

Research on the Innovative Teaching Model of Product Design Major Multidisciplinary Intersection

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Abstract. The rapid development of product design promotes the educational innovation of design specialty. By applying the interdisciplinary theory, on the basis of mastering its theoretical connotation and characteristics, and taking the current teaching reform trend and innovation goal of product design specialty into consideration, this paper discusses constructing a system with product design specialty as the core and cultivating students' practical design ability with systematic professional knowledge. It tries to overcome the problems of the traditional teaching mode of product design specialty through interdisciplinary and multi-directional methods, which allows the product design teaching system to apply the innovation and better follow the interdisciplinary development trend.

Keywords: interdisciplinary; product design major; characteristics of product design specialty; teaching mode innovation; project training.

1. Introduction

With the rapid development of economy, the great effect of product design on economic growth has gained the recognition in the society. More and more attention has been paid to the product design education, which has a close relation with it. According to the relevant research results, the traditional teaching mode is adopted in some colleges and universities at present, which will fail to meet the current development of emerging disciplines and the social demand for product design professionals. Therefore, the outdated teaching modes of product design education should be reformed to meet the needs of product design professional development. As an important trend in the development of emerging disciplines, interdisciplinary provides a new thinking for product design teaching and research. By taking the interdisciplinary as the link, we can develop an innovative teaching mode of interdisciplinary.

2. Concept of Interdisciplinary

The new discipline concept of "interdisciplinary" mainly refers to that according to the professional training objectives and curriculum, we should constantly get over the boundaries of different disciplines, apply the theoretical knowledge and technical methods of different disciplines, reasonably integrate them into the professional theory courses related to the specialty, perform systematic professional teaching, and promote the mutual penetration and integration of different disciplines in teaching. This new discipline concept is good for developing innovative teaching methods, promoting the comprehensive development of disciplines, and is also a new thinking to promote the derivation of emerging disciplines.

3. Product Design

Recently, we have found that the training of product design students, education-business collaboration, and industry-university research collaboration comprise the majority, including the studio system, contracting mechanism, etc. The concepts and technologies of similar disciplines can make the product design work more precise and appropriate. How to use domestic means to execute international education has evolved into a hotspot regarding the restructuring of art education in

colleges and universities. This paper mainly studies transboundary talent cultivation from the following three aspects.

3.1 Concept of Product design

"Product design" refers to transforming the technology, art and culture into productivity. And the "design" is the key of product design. It can provide a strategic means to solve the problems. From the perspective of discipline attribute, it is the intersection of natural science and humanities that promotes the birth of the emerging discipline of "product design". As time goes by, the product design does not only refer to designing a single product, but an innovative era of constructing interdisciplinary. Therefore, the product design specialty should become a comprehensive discipline integrating the interdisciplinary attributes of art design, mechanical engineering, consumer psychology and enterprise management.

3.2 Characteristics of product design specialty

Creativity: creativity is the soul and key point of product design. Without innovation, no value lies in the product design. Creativity must be put in the first place in product design teaching.

Practicality: product design has strong professional practicality, and the practicality of teaching activities must be highlighted in teaching, aiming to cultivate students' abilities of discovering, analyze and solve the problems.

Comprehensiveness: product design is a comprehensive discipline. The product design teaching should focus on how to highlight various professional knowledge in product design teaching and innovate the teaching methods to help the students gain the systematic professional knowledge.

3.3 The current problems in product design teaching

The teaching content of product design is single. Currently, a number of colleges and universities with product design still adopt the traditional teaching mode, whose teaching content is empty and boring.

The teaching knowledge of product design is insufficient. The teaching of most product design specialty adopts the professional knowledge for teaching without containing other relevant professional knowledge.

4. Requirements of interdisciplinary teaching for product design specialty

There are two specific requirements of interdisciplinary teaching of product design specialty: on the one hand, it requires the intersection and integration of product design and other related design majors, such as the intersection of product design and environmental art design, which is the internal communication between the two majors; On the other hand, the product design and other interdisciplinary together with interdisciplinary should cross and penetrate each other. Such kind of cross is the external communication between the two disciplines.

The teaching mode of product design specialty under interdisciplinary teaching is different from the previous traditional teaching process. In the specific implementation, it is necessary to strengthen the interdisciplinary and interdisciplinary research in the teaching of product design specialty, which helps to find out the intersection and complementarity of the relevant discipline knowledge.

In the process of practical teaching, the use of comprehensive, applied and innovative curriculum projects for training allows the students to find out the problems through different channels, ways and aspects, increase the students' professional knowledge, form a more systematic knowledge structure, improve the research ability of product integrity and create more valuable product design, which will meet the current requirements of society.

5. Innovative methods of interdisciplinary teaching in product design specialty

5.1 Revise the teaching plan of product design specialty under the background of interdisciplinary

It is necessary to break the boundaries between different disciplines, establish the concept of interdisciplinary teaching, clarify the training objectives of product design professionals, and create an innovative teaching plan for interdisciplinary teaching.

5.2 Optimize the curriculum system

5.2.1 Reasonably optimize the curriculum system

With the course selection system promoting the intersection among different disciplines, integrating the interdisciplinary knowledge related to product design allows the students majoring in product design to get more chances to learn the professional knowledge of other disciplines, from which the students will gain the professional and comprehensive systematic knowledge.

5.2.2 Various courses in the organically integrated curriculum system

The extensibility, integrity and pertinence should be taken into consideration, when having the curriculum of product design specialty. On the basis of the syllabus, the curriculum should extend the curriculum content of the relevant professional knowledge to enrich the teaching content and improve the teaching innovation and attraction.

The curriculum should highlight the development and characteristics of the times, change the previous design only for the professional content for products, underline the cross-professional and cross-fields and overcome the barriers among different disciplines. Integrating multi-disciplinary knowledge helps to complete the teaching process of how to analyze the concept of products from the perspective of design specialty, design research, and how to apply the knowledge of mechanical structure specialty to completing the model making. Such kind of curriculum integrates the interdisciplinary and establish a systematic professional teaching structure.

5.2.3 Establish curriculum group

The new teaching mode should establish the courses related to product design into a curriculum group, thereby constructing a comprehensive teaching system of product design specialty, coordinate the syllabus and course content in the curriculum group, reasonably adjust the relevant content and teaching based on the teaching requirements of product design specialty. The previous artificially separated curriculum system should be integrated into an interrelated and orderly whole. And the related courses will be closely connected with each other to improve the teaching effect [1].

Establishing the teaching mode of curriculum group can create an interdisciplinary environment, which combines the core courses of product design specialty as well as placing the relevant professional knowledge of this specialty in the same professional course for learning. And it is good for cultivating the students' comprehensive ability.

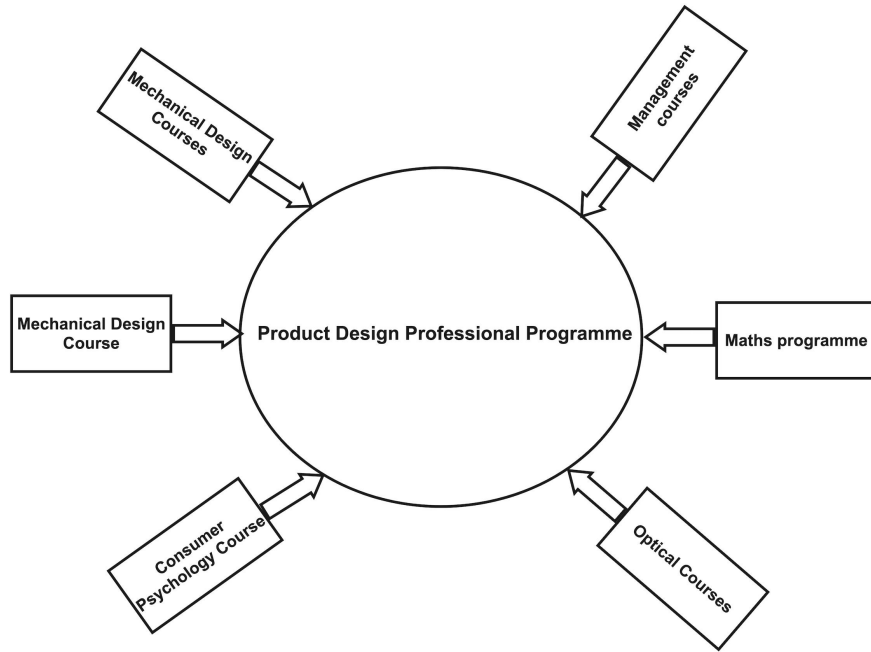


Fig. 1 Optimized multidisciplinary interdisciplinary product design courses

5.3 Practical teaching innovation to cultivate the comprehensive ability of product design through project training

5.3.1 The effect of interdisciplinary project training on practical teaching

Interdisciplinary project teaching is mainly to apply the interdisciplinary knowledge to the practice of the same design project, and the students can complete the professional learning in practice. It also focus on how to help the students apply the design means to solving the practical problems in interdisciplinary practical training, and learn what interdisciplinary knowledge can be applied to the project practice of their major. Such kind of innovative teaching method can deepen the students' theoretical knowledge in practical teaching, increase the flexible use of knowledge in teaching activities and improve the teaching quality.

5.3.2 Implementation plan of interdisciplinary project training

Interdisciplinary project training can adopt the combination of research-based teaching and practical links based on the theme research projects, break the traditional teaching of knowledge transfer, and establish an innovative talent training mode by taking the students as the core.

In the project practice training, a design team composed of interdisciplinary students is established. It solves the practical problems of design projects by combining with the project, discussing in groups, brainstorming together and applying different professional knowledge. Such kind of interdisciplinary project practice is good for the students to learn the professional knowledge of other disciplines and solve the problems encountered in design with broader thinking. It can achieve the purpose of systematically applying interdisciplinary knowledge and skills to the design practice, which will broaden the students' horizon, as well as increasing the students' professional knowledge and learning enthusiasm. The comparison of the traditional project training with interdisciplinary project training is shown in Figure 2 .

	Traditional project training	Multidisciplinary cross-cutting project training
Branch of learning	Single subject, monotonous and boring	Interdisciplinary and multidisciplinary integrated training
Project members	One person, one project, no team	Students from different professional backgrounds form project teams
Project source	Fewer real propositions, more virtual propositions	Richer sources of projects, while incorporating different elements of expertise
Resulting Outputs	Drawing, conceptualization, no output	Outputs are better addressed with cross-disciplinary knowledge support to facilitate quantification of outputs
Project mentors	Only professional teachers	Professional teachers from a cross-section of disciplines, as well as a supervisory team of corporate technicians

Fig. 2 Comparison between traditional project training and multidisciplinary project training

Secondly, in the project training, a compound guidance team composed of interdisciplinary professional teachers and enterprise technicians is introduced to instruct the students to perform the design project practice from different professional aspects, and the students are able to apply the interdisciplinary methods to solving the problems in design project practice. Such kind of innovative teaching method can improve the teaching interaction and help the professional teachers better get the hang of the students' progress in learning. What's more, it also solves the problems of single teaching mode and lack of creativity in product design.

5.4 Increase professional and practical activities

Product design majors pay more attention to the flexible use of knowledge in teaching, so increasing practical activities of relevant majors can improve the quality of teaching. In the teaching of product design, it is necessary to take students as the center and carry out diversified interdisciplinary practical activities. Such as: Teachers can according to professional training outline, lead the students to visit the appropriate product design professional related enterprises, such as environmental design, graphic design, digital media design the above enterprise. Letting students to contact other related disciplines in the development of the real design case, then let the students to join these companies related design practice, so as to extend the students' professional knowledge. In this way, it is convenient for schools and enterprises to cooperate and provide students with multi-disciplinary internship positions, which increases the internship opportunities for students in their interested majors. On the other hand, it also improves the employment rate of colleges talent cultivation.

5.5 Carry out interdisciplinary discipline competitions

Encouraging students to actively participate in all kinds of disciplinary competitions is one of the important means to realize interdisciplinary activities. Students are encouraged to participate in multidisciplinary competitions after the practical teaching of multidisciplinary projects. At the same time, a guidance team of professional teachers and enterprise technicians is formed to explore students' professional expertise and guide the problems in cross-professional knowledge in the teaching process. For example, after completing the project of "Research on Waste Materials in Product Design", the competition related to material science will be recommended to students, and they will be encouraged and guided to participate, so as to strengthen students' ability to solve practical design problems by applying material science and product design professional knowledge.

At the same time, students from different majors will form disciplinary competition teams and carry out relevant discussions during the competition. This team-oriented, interdisciplinary teaching model helps students extend their professional knowledge in other disciplines, broaden their horizons and build a sense of teamwork. On the other hand, by carrying out interdisciplinary discipline competitions, the difference between theoretical course content and practical application in professional teaching can be strengthened, the diversity of teaching can be increased, and students' learning enthusiasm can be stimulated.

6. Summary

The current product design constantly shows the characteristics of interdisciplinary in the development and innovation. Therefore, it is necessary to create a teaching mode of interdisciplinary product design. It can create a newly professional teaching mode of product design, as well as cultivating the students' comprehensive ability to solve the design problems with cross-professional knowledge, and effectively improve the teaching quality of product design specialty.

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