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Research on Packaging Design Curriculum Reform Based on Art-engineering Integration

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Abstract: *In order to meet the demand of interdisciplinary talents in packaging design field, it is a key step to improve the teaching quality and innovate the teaching content of packaging design course. This study attempts to introduce the teaching concept of the art-engineering integration into the actual teaching, and re-adjusts the lesson period of the teaching module. By adding aesthetic design knowledge such as graphic composition art, three-dimensional composition art, color composition art, visual communication design and other teaching measures in the packaging and decoration design module, as well as the reform of curriculum assessment methods, to improve students' interest in learning, innovative consciousness and design aesthetic literacy. The final practice proves that the students' aesthetic design literacy have been greatly improved, and a variety of teaching effects have been achieved.*

Key words: *Art-engineering integration; Packaging design; Design aesthetics*

Introduction

As an applied specialty of light industry, packaging engineering is mostly reflected in engineering practice (Huang, Guo & Teng, 2019), while its subordinate packaging design (packaging decoration and modeling design) belongs to the combination of art design and engineering application. The requirements of packaging design for talents in actual production are obviously higher than those in other directions of packaging engineering, and practitioners are required to have the dual qualities of artistic aesthetics and engineering practice. Therefore, how to train multi-disciplinary packaging design professionals has become the focus of talent training in colleges and universities. Based on the reform idea of "integration of artists and workers", this study discusses the content of packaging design course reform and improves students' professional quality by optimizing teaching methods.

Problems in Packaging Design Teaching

Textbook focuses on engineering with less to learn

In teaching practice, the content of textbooks often lags behind the needs of society, and teachers are more often required to supplement extracurricular knowledge. There are mainly two kinds of packaging design textbooks sold in the market, one is mainly based on packaging materials, packaging structure and packaging printing, and the other is mainly based on packaging art (color, modeling, consumer psychology). These two

kinds of teaching materials have their own characteristics. However, because of the disciplinary characteristics of printing and packaging engineering, teachers mainly choose the first kind of teaching materials. Students focus on the performance of packaging materials, product packaging requirements, transportation packaging and other skills, but the knowledge of packaging art is not deep enough, which leads to the lack of artistic beauty of the designed packaging works. It is difficult to meet the needs of comprehensive talents in printing and packaging enterprises (Yang & Yang, 2019).

Students with science background are weak in design aesthetics

Most of the packaging design courses are offered in the major of packaging engineering. Because of the engineering background of the students, the aesthetic knowledge they come into contact with is not systematic, so the artistic aesthetic accomplishment is relatively weak compared with the art students. Hunan University of Technology separately listed packaging design as a major and awarded a bachelor of arts degree to make up for the impact of discipline background in personnel training. This setting effectively integrates packaging decoration, modeling structure, materials and technology, and is conducive to the cultivation of applied senior talents in packaging design.

Single subject background of teachers

According to statistics, there are Tianjin University of Science and Technology, Jiangnan University, and Jinan University with Ph.D. in packaging engineering in China. These schools train doctors mostly on packaging materials. Only Hunan University of Technology's Material Science and Engineering major has a research direction of reduced packaging structure and safety design, but it enrolls a small number of students every year. At present, many college recruitment requires applicants to have a Ph.D., preferably undergraduate, master, and doctoral subjects in similar directions. Due to the large professional span, it is difficult for many professional teachers to have dual-disciplinary background in arts and engineering. Even if they have a dual-disciplinary background, they will not have enough confidence in the application process, which has caused the teachers of packaging engineering to focus on engineering and practical applications, and despise art design aesthetics.

Poor effect of practical teaching

Limited by subject background and educational resources, the packaging design practice class focuses on packaging structure design and manufacturing, transportation packaging, packaging and printing. Even with the experience of corporate internship, students are difficult to carry out packaging decoration and creative packaging design due to their own lack of design aesthetic knowledge and differences, which ultimately results in poor practical teaching.

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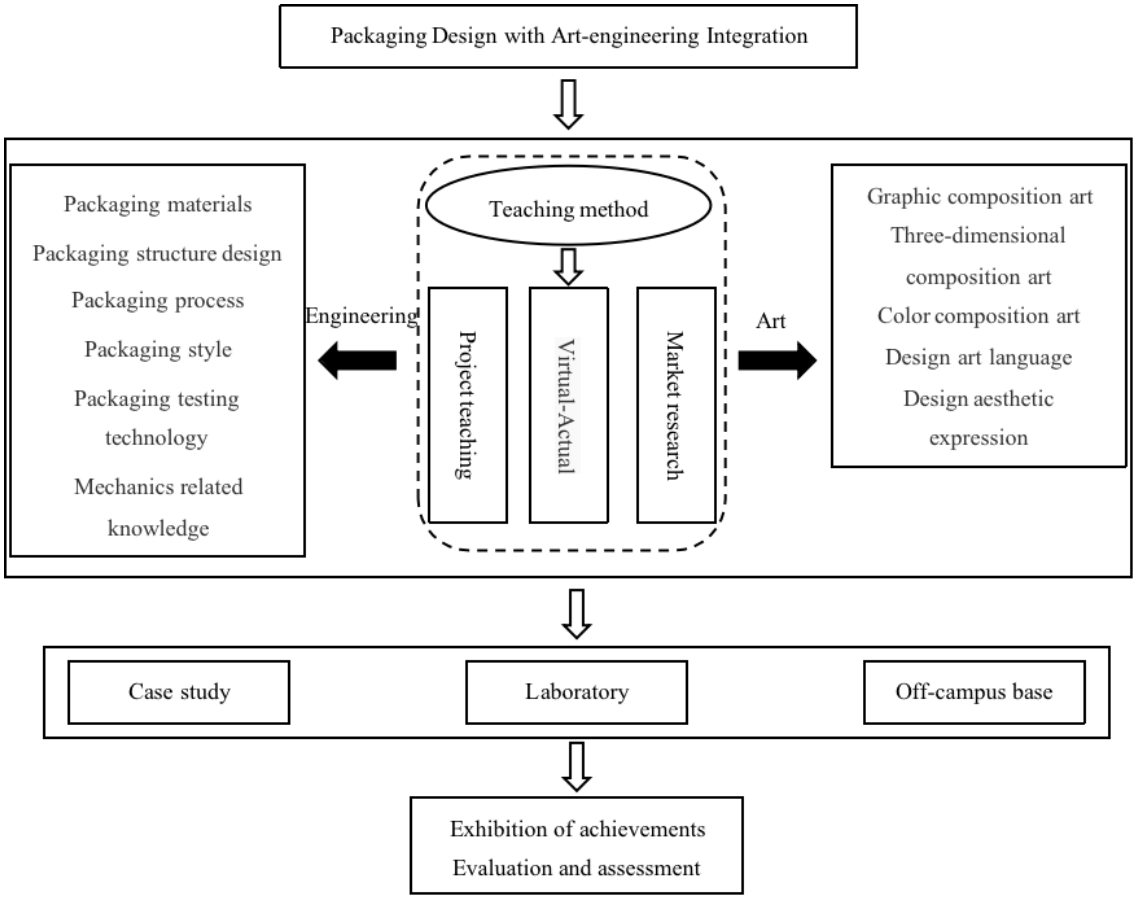
Curriculum Planning of Packaging Design with Art-engineering Integration

Teaching ideas of art-engineering integration

The teaching method of art-engineering integration refers to the combination of art design and engineering practice. Strengthen the cultivation of students' aesthetic literacy in the teaching process, and integrate artistic aesthetics into packaging design, so that packaging products not only conform to engineering practice but also have design aesthetics, and make up for the design aesthetic defects of students (Wang, 2017). The teaching framework is shown in Figure 1:

Figure 1 Teaching framework



Curriculum content reform

A. Macro Reform of the Curriculum

In practical teaching, we divide packaging design into five parts: packaging materials, packaging structure design, packaging decoration design, packaging printing and experimental teaching. The comparison of lesson period before and after the reform is shown in the following table:

Table 1 Comparison before and after the reform of packaging design lesson period

Project section	Lesson period (before reform)	Lesson period (after reform)
Packaging materials	10	6
Packaging structure design	12	6
Packaging and decoration design	10	14
Packaging and printing	10	6
Practice (experimental class)	12	16
Total lesson period	54	48

National Standards for Teaching Quality of Undergraduate Majors in General Colleges and Universities in 2018 adjusts the lesson period of packaging materials, packaging structure design and packaging printing. These three sections appear frequently and repeatedly in other courses, and some of the content can be used as a separate course, such as packaging printing, packaging materials, packaging CAD. Therefore, the packaging and decoration design lesson period have been increased from 10 classes to 14 classes in one semester, aiming to improve students' aesthetic consciousness and aesthetic accomplishment by analyzing specific cases. The practice class has also been increased to 16 lessons per semester, introducing practical contents such as food packaging, drug packaging, cosmetic packaging, electronic product packaging and so on, in order to enable students to carry out innovative practice effectively after theoretical study.

B. Increase the knowledge of art design

The packaging and decoration design teaching section has introduced the knowledge of plane composition art, three-dimensional composition art, color composition art and visual communication design. This part of the art design class accounts for about 85% of the packaging and decoration design sector and it is conducive to the cultivation of students' aesthetic appreciation ability and the grasp of aesthetic knowledge, and apply it to packaging design. The specific additions are detailed in Table 2.

Table 2 Increase knowledge points in packaging and decoration plate

Knowledge points	Lesson period	Concrete content
Graphic composition art	3	Repetitive composition, approximate composition, dense composition, segmented composition, spatial composition, contradictory space, contrastive composition, balance composition and so on (Li, 2020)
Three dimensional composition art	3	Creation method, space form and beauty principle of form of three-dimensional form (Chen, 2020)
Color composition art	3	Color vision, color stereo, color contrast, texture contrast, color change, strong stimulation harmony, color emotion, form without technique, color order, etc. (Qiu, 2020)
Visual communication design	3	Font design, logo design, image design, layout design, etc

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Innovation of teaching methods

A. Project teaching method

The key point of the project teaching method is to combine theory with practice, and take the project as the teaching object in actual teaching. Taking the packaging design of local products for poverty alleviation as an example, we learned the background, current situation and culture of local products in poverty-stricken villages through the village secretary, and put forward specific requirements for packaging design. In accordance with the above requirements, the class will be divided into groups of 5 people in each group. The team leader will lead the team members to formulate the project plan, and refine the design steps and the division of labor. Teachers supervise and guide the whole process. Different from the previous simulated project teaching method, this kind of "project teaching", which combines teaching projects with poverty alleviation, can strengthen students' sense of participation and social responsibility, and improve students' technical level and practical experience.

B. Virtual-actual combination teaching method

At present, in the face of special packaging materials, large packaging or complex packaging design, it is difficult for students to correctly understand and learn through a single plane picture. The virtual reality technology introduced in the actual teaching is not only green and easy to preserve, but also can effectively reduce the teaching cost (Duan, Liu, Zang & et al., 2019). At the same time, through human-computer interaction, students can immersively experience the internal structure of packaging design and the appearance of finished products, break the boring classroom environment, and stimulate students' enthusiasm for learning.

C. Market research teaching method

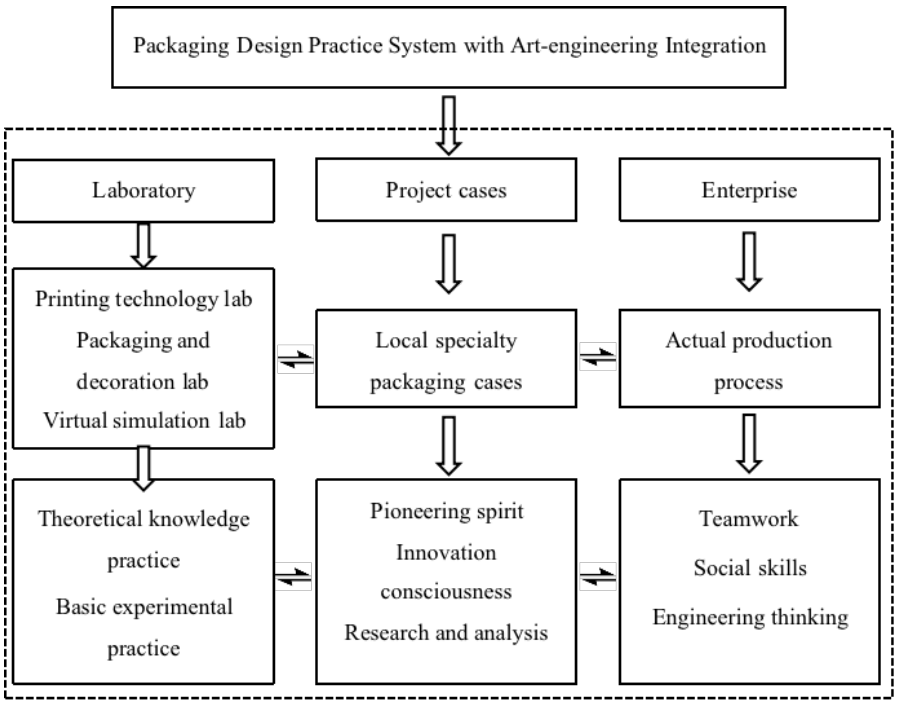
The purpose of introducing market research into actual teaching is to allow students to enter the first-line market to truly understand and clarify the needs of the public and avoid blind design. For example, in the case of agricultural specialty products in poverty-stricken villages, it is difficult for students to accurately locate the design direction only from the information provided by the local person in charge. This requires students to further in-depth and comprehensive grasp of agricultural specialty product information, market needs, and psychological characteristics of consumer groups. Optimize the design through market research, but also provide a scientific basis for practical teaching and shorten the distance between students and the market.

Practical teaching platform

For the applied curriculum, the practice link is a very important part. In the curriculum reform, we should carry out teaching according to the idea of "integration of industry and teaching, serving the local area, and cooperation between schools and enterprises". Give full play to the role of experimental teaching center, project case and enterprise. Take the packaging of local products in poor villages as the practical object, weaken the role of teachers, and let students come into direct contact with poor villages and enterprises.

By creating a real working environment, we can train students' comprehensive abilities such as team consciousness, innovation, emergency and so on. The detailed practical teaching system is shown in figure 2: the results produced in the practical teaching school are not only used by enterprises, but also can participate in all kinds of packaging design competitions or apply for patents to achieve the diversified output of the results.

Figure 2 Practical system of packaging design based on art-technology integration



Curriculum Assessment Reform

The theoretical knowledge involved in packaging design courses is numerous and complex. Before the reform of the teaching model, it mostly adopted the traditional examination method. The traditional test mode can test students' theoretical knowledge reserves, but the practical ability can not be reflected. In addition, printing test papers and revising test papers is not only cumbersome, but also requires a lot of work and is difficult to store. In view of the application characteristics of the curriculum, a combined assessment method will be adopted after the reform. The specific model is shown in Table 3. After the reform, the mode breaks the examination method of paper examination paper, but the professional teachers combine the enterprise teachers to examine the students' packaging design works, in order to improve the students' aesthetic level and design ability.

Table 3 Examination of packaging design course of art-technology integration

Evaluator	Percentage of points	Assessment content	Assessment ability

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Professional teachers	3	1. Normal attendance (10%) 2. Homework (20%) 3. Artistic elements (color, layout, font, etc.) used in packaging design (30%)	Learning attitude Basic knowledge Practical application Analyze the problem
Enterprise teachers	3	1. Depth of project planning and field investigation (5%) 2. Feasibility of packaging design (10%) 3. Proficiency in design process (10%) 4. Aesthetics of the finished package (15%)	Teamwork Social skills Engineering thinking Sense of responsibility

Implementation Results

The reform of packaging design curriculum under the background of art-technology integration has improved students' artistic aesthetic quality. In the teaching process, students can actively devote themselves to practical projects, deeply understand the needs of market customers, and integrate theoretical knowledge into packaging design practice. Many achievements have been made in the course reform over the past two years: 35 awards above provincial level in packaging design competitions, 12 academic papers, 17 appearance patents in packaging design (11 authorized). In addition, students assisted in designing and transforming packaging of special agricultural products in impoverished villages and put into mass production, such as passion fruit, black plum, sweet potato vermicelli, and achieved good economic benefits.

Conclusion

Based on the practice of art-technology integration reform, we found that introducing design aesthetics knowledge into packaging design courses, with practical project practice, can effectively exert students' creativity, improve their students' aesthetic literacy, and visual impact and aesthetic value of design works. At the same time, shortening the distance between textbook knowledge and actual production can help students increase their learning interest and comprehensive ability, and cultivate multi-disciplinary application-oriented talents in the field of packaging design.

Funding

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