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Instructional Design and Practice of Installation Art Based on STEAM-OBE Concept

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ABSTRACT

Digital media art is the most cutting-edge part of contemporary art, and major universities have gradually followed up digital media-related professional creation courses, among which the course of interactive installation art creation is an important practical course for digital media art majors. Students can learn interactive installation art creation in digital media art through hands-on practice. At present, there are still some problems in the design of interactive installation art creation course, which are mainly reflected in the following aspects: 1. The teaching system is not comprehensive enough. 2. Lack of project management awareness. 3. The evaluation system is not comprehensive enough. In view of the above problems, by analyzing the OBE concept and STEAM concept, the experimental teaching content and process are optimized, and an interactive installation art online and offline experimental teaching mode integrating OBE and STEAM is built. The concrete practice of constructing the teaching mode integrating OBE and STEAM concept is as follows: 1. Establishing the teaching knowledge system based on STEAM concept. 2. Student-centered initiative learning. 3. Project-based learning. 4. Establish course assessment system and work evaluation system based on STEAM concept. At present, the online and offline hybrid experimental course teaching, which integrates OBE and STEAM concepts, has been successfully carried out. Students watch the teaching videos recorded by teachers through the school's online learning platform, learn the creation process of installation art online, and conduct concentrated experiments in the offline basic experimental course. In the end, a lot of excellent assignments have been born, and students have obtained good results. It can improve students' learning engagement, enhance students' learning experience and teaching satisfaction, and provide a reference for the teaching reform of interactive installation art.

Keywords: Instructional design, Steam-OBE concept, Installation art

INTRODUCTION

With the development of digital media art courses in major universities, the research and design of its teaching mode have become the aim of this course to cultivate students' higher aesthetic taste and innovative ability. On the one hand, innovation is the inevitable requirement for the development of education, is the trend; On the other hand, based on the characteristics of the discipline itself, students are required to have the ability to innovate and

make use of the professional quality they have learned to create artistic works that can arouse people's emotional resonance.

By integrating the STEAM-OBE concept and aiming at the problems existing in the current new media art creation course, this course proposes new and innovative plans for the course structure, teaching methods, teaching concepts and assessment methods, which greatly improves the organizational ability of the course.

OUTCOMES-BASED EDUCATION

OBE comes from the concept of OBE (Outcomes-based Education) in the international educational community in recent years, that is, results-oriented education, which is a goal-oriented education model, due to its expected "Outcomes". Derived from the concept of "Student Learning Outcomes" SLOs (Student Learning Outcomes), we can invert the expected "learning outcomes" to cultivate students' ability and design teaching programs, so OBE can also be understood as "ability-oriented education".

This concept emphasizes the integrated assessment of cognition, skills and attitudes, and optimizes the effect of education and teaching through the topological structure of "guide structure, result orientation, learning assessment and student center". OBE pays more attention to students' learning process and reflection, emphasizing the overall integration of students through reflection and practical operation in the complete learning process.

STEAM CONCEPT

STEAM concept originated in the United States. It mainly consists of five goals and evaluation systems, including Science, Technology, Engineering, Art and Mathematics, which can cross disciplinary restrictions and make knowledge and skills more inclusive and connected. It is an educational practice form that integrates science and technology with humanities.

The STEAM concept has been constantly changing since the 1980s, and has accumulated a lot of teaching results and practical cases.In the 21st century, Georgette Yakman proposed to add "A", that is, Art, to "STEM", thus giving birth to the concept of STEAM. The concept of STEAM no longer only focuses on the integration of science and technology disciplines, but develops the integration of STEAM education towards a broader and more multidimensional interdisciplinary field.

THE TEACHING GOAL OF INTERACTIVE INSTALLATION ART EXPERIMENT

Interactive installation art experiment is a new art form, through digital technology, sensors and other scientific and technological means to interact with the audience to create visual and auditory interactive effects. Its goal is to help students understand and master the basic principles and technical means of interactive installation art through experimental teaching, and cultivate their ability to create new artistic expressions and solve practical problems.

The teaching objectives of interactive installation art experiment mainly include the following aspects:

1. Let students master the basic concepts of interactive installation art.
2. Cultivate students' creative thinking.
3. Cultivate students' technical ability.
4. Cultivate students' teamwork spirit.
5. Cultivate students' aesthetic quality.

The teaching goal of interactive installation art experiment is comprehensive, not only technology, but also thinking and art, which can improve students' all-round literacy and comprehensive ability.

Experimental Hardware and Software of Interactive Installation Art

Arduino Uno development board kit, 3D printing equipment and open source hardware are used as teaching hardware. Use Arduino IDE, processing, Touch-Designer, etc. as teaching software.

EXPERIMENTAL TEACHING CONTENT DESIGN BASED ON OBE AND STEAM CONCEPT

OBE refers to the student-centered, through the teaching based on learners' ability goals, to achieve the overall improvement of students' ability and quality. In the experimental teaching of installation art, OBE is adopted to achieve the following aspects of work:

1. Setting course objectives
   According to the actual situation of students and the law of physical and mental development, the curriculum objectives in line with scientific principles and educational laws are set up, and the core skills and related abilities that students should master when learning installation art experiments are explained in detail.
2. Arrangement of teaching content
   The teaching content should be closely related to the curriculum objectives, and try to improve students' interest and enthusiasm, so that they can take the initiative to participate in experimental activities and develop their potential.
3. Application of teaching methods
   In experimental teaching, a variety of teaching methods should be adopted, such as phenomenon observation, experimental operation, practical activities, creative thinking, etc., combined with the actual situation of students and the course content, to cultivate students' hands-on ability and innovative consciousness.
4. Establishment of evaluation system
   In the process of experimental teaching, it is necessary to conduct a comprehensive evaluation according to the curriculum objectives, assess the ability and quality of students, and promote the feedback and summary of students' results through guiding students' self-evaluation and evaluation, so as to improve students' self-management and lifelong learning ability.

CONSTRUCTION OF TEACHING MODEL INTEGRATING OBE AND STEAM CONCEPT

Combining OBE and STEAM concept, the change of teaching model pays more attention to fundamentally improve the comprehensive quality of students and attach importance to students' learning and development. We should focus on "student-teacher-problem". Students are given learning tasks or problems, and teachers help students with academic practice, thinking and inquiry in the process of guidance, so as to achieve the purpose of understanding new knowledge.

The concrete practice of constructing the teaching mode integrating OBE and STEAM concept is as follows:

1. Guide students to study
   Teachers should guide students to learn, propose questions or tasks, guide students to find answers and discover potential, so that students can gradually master STEM-related professional knowledge in these practices.
2. Progressive observation
   Adopting the progressive observation method, students can gradually understand and master the learning knowledge through the process of exploration and practice, so as to better master and practice, and improve the learning effect.
3. Student-centered
   Student-centered is the core idea of OBE concept. The STEAM concept emphasizes the nature of practice, and supports students' active, independent and social learning by promoting the improvement of students' comprehensive quality.
4. Project based learning
   Through project-guided learning, problem-oriented, specific open questions are put forward, allowing students to explore answers, master methods, broaden ideas, and improve practical ability, so as to ultimately enable students to independently develop innovative project works.

CONSTRUCTION OF COURSE ASSESSMENT SYSTEM BASED ON STEAM CONCEPT

1. Basic evaluation dimension
   Scientific experiments. The elements of scientific experiment should be reflected in the curriculum, so that students can explore scientific knowledge, improve scientific practice ability and explore innovative thinking through experimental operation.
   Project works. By giving students some specific course projects, students are asked to think creatively in the project, design and produce art or technology products or works that meet the course objectives, and evaluate students' innovation level and creative ability.
   Mathematical model. In teaching, natural science, technology, engineering and art should be closely combined with mathematics, so that

students can learn to use mathematical methods to establish mathematical models of practical problems and improve the ability to solve problems with mathematics.

Table 1. Curriculum schedule.

Teaching weeks	The type of course	Content of courses	Instructional objectives	Hours
1	Online teaching	The basics of interactive installation art	Understanding the basic concept, development history and basic creation process of installation art.	4
	Offline teaching	Basic creative practice 1	Understanding the implementation principles of hardware and functions	4
2	Online teaching	Introducing Arduino\Touch-designer\Processing	Learning some of the basic functions of creative software	4
	Offline teaching	Basic creative practice 2	Creating Installation Art Practice Based on Case Studies	4
3	Online teaching	Learning Arduino	Learning the Use of Arduino-based Sensor Hardware	4
	Offline teaching	Basic creative practice 3	Developing Initial Creative Project Proposal and Plan, and Conducting Design Research and Discussion.	4
4	Online teaching	Learning Touch-designer\Processing	Learning TouchDesigner: Creative Case Studies and Basic Application Methods.	4
	Offline teaching	Basic creative practice 4	Advancing the Creation of Installation Art.	4
5	Offline teaching	interim report	Reporting the Knowledge Acquired in the Initial Phase, and Generating a Design Proposal for the Subsequent Project.	4
	Offline teaching	prototyping	Creating a Prototype for the Creative Project Design.	4
6	Offline teaching	Test and iteration	Completing an Installation Artwork.	4
	Offline teaching	Conclusion and evaluation	Peer Assessment among Students and Course Evaluation Conducted by Teachers.	4

2. Project management
In STEAM education, it is necessary to conduct a holistic assessment of students' project works, so as to promote the improvement of students' literacy, skills, hands-on ability and innovation ability. The assessment system should include the following:
Project planning. students need to pre-plan the project's goals, schedule, resource requirements, etc., to ensure that the project works smoothly and efficiently.

Project execution. In the process of project implementation, students need to carry out group cooperation, experimental operation, literature reading, data analysis, production results and so on.

Project evaluation. The content of evaluation includes the quality of the project results, whether they meet the expected objectives, the division of labor and collaboration of students, personal performance, and so on.

Project review. Students need to review and evaluate the entire project, which helps to find shortcomings and improve teaching effectiveness, and also plays an important role in promoting the lifelong growth of students.

3. Comprehensive evaluation

   Comprehensive assessment needs to assess students' ability from multiple angles, so the assessment elements include: students' scientific experiment ability, artistic creation ability, innovative thinking ability, communication and cooperation ability, research methods and experimental safety and environmental awareness, and so on.

TEACHING PRACTICE AND EVALUATION

The course assessment will be based on students' comprehensive online and offline learning. The final total score includes mainly usual score (30%) + final score (70%).

The usual score include attendance (10%) + online course learning (30%) + basic experiment completion (40%) + course interaction performance (20%).

The final score will include the presentation of the creative project (10%) + completion of STEAM metrics (50%) + innovation and design of the project (30%) + teamwork (10%).

TEACHING PRACTICE

At present, the concepts of OBE and STEAM, has been successfully carried out by the School of Art Design and Media of East China University of Science and Technology. Students watch the teaching videos recorded by teachers through the school's online learning platform, learn the creation process of installation art online, and conduct concentrated experiments in offline basic experimental courses. All the students completed the online MOOCs viewing within the specified time, and had repeated viewing records. In the project practice module, students give full play to their thinking, select the project, formulate the plan, and conduct in-depth design research using observation method, experience method, questionnaire survey, competitive product analysis and other methods. After prototyping testing and multiple optimizations, many excellent large-scale projects are finally born, such as the interactive lighting installation art works combining Arduino open source hardware and LED lights. In the end, all the students got good grades.

Figure 1: Curriculum outcome (by the author, 2021).

CONCLUSION

Aiming at the problems existing in the experimental courses of interactive installation art, this study reformed and explored, integrated the concepts of OBE and STEAM with the mixed teaching mode of online and offline, and constructed a new teaching mode for experimental courses of digital media art majors.

Practice has proved that the new model effectively improves students' learning efficiency and enthusiasm for interactive installation art, reduces the learning difficulty, and better achieves the curriculum training goal. Compared with the traditional teaching model, the teaching effect has been significantly improved, and it has better practical application and promotion value.

constructed framework model, the research can be further expanded, the possibility of applying this model in other courses or teaching of other majors can be studied, and specific implementation methods can be proposed.

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