention to it, and select effective information from it for acceptance and memory ^[10]. This process is a superposition of information, according to the current picture information, combined with the picture information of the previous frame to form a complete information chain. As a visual symbol with time dimension, dynamic graphics can change as per certain default process in the process of transmission, audience only needs to organize the graphics, text, sound and other elements contained in these dynamic graphics in a logical manner ^[11]. The audience follows the digital animation shot, and form continuous pictures into a whole, increase the filtering and refining of information, so that more time stays on the key information of the graphics, and plays a role of information enrichment.

Gestalt Theory holds that the information received by human brain is not isolated, but a complete phenomenon related to the whole body. The complete phenomenon has the characteristics of phenomenon and information itself. After receiving, maintaining and analyzing information effectively, people have the ability to keep the received information. Students demonstrate the experimental content via digital animation, keep experimental phenomena in their minds, and raise the accuracy and effectiveness of information by using the playback and extension functions of digital animation technology, thus improving the

analysis effect of experimental information, and finally feedback to the brain to achieve a higher degree of experimental practice through interactive technologies.

Graphics is the “language” without boundaries, in the process of knowing the world, the first way is to record and convey information by means of graphics and images. Word is static, abstract, and divided by cognitive domains. Therefore, in conveying information, word has the characteristics of prioritization. User’s perception of things is common, which can be transmitted and recognized quickly and without obstacles. According to the characteristics of graphics, digital animation can complete the experimental demonstration and virtual experimental fluently with immediate and effective feedback and results. In experimental demonstration and virtual operation, to start, pause, and continue the experiment according to the understanding of the audience, allow the audience enough time to understand the image information, to analyze, define the experiment content, thereby emphasizes the key knowledge points of experimental teaching content, and strengthens the characteristics of experimental phenomenon.

5. Conclusion

Experimental teaching is a rigorous course, which requires students to have strong practical ability, only when students have effective experimental information, abundant experimental knowledge and correct experimental operation, can they obtain accurate experimental results. The brain’s thought process about information is continuous, emphatic and valid. Given the nature of brain thinking, the digital animation technology can strengthen the content and information of experimental practice through intuitive performance, thus improving the teaching effect of experimental teaching

References

- [1] Shuai Yang, Chao Han, Four Aspects of Laboratory Construction in New Era [J]. *Experimental technology and management*, 2006.3(1):90-91.
- [2] Department of Education, Notice on the Construction and Evaluation of Experimental Teaching Demonstration Centers in Colleges and Universities, Department of Higher Education, [2005] 8.
- [3] Haiyan Liu, “Student-centered Learning”: Core Propositions of Teaching Reform in European Higher Education[J]. *Education Research* 2017.(12):119-128.
- [4] Qinghong Yi, Research on the flipped classroom based on MOOC and its teaching structure[J]. *Modern Educational Technology* 2015.4.(14):94-100.

- [5] Limeng Zhu, Deyuan Zhou, Mingyue Hao, Experimental study on seismic behavior of composite shear wall with double steel plates and infill concrete with binding bars, [J] *Journal of Building Structure*,2013, 34(6):93-102.
- [6] Jinglan Zhang, An Inspiration of Learning-oriented MOOCs for the University Teaching of Humanities Courses[J]. *Journal of Huaihai Institute of Technology (Social Science Edition)*, 2014.9(12):127-130.
- [7] Xiaohai Yu, Hui Cong, Juan Du, Application of micro-classroom in functional experiment teaching, *Basic Medical Education*,2017.1(19):54-56.
- [8] Yajun Rong, Wei Wang, Jiwei Yuan,et al, Construction of Virtual Laboratory[J]. *Journal of electric power system and automation*. 2012, 24(3):86-90.
- [9] Jiangping Chen, Jianlong Shao, Yanqing Ye, Network communication technology in virtual laboratory teaching[J]. *Computer Applications*, 1999, 19(10):64-65.
- [10] Yi Gong, Research on Dynamic Graphical Information Communicated in Art Design[J], *Packaging Engineering*,2016.9(18):211-214.
- [11] John McWade, *Before & After: How to Design Cool Stuff*[M]. Posts & Telecom Press,2010.