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Research on the Application Strategy of Project-Based Learning Teaching Mode in Practical Teaching of Product Design

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ABSTRACT
To explore the application strategies of PBL teaching in the teaching of product design major by introducing PBL teaching model into the teaching process of product design major. This paper analyzes the relationship between project-based learning and product design teaching, and puts forward the integrated application strategy of project-based learning and teaching mode in product design specialty that is, drawing "construction drawing", focusing on "key points", and fighting "global war". Project learning teaching model is applied to product design process, complies with the design practice, and diversified characteristics, can effectively promote students' learning initiative, improve the efficiency of knowledge absorption, promote the innovation ability, through the deep understanding of the essence of the project learning teaching mode, grasp the key link, and the application effect of the project learning into practice, new changes of power product design professional teaching, to promote the innovation of the product design teaching practice.
Keywords: *Project-based learning, product design, teaching mode*

1. INTRODUCTION

For ages, the multi-subject education mode with knowledge acquisition as the core has cultivated a large number of talents with broad knowledge and solid foundation, and provided a solid foundation of human resources for China's reform and opening up and national construction. As the environment and the changing of The Times, serve for teaching purpose and teaching model has been improved, in November 2020, the Ministry of Education of new arts construction working group meeting, issued the declaration of new liberal arts building, a comprehensive deployment to the construction of new arts and requirement of higher education reform unceasingly, for the development of the design of the construction of new arts context put forward new demands and new challenges, new teaching mode, how to improve and innovation fusion for discipline construction is the urgent need of research problems.

Product design is a comprehensive interdisciplinary subject with prominent practicality, and it is also an interdisciplinary subject that unifies the knowledge of art, science, society, economy and other related fields. It has a strong discipline characteristic of arts + engineering, and requires designers to have a "generalist" knowledge structure. In the talent training plan, in addition to the practical basis, mastered the basic solid design theory knowledge, more emphasis on design practice ability, engineering design application ability and innovation ability, training to engage in product design practice applied professional design talents, practice teaching as an important way to achieve this goal and link, for professional development and product design is of great significance to the discipline construction, and universities to deepen education reform, the key to improving the quality of personnel training.

2. PROJECT LEARNING AND PRODUCT DESIGN

2.1. Characteristics of Project-based Learning and Teaching Model

Project-based Learning (PBL) is a project-based teaching mode with life experience as orientation and "real problems" as the core. It aims to integrate students into a meaningful task completion process so as to achieve Learning goals. It originated from the medical education of McMaster University in Canada, and has been widely applied in the fields of medicine, engineering and business. It has the typical characteristics of authenticity, skill, interdisciplinary, student-centered, initiative learning, cooperative learning and progressive inquiry. Teachers and students in PBL teaching mode and other personnel involved in the activity form learning community through mutual cooperation, communicate, and to establish close relations of cooperation, in the process, teachers play the role of partners, is the facilitator of knowledge, which provide scaffolding and various support means to promote the teaching content, advocates

learners' active learning, students in the construction of a complex project to solve in the process of active self-knowledge.

2.2. Development Opportunities and Challenges of Product Design

"New arts" design education continuously explore construction requirements, integration and innovation, cross and integration, coordination and sharing as the main path, break through the traditional mode of thinking, promote multidisciplinary cross and depth fusion, promote the traditional art design major updates, from subject orientation to demand oriented, from professional segmentation to cross fusion, from support services to adapt the lead[1], make a design discipline development more open, flexible and innovative. Product design practice course shapes professional talents of product design and development, and cultivates students' design thinking with innovation driven as the core and art and science combined. User-centered, design aesthetic and product functional oriented design ideas; To product modeling, structure, color, texture, materials, technology comprehensive application ability for the quality of the core aspects of knowledge, it emphasizes the idea of market in the design of products and services, attach importance to achieve mastery through a comprehensive study of cross-cultural and interdisciplinary knowledge, at the same time, training students' insight into the ability of science and technology and social development trend, the ability of language communication and expression ability, collaborative innovation[2].The talents cultivated by the training show the characteristics of cross-discipline, master cross-field knowledge and have strong comprehensive quality.

In today's design education, the traditional educational theoretical framework has caused difficulties for learners in learning methods. Information technology has accelerated the flow, access and reproduction of information, but hindered observation skills and original thinking [3]. Design education is mostly single-instruction or transmissive learning with feedback from others [4], which results in poor results of integration and cross-field cooperation. Because there is no established experiential learning form, novice designers lack a lot of real project training to strengthen their personal design experience and skills, resulting in "experience difference" between them and experienced designers [5]. In the learning process, technical and economic standards are often taken as the premise, but in the design conception stage, rigid, narrow and blind design confinement phenomenon will appear, thus making design thinking routinized and other problems [6]. Therefore, it is necessary to change the thinking of design teaching, explore new modes and seek new methods, and the study of project-based learning teaching mode is a new attempt to practice teaching in product design.

3. THE RELATIONSHIP BETWEEN PROJECT LEARNING AND PRODUCT DESIGN PRACTICE

Project learning teaching model is to pass around a particular learning project, selecting and using the optimization of learning resource adequately, in the practice experience, internalized absorption, explore innovation gain a more complete and specific knowledge, master the specialized skills, training students' scientific thinking and deep thinking, so as to learn enough knowledge. The practical teaching of product design is also to give students more possibilities and freedom by cultivating and improving their practical perception ability, skill-based experience, interactive experience, imagination and creativity, so that they can solve problems in a unique way according to their own pace and with their own initiative. The combination of the two is not only conducive to students' activation, application and acquisition of concepts and facts, but also conducive to students' clear expression of follow-up questions and the formation of mature learning strategies.

3.1. Improve Students' Practical Perception Ability

Since ancient times, China has emphasized the "unity of knowledge and practice", which requires the combination of knowledge and practice. Product design professional talent training concept is fine "art" good "work", art and engineering combination, both. Psychologist James Gibson has emphasized the importance of action and feedback in practice for perceptual development [7], especially in situational practice. 1 Real learning environment can promote "warm up", recall and wake up the learned knowledge, and let students experience the real life work practice, which is not only conducive to the creation of space and objects, but also conducive to the burst of creativity and inspiration. When interacting with the project and environment, students are fully aware of and participate in the design process, and experience the whole process of "conception, design, implementation and operation" of the product. They will also have "unexpected" harvest in the interaction and response, thus achieving "knowledge acquisition" and promoting the construction and transfer of knowledge.

3.2. Cultivate Students' Experience in Skills

Ingold (2011) proposed the concept of skillful practice [8]. Skill is the product of the relationship between mind, body and environment. Skill-based practice is acquired through the coordination of perception and action, not through the

transmission of rules or instructions, but from experience or practice. Such skill-based practice has been advocated and applied in various educational institutions.

3.3. Cultivate Students' Interactive Experience

Dewey points out that learning comes from the interaction between learners and the environment, is the core of the educational process, and should have continuity and future-oriented experience [9]. Instead of waiting for passive feedback from others, learners rely on the feelings and perceptions they gain through experience and begin to judge the quality and process of their work.

3.4. Cultivate Students' Imagination and Creativity

James T. Wang believes that imagination is the core of design [10]. Imagination and creativity have become important intelligence and abilities that students need to survive in today's rapidly changing world. He also stressed that, in terms of creativity, creation is always a constant struggle to find new forms within the individual's imagination. If a person's critical and operational abilities are greatly stimulated and demonstrated, then he will have more freedom in expressing new designs.

4. THE DEFICIENCY OF THE LEARNING TEACHING MODE IN THE PRACTICAL TEACHING OF PRODUCT DESIGN

(1) There are some problems in professional practice courses, such as unclear teaching objectives, homogeneous activity design and unclear learning effect; Lack of continuity between each professional courses, the practice teaching of fragmentation, despite the course training outline design detailed training plan, make clear a regulation should set up the connection between the courses and cohesive relationship, but in the process of curriculum implementation due to the different teaching teacher's ability to execute and the outline of the difference of reading course and course between prone to "lost" phenomenon, there are even more repeat teaching phenomenon, cause lack of lateral connection between curriculum and vertical depth, serious impact on the effective integration of teaching resources.
(2) Product design existing in practice teaching of PBL teaching mode design lack of considering the interdisciplinary content, the discipline integration, knowledge interaction in the process of the depth and breadth can better meet the requirements of the syllabus, causes students to learn knowledge to float to the surface, the lack of comprehensive thinking in solving practical problems, and PBL project learning emphasizes the diversity of students, emphasizes the creation process of knowledge and the integration of new technology, new media, more and more outstanding creative expression, but the more practical learning remains restricted to students in their own ability, Lack of the application of corresponding technical means. Such as: electronic books, audio and video media and other technologies and digital media related platforms, software, etc.
(3) Lack of challenge and experience in project design and management. Some teachers themselves have insufficient teaching experience, and some young teachers directly enter colleges and universities from fresh graduates. They are relatively short of project experience of different types of real topics, and most of them focus on virtual projects or topics in practical course teaching. And demands of the students is the hope to be able to learn by real effective project and course of organic union, but in practice but not real contact the actual project, the "macmillan disconnect", this also directly causes students to enter society after post identity change the lack of ability to solve practical problems and the corresponding strain capacity, can't satisfy the requirement of the society, the enterprise of choose and employ persons.
(4) In the process of fusion of PBL teaching mode, has the innovation practice classes, in particular, the project learning, process evaluation, work quality and scoring criteria such as the lack of systematic evaluation standard of diversity, timeliness, more is in the process of learning with teacher evaluation as the main body, with the proportion of teachers' personal arrangement evaluation set of summative evaluation, from the design project of product innovation, function in practical works, artistic quality, integrity and other aspects of achievement, in after learning of students need to master the specific design of practice ability, to what extent there is no clear appraisal standard, Lack of effective evaluation of students' practical learning process and evaluation of practical operation ability in each stage, cannot achieve good teaching guidance and supervision, is not conducive to stimulate students' initiative to learn, explore the enthusiasm of problems and improve the quality of teaching.

5. THE INTEGRATED APPLICATION STRATEGY OF LEARNING AND TEACHING MODE IN PRODUCT DESIGN SPECIALTY

5.1. Draw the "Construction Drawing" Well -- Plan the Teaching Design

(1) Teachers are both lecturers and planners, who not only teach the curriculum content stipulated in the curriculum training syllabus, but also integrate the curriculum resources to form an organic whole. Project learning PBL teaching mode with the traditional teaching method of the coordination and cooperation, on the necessary knowledge content, the teacher through theory teaching, case analysis, in the form of situational teaching, group discussion and,

more is through the clear project set to inspire and guide students to autonomous learning, build the system of knowledge, promote the product design professional education with social practice closely, promote the reform of teaching content, teaching method innovation. Therefore, product design professional practice courses through the integration of project learning in the course of the teaching mode to the introduction of the actual project, first requires teachers to the teaching target, teaching resources, student status, social environment, related subject content, and the analysis and research of the system and integration of past experience, and give full consideration to the progressive characteristics in the process of project implementation and its innovation has the ingredients and unforeseen composition, focus on the learning of students in the process, forecasting students may encounter problems in advance, reasonable planning project and import the professional course of the implementation of the scheme, to optimize the design of the project learning teaching process (figure 1),Grasp the new era of development put forward new requirements, new changes and new stage, new features, new test, the new change, application and innovation, advance the integration teaching mode with modern information fusion, cross fusion with other disciplines, and similar professional cluster fusion, and then draw "shop drawing" of teaching, building is suitable for the innovation and development and professional training of teaching mode of subject construction.

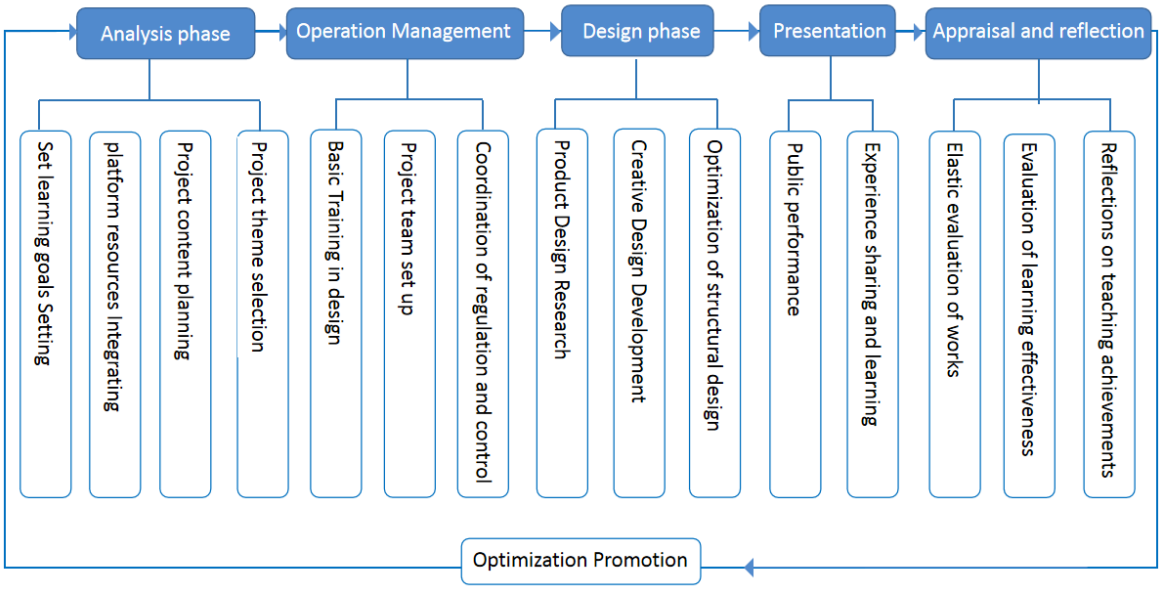

Figure 1 General flow of PBL teaching mode into product design practice course teaching

(2) Project setting can give priority to projects that are closely related to students' life experience, learn new knowledge through inquiry and apply previous knowledge and experience to solve real problems. Through first-hand experiences stimulate students' study enthusiasm, improve students' ability to solve problems, to enlighten students identity change after the solution actual problem ability and the team cooperation ability, through the real scene trigger the students' learning enthusiasm, improve students' solve ability in learning and life, inspire the student ability to solve problems in the future life work and team cooperation ability, at the same time, considering both PBL teaching mode and teaching activities for all sorts of study resource construction, and used in the process of project implementation of effective incentive mechanism, promote the project design by the horizontal contrast between different team effect.

(3) To enhance the challenge of project design. To the requirement of project learning and the degree of result set need to have enough challenges, the teacher in the full understanding of the professional skills of the students have mastered and the status of the study and the professional talent training goal, on the basis of the design has the certain difficulty, and corresponds to the actual work of professional course training mission, design program requires learners repeatedly check data and in-depth research, do it yourself, to solve the practical problems existing in the project. By encouraging students to keep exploring and trying in the learning process, students can be inspired to fight and interest, and their desire for success and efforts can be improved, so as to realize the communication and integration between academia and industry through project-based learning.

5.2. Focus on the "Key Points" -- Strengthen the Participation of Students

Through to the PBL teaching mode into the product design in the role of the general process of leading professional courses, PBL is the focus of the project learning process tracking, inspection, adjustment, performance, evaluation,

etc., the early stage of its teaching consume more time required to design planning, curriculum implementation process execution cycle is long, requirements, an all-round evaluation of project and the process and result evaluation and weight. In the process, the teacher plays the project organizers, promoters, guiders, supporters, partners, supervisor and assessor, summarizes different roles, such as PBL teaching mode requires teachers to course project design, operation and management, teaching evaluation and feedback for effective monitoring, according to the students' learning process and class discussion, again carries on the analysis and solutions to help and guide the students to solve problems, to improve students' ability to analyze and judge problems, middle school students to discuss and solve process to generalize and summarize the purpose of control, ensure project achieve learning goals in a given time. Though the teacher to participate in the whole process of project practice and free outside its teachers, students as the subjects of curriculum design project is a participant, practitioner, also is the creator, in the process of project design leading to participate in the overall process of innovative solutions, independent design, the solution for the assigned project, innovative solutions, to complete the works and so on each link, therefore, the project learning PBL teaching mode need to pay special attention to the key points of application of student-centered teaching mode and team cooperation, strengthen the student main body participation.

5.3. Fight the "Overall battle" -- Flexible Teaching Evaluation and Feedback

A good teaching mode should be able to stand the test, set up the overall view of course training, and achieve a good teaching "global war". It is necessary not only to evaluate and reflect the preliminary planning and design of course teaching, but also to evaluate the receiving effect and learning effect of students in the process of practice, so that both curriculum design and student feedback are important, and both the implementation process and the final evaluation of the results are important. In PBL teaching mode, evaluation requirements are completed jointly by experts, scholars, teachers and students, which not only requires the evaluation of project results, but also emphasizes the evaluation of the learning process. The evaluation content includes project selection, students' performance in individual groups, plan, schedule, result expression and achievement display, etc. The evaluation of results emphasizes students' mastery of knowledge and skills, completion effect of works and learning experience. The evaluation of the project design process emphasizes research and analysis, various raw data, project progress process, questionnaire production, creative product development, etc. It combines quantitative evaluation with qualitative evaluation, formative evaluation with summative evaluation, individual evaluation, group evaluation, self-evaluation and others evaluation to realize multi-level and diversified evaluation and generate feedback, providing reference for further optimization and promotion as well as guidance for subsequent project-based learning.

6. CONCLUSION

The reasonable planning and effective introduction of project-based learning teaching model have great positive influence on the teaching process.It follows the basic rules of subject characteristic education and talent cultivation,and also complies with the development trend of interdisciplinary and cross-cultural times and the requirements of the construction of new liberal arts.Besides,it enriches the form and content of product professional practice class and strengthens the students' main participation.Thus, it can promote the all-round development of students and the formation of personalized design style, promotes the further sublimation of the teaching achievements, and lay a solid foundation for the formation of the healthy development of the teaching classroom ecosystem and the acceleration of the innovation and development of education.

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