

The Impact of Project-Base Curriculum on Product Design Major in Institutions of Higher Vocational Education in China Base on Talent Cultivation Model Innovation

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Abstract

At present, China has a shortage of professional talents and labour surplus idle general problems, there are also the status quo and problems of higher vocational college education reform. On this basis, this paper uses relevant educational theories and previous research results to study and analyse the relationship between the training objectives of high-skill applied talents, practical teaching and project curriculum construction, information teaching and the reform and innovation of the training mode of product design professionals. Therefore, the paper discusses the positive influence of multi-dimensional innovation of teaching mode on the reform of professional personnel training mode verifies the existing theories of innovation and entrepreneurship education through the continuous enrichment and improvement of Talent Cultivation mode system, and provides suggestions for further research by relevant researchers, and provides ideas and concrete implementation plans for educators to carry out teaching practice.

Keywords: Product Design Education; Higher Vocational Education; Project-Base Curriculum; Talent Cultivation Model

1. Introduction

1.1 Background to the Problem

According to Nurtanto, M., Fawaid, & Sofyan (2020, July), globally, the drive to reform the training model of skilled higher vocational employees is considered a long-term solution to long-term social problems that governments and companies have failed to address. Every country experience this set of socioeconomic issues related to work and labour security. B. Larue (2020), even at various eras in a specific nation. Therefore, it is attributed by numerous researchers, including Börner, K., Scrivner, O., Gallant, M., Ma, S., Liu, X., Chewning, K., and Evans, J. A. (2018), to the discrepancy between the

supply and demand of specialised talents, the failure of policies, and industrial operations, which are manifested as the two-level differentiation between the shortage of professional talents and the lack of skilled workers.

A modern apprenticeship model has been widely adopted to address the societal issue of supply and demand in many western nations. Students can get a variety of higher education opportunities through collaboration between educational institutions and businesses that foster specialised talents (Lou & Xu, 2019). (Li, 2022) concurred that this approach may effectively utilise the industry's functions, take part in the process of developing talent, and address the employment issue. Relevant studies also indicate that this type of training can successfully develop applied talents with vocational abilities in universities and colleges while also cultivating their professional traits.

According to Jin & Qian (2019), the solution to the social employment problem is, in fact, the most crucial fundamental issue in the process of higher education and training, according to China's national circumstances. In fact, more professionals have been studying the training method for higher occupational skills in depth in recent years.

1.2 Statement of the Problem

According to the research of (Zhang, 2021) et al., the social demand for vocational skilled talents is increasing, but the Talent Cultivation level of higher vocational education in China is still in the primary stage, and it still lacks a unified paradigm with a large number of relevant concepts of literature and empirical research. (Lou Y., 2021) pointed out in the report that most of the research on the training mode of higher vocational talents is basically exploratory, and little empirical research is carried out. These studies are mainly aimed at theoretical debates based on exploratory research, although this approach to research makes use of case studies and underlying theories to some extent to help understand relevant research concepts. However, in order to turn this research into a deeper field, it is necessary to make the necessary hypotheses and tests on this concept. This can be done by conducting empirical studies based on appropriate sample sizes and research designs that provide profiles of conclusions. (Zhang & Shen, 2021) supports the use of empirical research and suggests necessary empirical tests for the reform and innovation of Talent Cultivation mode in higher vocational colleges. To determine whether it really solves the problem of application-oriented vocational personnel training, and whether it solves the problem of social employment, so that the research results are more constructive and feasible.

1.3 Purpose of the Study

1.3.1 To find out the target orientation and training mode has impact on the cultivation of product design talents in Higher vocational colleges in China.

1.3.2 To identify the practical teaching in classroom teaching form of social practice has impact on the cultivation of product design talents in Higher vocational colleges in China.

1.3.3 To examine the project-based teaching model for developing vocational competencies has impact on the cultivation of product design talents in Higher vocational colleges in China.

1.3.4 To determine the training Mode such as Information-Based has impact on the cultivation of product design talents in Higher vocational colleges in China.

1.4 Research Questions

This study aims to answer the following research questions:

1.4.1 What are the effects of target orientation and training mode on the Product design Talent Cultivation innovation in higher vocational colleges?

1.4.2 What is the influence of practical teaching in classroom teaching on the cultivation and innovation of product design talents in higher vocational colleges?

1.4.3 What is the affect of project-based teaching Model on the Product design Talent Cultivation innovation in higher vocational colleges?

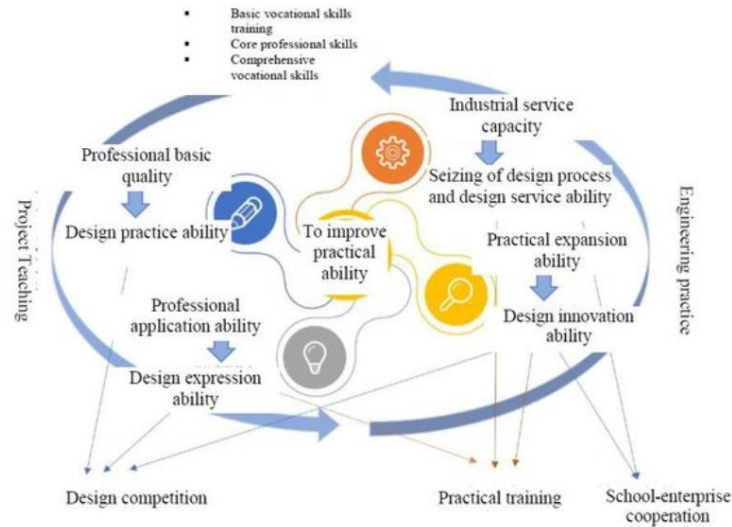
1.4.4 What is the impact of training Mode such as Information-Based on the Product design Talent Cultivation innovation in higher vocational colleges?

2. Literature Review

2.1 Target Position and Standards of Talent Cultivation

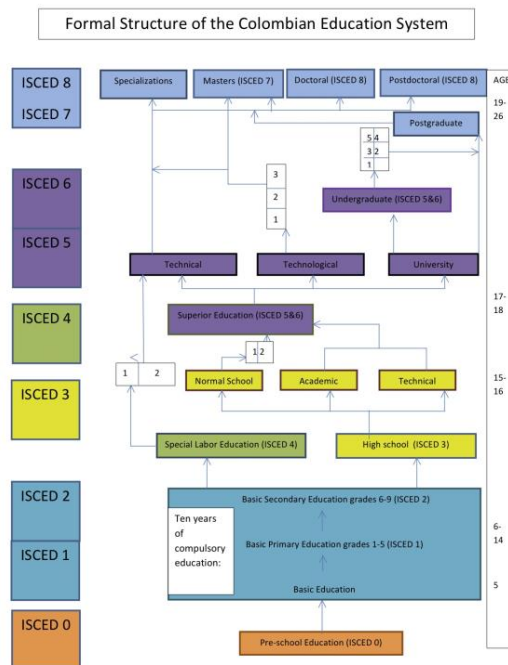
Research by (Jiang, 2022), Double first-class construction is a higher education policy implemented in 2015 to enhance the comprehensive strength and international competitiveness of China's higher education. Therefore, higher vocational colleges should reform the quality of personnel training according to the specialty (shown in Figure 1). In the new concept of talent training, "fusion" has been put forward many times (Liu & Jin, 2020). Product design major is the integration of "new engineering" and "new arts". On this basis, combined with the new arts of culture, society, emotion, behaviour habits and other contents, so that the product design talent training are more oriented towards the courses (Ma, 2020). Since the evaluation system of education and teaching is relatively complex, it is necessary to find a more effective operation mode and clarify the objective of talent training (Wang, 2020). Therefore, higher vocational colleges should reform the quality of personnel training according to the specialty. But from this table, there are too many factors to consider, but not conducive to clear the orientation of talent training.

Figure 1 Illustrates the conceptual model of talent training mode, and emphasizes that higher vocational colleges should reform the quality of talent training according to the characteristics of the specialty



Source: Conference: Proceedings of the 7th International Conference on Education, the Arts and Intercultural Communication (Iceland 2022) (He & Li, 2020) believes that one of the reasons for many problems in current talent training education is that the talent training mode is not hierarchical, so the training objectives and standards are not clear. In response to the wide variety of education systems worldwide, UNESCO recognized the need for an International Standard Classification of Education (ISCED). This system makes it easier for policymakers to compare strengths and weaknesses of their education structure to those of other countries. The following chart, shown in Figure2, was adapted from the World Technical and Vocational Education and Training (TVET) Database: (Alexandra (Ali) Philbrick, 2021) By constructing these different levels of vocational education, the goal positioning and training standards of talent training are clearer.

Figure2 The ISCED consists of 8 education levels



Source: Created by Ali Philbrick, 2021

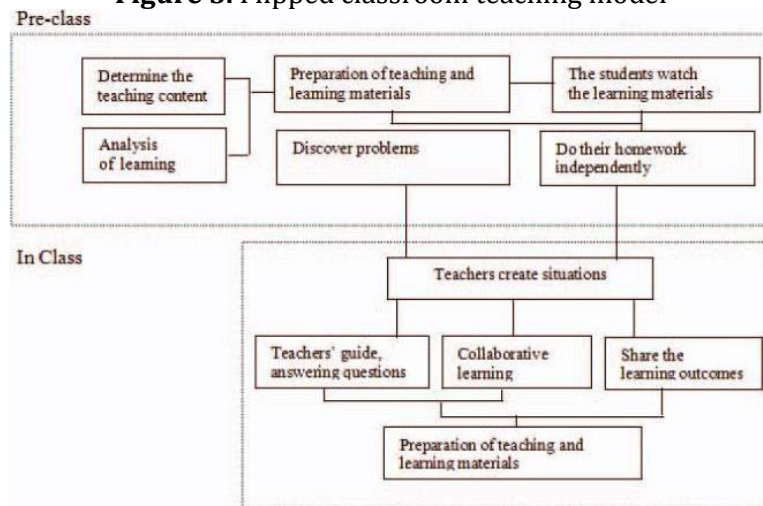
The problems existing in the education of product design specialty in colleges and universities are mainly manifested as the unreasonable sequence of courses and the arbitrariness of course content. The teaching mode is too traditional and the practice link is too few. (Li & Liu, 2021). Therefore, talents training in higher vocational colleges should start from the perspectives of clarifying the professional training objectives, optimizing the curriculum setting, innovating theoretical teaching methods, and actively carrying out practical teaching, so as to explore the effective mode of product design education and teaching, so as to improve the quality of education. And (Ge & Jiang, 2021) describes that most of the current professional training system of vocational colleges lacks pertinence. This is because many higher vocational colleges focus on the integrity of professional disciplines and the potency of talent training, rather than constructing majors according to professional posts, without cultivating talents according to specific posts and professional abilities. This causes students to learn too broad in school, and the contradiction between the uncertainty of employment post after graduation and the singularity of the actual job post, which weakens students' competence and working ability in the actual job post after graduation. Therefore, talent training for higher vocational product design needs more focused and practical target positioning. (Zhu, Zhao, & Han, 2021) generally pointed out that in the reform of talent training mode, higher vocational colleges should first fully grasp the needs of industries and enterprises, define their own positioning and establish goals. (Liu B., 2021) more specifically put forward that "results-oriented education" is an operable talent training method, which can effectively improve the efficiency of talent training and gradually build and promote first-class majors through: goal - demand - process - evaluation - improvement and repeated practical operation. Therefore, the first step of reform and innovation is to determine the target orientation and training standard of talent training.

Through the above literature analysis, it can be seen that the target positioning and training standards should be consistent with the national conditions, so as to determine the direction of the reform and innovation of higher vocational talent training mode. (Yang, 2020) points out that under the background of "mass innovation and entrepreneurship", innovation and entrepreneurship education has emerged as a teaching model required to adapt to China's economic, social and national development strategies, which provides opportunities for a brand-new educational reform practice.

2.3 Practical Teaching in the Professional Classroom

Higher vocational students based on the training of "mass entrepreneurship and innovation" talents have become the main body of classroom teaching, which is an important part of the teaching reform in the new era, and has very important guiding significance to improve the quality of higher vocational teaching. (Zhu W., 2022) believes that creating a harmonious, democratic and pleasant classroom teaching atmosphere is an important way to stimulate students' enthusiasm and improve the classroom teaching effect. In the construction of student-oriented classroom teaching, (Zhou, 2021) specifically emphasized the use of classroom teaching questions has a very positive role. This helps to improve the efficiency of classroom teaching. In order to develop practical teaching, it is necessary to explore methods and skills such as classroom questions. In addition, we should also carry out "cooperation" activities between teachers and students to increase practical teaching. (Guan, Yuan, Xie, Feng, Sun, & Li, 2019) also showed through classroom teaching experiment results that the flipped classroom teaching model, which pays more attention to practical teaching (as shown in Figure 3), can not only cultivate students' good learning habits, but also improve students' learning initiative, creativity, practical ability and communication and cooperation ability.

Figure 3. Flipped classroom teaching model



Source: Journal: A Study on the Application of Flipped Classroom Teaching in Higher Vocational Education, Computer Science & Education (USA 2019)

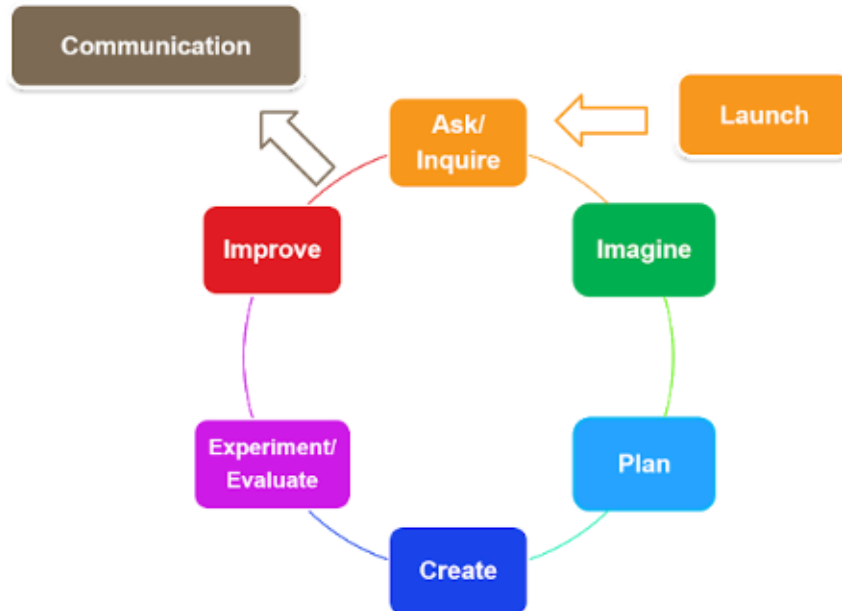
In recent years, higher vocational colleges have gradually increased the practical links of students in school, and the practice innovation mode is also constantly improved, such as the construction of practice bases, arrangement of graduation internship, on-the-job internship, etc. but (Li Y. , 2019) also pointed out objectively that practice teaching is still a weak link in the training of talents in higher vocational colleges. Therefore, (Gao, 2021) even believes that through teaching practice, teachers and students can intuitively understand their own strengths and weaknesses, as well as the knowledge and skills they should have in the industry, so as to make their career planning more reasonable.

2.4 The Project-based Teaching Mode of Professional Courses

Although project teaching started late in China, it brings a new direction for China's classroom teaching reform and conforms to the "people-oriented" education concept in education reform. (Li & Song, 2022) puts forward that the flexibility of project-based teaching determines that it can meet the requirements of different teaching objectives, pay attention to the cultivation of students' abilities, and improve students' comprehensive quality. (Yang J., 2021) further expressed that project teaching is a very practical teaching method, and the cooperation between universities and enterprises should be strengthened, and the research and development mode of design companies or enterprises should be fully introduced.

(Hou, 2020) Teachers, as project managers, should stimulate students to independently carry out design activities as product designers, deal with the difficulties in design, and improve practical ability. (Qi & Dong, 2021) Through a special study on the Dutch project teaching model, it was found that under the Dutch project teaching model, teachers respectively assume five roles: project task maker, professional tutor, project tutor, lecturer and life coach. Students in the program also play a variety of roles: leaders, secretaries, communicators, document managers, and team members. (Hou, 2020) proposed that in this mode, teachers as project managers only control the project process at the macro level, while students as product designers independently solve project tasks. (SREB,2022) The project-based learning approach incorporates the experience of the enterprise, including career paths, work-based learning, and high-quality assignments to propose a high-quality project-based learning framework (figure 4).

Figure 4. Framework for High Quality Project Based Learning. (Southern Regional Education Board,2022)



Source: Web site: SREB’S APPROACH TO PROJECT-BASED LEARNING International Journal of Educational Research Southern Regional Education Board (USA 2022)

(Yuanlong, Bo, Qiong, & Mingjun, 2020) proposed in the research that the ability could be gradually cultivated through project teaching, and a multi-level project curriculum system (as shown in Table 1) was established. The project curriculum system of product design major was implemented in four stages.

Table 2. The curriculum system of “Multi-Level Projects to develop abilities step by step

Professional Ability	Project type	Courses	Semester
Basic knowledge			The first semester
Design execution abilities	Virtual project/School tutors	Creative Expression, Computer-aided 3D Modeling, Computer-aided 3D Rendering, Product Draft Production	The second semester
Design innovation skills	The improved design of small products and small household appliances/School-enterprise tutors	User Research, Product Function and Structure Design, Product Dynamic Performance, Appearance Model Design	The third semester

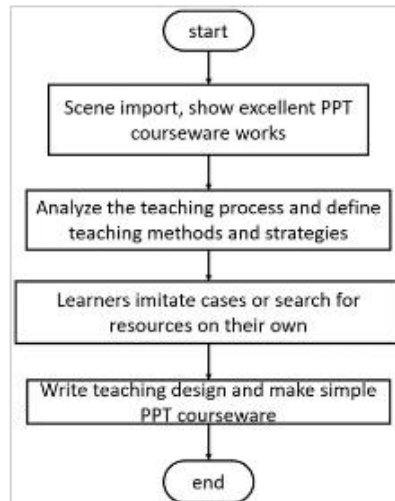
Thinking and design abilities on business	Commercial design project/School-enterprise tutors	Market Research, Product Form Design, Product Project Design, Structural Model Design, Commercial Digital Image	The fourth semester
Interdisciplinary innovation abilities	Business model innovation and design/Assisted by school and enterprise tutors Product integration and innovative design/Assisted by school and enterprise tutors	Business Model Innovation and Design, Intelligent Product Design and Development, And Layout Design	The fifth semester
Integration abilities on design		Internship	The sixth semester

Source: Conference: Research on the Talent Training Mode of "Integration of Work, Study and Business "in China's Higher Vocational Education Under the Background of Industry 4.0, International Conference on Teaching, Assessment, and Learning for Engineering (USA2020)

2.5 The Information Teaching Mode of Professional Courses

Distance learning has been applied to a large extent in universities in developed countries and some developing countries. Students can use information technology to receive efficient education and training through the network platform. (Zou, 2022) In the context of the rapid development of educational informatization, how to optimize and improve the teaching model of higher vocational colleges is the work that educators, especially teachers of higher vocational colleges must pay attention to. (He-Hai, Qi&Yu-Sheng,2019) found in the experiment that integrated multimedia courseware can improve the integration of information teaching resources (figure 5).

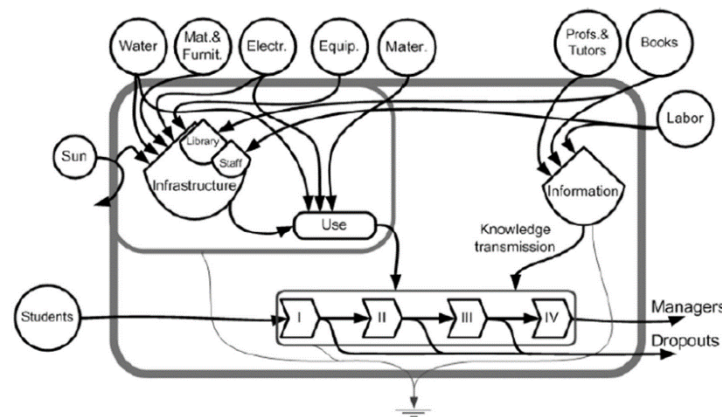
Figure 5. The process of making multimedia courseware for information teaching resources



Source: Effects of Project-Based Learning on Teachers' Information Teaching Sustainability and Ability, Special Issue Selected Papers from the Eurasian Conference on Educational Innovation Sustainability (Swiss 2019)

(Zhang Y., 2022) To improve the effect and quality of information teaching, it is necessary to combine with the actual teaching situation, build a matching information teaching environment, strengthen the information literacy of teachers and students, and promote the close integration of information technology and curriculum education resources.(J.H., B.F., F., & C.M.V.B., 2018) Many education scholars believe that knowledge can be transmitted through the classroom as well as the Internet(figure 6).He even designed energy thinking images for technology management courses.

Figure 6. Knowledge transmission may occur in classroom or via the Web.



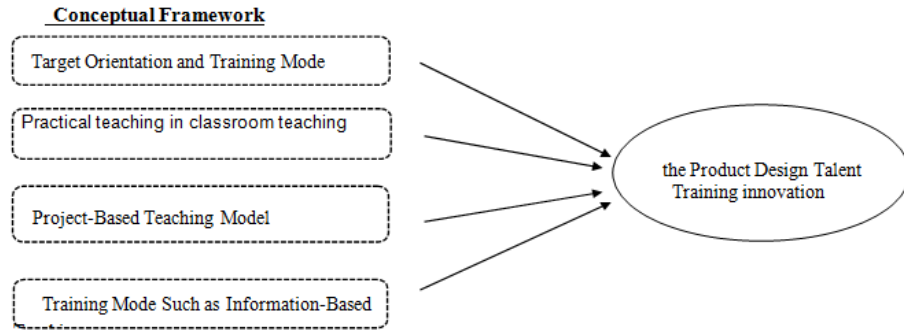
Source: Journal: Decision making under the environmental perspective: Choosing between traditional and distance teaching courses, Journal of Cleaner Production (USA 2018)

(Zhang, Liu, Cao, & Xie, 2022) is put forward, how to education the drive to explore the informationization teaching management reform of big data is an urgent topic, at present still faces many problems, such as personalized adaptive learning research remains to be strengthen, classroom information teaching mode still needs large data optimization, the teachers level to enhance, college education informatization management mode needs to be change, etc. This provides an important model reference for the information integration of other professional courses. At present, the combination of information technology and professional practice teaching needs more empirical research.

2.6 Conceptual Framework

To sum up, I believe that the four IDV contents proposed are closely related to the steps and links before and after the innovation of talent training mode. DV is the Product Design Talent Training innovation. Through the relationship between IDV and DV, further to study the talent training mode innovation strategy of product design major in higher vocational colleges (as shown in Figure 7).

Figure 7. Research conceptual framework



3.Material and Methods

3.1 Research Design

The research will be a descriptive research and an intensive secondary survey will be conducted to obtain the real teaching effect and feedback attitude of teachers and students under the background of offering project-based courses in product design major of higher vocational colleges. Descriptive research describes phenomena as they exist and here data is often quantitative and statistics are applied. It is used to identify and obtain information on a particular problem or issue. Descriptive research will be used to test and to answer the research questions and this is carried out by a survey design. Therefore, it will consist of designing and administrating the questionnaires, constructing the sampling strategy and analysing the result.

3.2 Population

The target population of this study will focus on teachers and students majoring in product design in higher vocational colleges in Qiantang district, Binjiang District and Xihu District of Hangzhou, and the target population in this area is about 2000 people. The sample size of this study will be calculated using a sample calculator formula. Therefore, if the target population is 2000, 323 sample size is sufficient.

3.3 Questionnaire Design

Primary data will be collected using questionnaires and the questionnaires will be divided into 3 sections to address the research objective on understand the impact of offering project-based courses on product design specialty in higher vocational colleges, as well as the impact of teaching effect and feedback attitude of teachers and students. The first part of the questionnaire is about personal factors, such as teachers' professional skill level, teaching level, title and teaching experience. Students get to know the general situation of teachers and students in terms of high school source type (ordinary high school or vocational high school, or art major background), college entrance examination score, gender and interest point. In the study of the target population, this set the fundamental profiling and allow the researcher to compare the profile by segmenting it by each of the personal factors.

The second part of the questionnaire will include the analysis of independent variable factors involved in the product design talent model. These problems will be based on the objectives of talent

training, the practice of professional course teaching, project-based teaching and information mode. This will enable researchers to measure the value of the reform of the talent training mode for product design majors through the individual factors mentioned in the first part of the questionnaire.

Finally, the last part of the questionnaire is about the feedback of teachers and students on the project-based curriculum design after teaching reform, including the teaching effect and acceptance degree of professional skills under this new mode and whether it has value-added impact. The purpose of this question is to understand whether the change of design professional talent training mode is beneficial to teachers and students in higher vocational colleges, and to connect it with the second part of the questionnaire to understand whether teaching reform factors have any influence on the output of the third part. To sum up, the questionnaire is shown in the following table 2:

Table 2 Questionnaire Design Form

Part/ content	Ask specific questions	Design of problem options	The independent variables involved	Related to the content of the dependent variable
Part1: Personal factors	1 What kind of student/teacher are you?	According to the type, subdivide the characteristics of individual educational background	IDV1: Personnel training objectives and standards;	The audience of the reform of talent training mode
	2. What level of professional skills do you possess or excel in product design?	According to the value of 5 levels, the individual is subdivided into various professional skill levels		
Part2: Analysis of the situation	Do you agree with the professional teaching resources and teaching mode of the school?	Judging the degree of recognition of each aspect of teaching resources/measures according to the 5 grade value	IDV1: Personnel training objectives and standards;	Various ways and dimensions of the reform of personnel training mode
	In your opinion, how to improve the teaching resources/measures based on the following aspects in the teaching process of	To judge the degree of improvement in each aspect of teaching resources/measures according to the value of 5 grades	IDV2: Practical teaching of professional course; IDV3: Project-based teaching mode;	

	product design major?		IDV4: Information and other advanced teaching equipment/methods;	
	Do you think there are various problems/situations in the teaching process of professional courses at present?	To determine the frequency or impact of teaching problems/poor conditions in each area according to the 5 scale values		
Part 3: Reform of the feedback	Do you think the contents and forms of the reformed teaching model have effectively improved the teaching quality compared with the traditional teaching model?	According to the value of 5 grades, the effect and influence degree of the model reform in all aspects are evaluated	IDV1: Personnel training objectives and standards; IDV2: Practical teaching of professional course; IDV3:	Effect and evaluation of personnel training mode reform
	To what extent do you think the professional skills of the following product design will be improved after the change of teaching mode?	According to the value of 5 levels, the improvement degree of professional skills after the reform of the model is evaluated	Project-based teaching mode; IDV4: Information and other advanced teaching equipment/methods;	

3.4 Sampling Method

Sampling method can be roughly divided into two major categories, probability sampling and nonprobability sampling, probability sampling is also called the principle of random sampling is based on probability theory, in accordance with the principle of randomization method drawn from the overall sample, its characteristic is to extract the samples has certain representativeness, sample can infer that the overall features, but the operation is relatively complex. It is characterized by a fast, simple and cost-saving data collection method. However, the sample representative is poor, generally not to infer the overall characteristics, more used for exploratory research. Therefore, probability sampling or random sampling will be adopted according to the research object of this paper and the research purpose of this topic.

As can be seen from the foregoing, the research objects of this paper are teachers and students majoring in product design from higher vocational colleges in Qiantang District, Binjiang District and Xihu District of Hangzhou, with a sample size of 2000, which is a relatively large sample size. Therefore, it is not appropriate to use pure random sampling. As the overall samples are evenly distributed in all districts of Hangzhou, the differences between samples are small, so the systematic sampling method can be used to obtain the research objects.

The operation mode is roughly as follows: the total sample of about 2000 people (the ratio of teachers to students is 1:1.8) is divided into Qiantang District, Binjiang District and West Lake District according to the region, of which 800 people are in Qiantang district, 700 people are in Binjiang district and 700 people are in West Lake District. Random sampling was used for each part, and the samples were 109 in Qiantang District (39 teachers: 70 students =1:1.8), 107 in Binjiang District (38 teachers: 69 students =1:1.8) and 107 in Xihu District (38 teachers: 69 students =1:1.8).The sample of the three regions is summarized, 115 teachers, 208 students, the ratio is 1:1.8, the number of samples is 323, which is the object of this study.

3.5 Data Collection Procedures

This research team is composed of teachers and students from product design related majors of Hangzhou vocational college, and conducted days of survey in Hangzhou Vocational and Technical College. They are professional teachers and students from the professional group of product design in Higher vocational college. They were invited to help complete the questionnaire, and they themselves understood and participated in filling in the questionnaire.

Through them detailed profiles will be provided to project members to deal with general questions respondents may have. They will contact every other student and teacher in the field who has left the school. To encourage a high response rate and collaboration, participants will be rewarded with small gifts of their own design, such as canvas bags and mobile phone pendants, as a sign of appreciation. At the end of the survey, questionnaires will be collected and entered into Excel template, and relevant software will be used for research information and data analysis.

3.6 Data Analysis Tools

This study was conducted in the form of quantitative questionnaire, and the questionnaire Star APP was used to collect all data. And use its own SmartPLS data analysis tool for analysis and research. It includes exploratory factor analysis, descriptive research analysis, causal research analysis, etc., to determine whether there is a significant relationship between respondents.

4. Results and Discussion

From the preliminary investigation and analysis, some statistical data with research value can be obtained. For example, it can be seen from Figure 8 that the interviewed students mainly come from ordinary high schools. The second is the 3+2 mode of direct admission students (from secondary vocational to higher vocational, five-year system), and secondary vocational examination students. As can be seen from Figure 9, the interviewed teachers in higher vocational colleges are mainly academic teachers, followed by teachers from enterprises and teachers with both professional skills and academic level. It can be seen that the main object of talent training in higher vocational colleges is those ordinary high school students who have hardly received professional training before, and

the teachers who teach are academic teachers who lack professional skills. This has important research and reference value for the reform and innovation of the teaching mode of higher vocational courses.

Figure 8 Types and proportions of higher vocational students

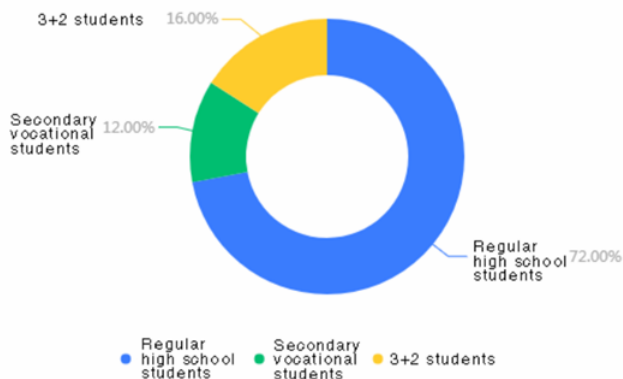
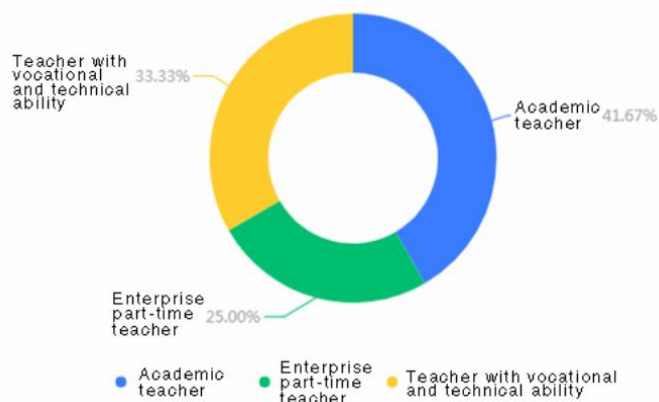


Figure 9 Types and proportions of higher vocational teachers



5. Conclusion

This research will benefit:

Higher Vocational Colleges (Product Design-related Majors)

This study puts forward the objective orientation of Talent Cultivation and the influence of using social resources to carry out practical teaching on product design Talent Cultivation. This will help higher vocational colleges and product design related majors to carry out effective educational reform.

Scholars and Educators

This study verifies the existing theories of innovation and entrepreneurship education through the continuous enrichment and improvement of Talent Cultivation mode system, and provides suggestions for further research by relevant researchers, and provides ideas and concrete implementation plans for educators to carry out teaching practice.

Government education departments and relevant decision makers

The results of the survey for the government department of education and education related policy makers provides practical information, to supplement to solve the problem of practical skills training and employment and the efforts of the plan, and find in higher vocational colleges and social industry enterprises to strengthen social and economic development and employment and stable solution. It is hoped that this research can make the government education department and relevant decision makers realize the potential of reasonable Talent Cultivation mode in higher vocational colleges to effectively solve the problems of education and employment.

Acknowledgements

The author is deeply grateful to the tutors of the university where he studied for his PhD and the teachers of related courses for supporting the publication of this research paper. In addition, the researchers expressed gratitude to everyone involved in the study.

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