July - August 2020
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Multi-Dimensional Education Certification Based on Vector Space

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Abstract

Multidimensional education professional certification is an important part of the multidimensional education quality assurance system. This article aims to discuss the trend of reform and development of multi-dimensional education practice teaching based on the indicators of China's multi-dimensional education professional certification standards and practical teaching, and to share the promotion of multi-dimensional education professional certification of a university to promote the teaching of various disciplines. System reform and reconstruction.

Keywords: *Practical Teaching, Multi-Dimensional Education Certification, First Classroom;*

1. Introduction

Multi-dimensional education certification has a great impact on the promotion of education, teaching and promotion[1-3]. Vector space has greatly contributed to the optimization of queries. The expansion of Internet information, search engines and many other online tools will use vector space[4-6]. Relying on vector space, this paper establishes a vector space model, discusses reform trends and development paths in multi-dimensional education practice teaching, so that multi-dimensional education certification can be widely promoted and benefit the public.

2. Multidimensional education certification based on space vector

In recent years, the school has taken the multi-dimensional education professional certification as an opportunity, followed the principles of multi-dimensional education certification "continuous improvement" and "everyone benefit", and took advantage of the education plan of outstanding engineers to cultivate education, out of practice teaching design and management reform. In parallel, explore the establishment of a three-dimensional undergraduate practice teaching system with "deep internships, exploratory experiments, and procedural practices" as the main exploration content (as shown in Figure 1). In-depth internships and exploratory experiments belong to the first classroom, while process practice is the second classroom practice teaching with scientific research training and subject competition as the main content. Among them, the graduation practice link may be cross-integrated with the internship, and the long-term internship may also serve as the graduation design. The second classroom practice research training (SRTP) and subject competitions may become the starting point of the graduation design (thesis). The practical teaching in the first classroom and the second classroom presents a trend of benign intersection and integration.

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July - August 2020
ISSN: 0193-4120 Page No. 5745 - 5752

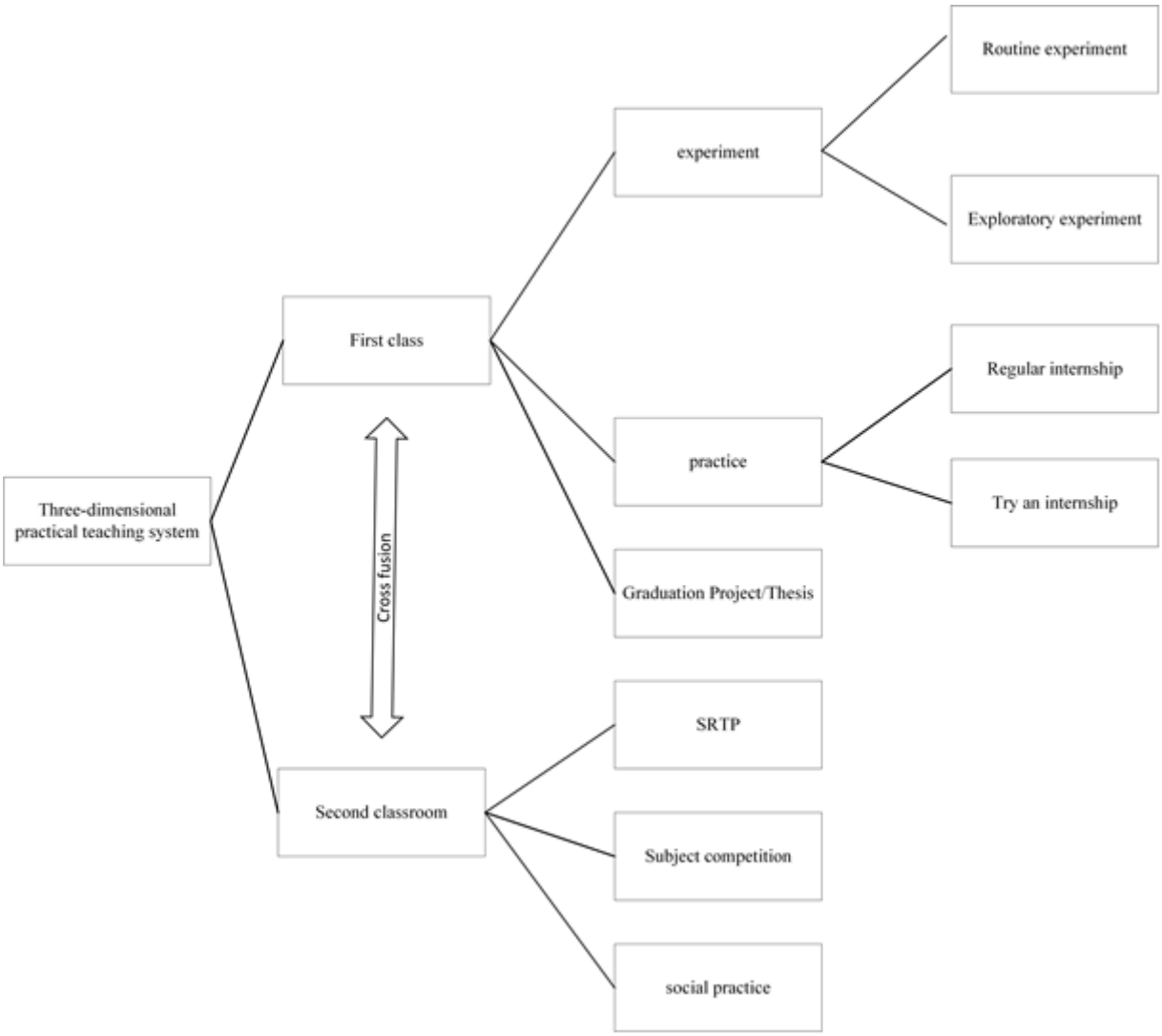

Figure 1. Three-dimensional practical teaching system structure diagram.

2.1. In-depth internship

A certain university started to guide and promote in-depth internships featuring "out of campus, in-depth experience, school-enterprise collaboration, and model innovation". Majors are required to carry out internship cooperation with off-campus enterprises, research institutions and other units as much as possible, reduce local and on-campus internship projects, extend the internship time, and ensure that the internship is more than two weeks and the professional internship is more than four weeks, so that students can achieve a deep experience and a deep understanding of the major The purpose of connotation and extension; to establish a multi-level long-term stable internship base, in addition to the number of students to meet the needs of internships, but also to ensure the relevance to the major; through the adjustment of training programs and teaching plans, flexible arrangements for internship time to ensure The length of the internship and the depth of the experience; the internship is not limited to a concentrated form, but is appropriately dispersed. It can be divided into several groups and teams according to the students' life goals, future growth plans, career interests, etc., and several students form one Groups, each group goes to an internship unit for internship.

The results of the questionnaire survey show that most students who have participated in in-depth

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July - August 2020
ISSN: 0193-4120 Page No. 5745 - 5752

internships believe that the internship is related to the major they have learned, and promotes professional learning, exercises their work skills and increases their workplace experience. More than 60% of students believe that the knowledge and skills learned in school cannot meet the internship requirements, there is a gap between theoretical study and practical application, and the practical skills required for work cannot be acquired in the classroom. Almost the same proportion of students hope that the internship unit will train themselves in professional practical skills. This result once again confirmed the importance and necessity of practice teaching for the cultivation of multi-dimensional practical ability.

2.2. Exploratory experiment

A university has been implementing the "Exploratory Experiment Plan" since 2013. Based on the existing three types of experiments: basic normative, comprehensive design, and research and exploratory experiments, a new mode of exploratory experiment was proposed, namely, “exploratory experiment = innovation "Sexual experiment + open experiment", constructing the basic process of exploratory experiment from four aspects: experiment topic selection, scheme design, content integration, and process interaction. The purpose of its teaching is to enable students to master the general methods and procedures of "research", and to cultivate innovative consciousness and innovative thinking in the process of experimental teaching, and to enhance the ability of innovation and practice. Through students’ exploration of problems, teachers are forced to improve the level of experimental teaching, through the reform of experimental teaching, the reform of theoretical courses is forced, and the improvement of students’ abilities through the second classroom forces the reform of the teaching model of the first classroom.

The reform practice of exploratory experimental teaching mainly involves innovative measures in terms of system construction, resource guarantee, achievement recording and achievement evaluation. After the implementation of the two rounds of reforms, a lot of results and experience have been achieved in cultivating students' practical and innovative research capabilities, and some new problems have also been encountered in terms of evaluation and incentives, and resource allocation.

2.3. Graduation Project (Thesis)

A certain university has a mature "four one" graduation design (thesis) quality assurance mechanism. "One system": Established and perfected the graduation design (thesis) process management information subsystem, and became a very important part of the educational administration system. There are dedicated personnel at the school and college levels responsible for maintenance and management. "One review, one review and one evaluation": The graduation design (thesis) is first a course, and secondly it has its particularity, that is, it is a course to test comprehensive ability in the final stage of university study, so in addition to the normal course management operation , The school organizes a mid-term sampling inspection every year, a blind review of the brother colleges and universities, as well as a special 100 graduation design (thesis) evaluation activities, related results feedback, and take corresponding improvement measures. In addition, the school also encourages all majors to actively develop enterprises and industries to provide topics and instructors for graduation design (thesis), and to broaden the channels for long-term internship and graduation design.

Table 1 shows the progress of graduation design (thesis) and the situation of instructors in recent years. From the 2009-2019 undergraduate graduation design (thesis) and the changes in the situation of the instructors, we can see that the average number of students who instructed the graduation design (thesis) has been decreasing year by year, indicating that more teachers have participated in guiding the graduation design of undergraduates (Thesis) work, teachers’ emphasis on and participation in undergraduate teaching is increasing year by year. The number of off-campus

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July - August 2020
ISSN: 0193-4120 Page No. 5745 - 5752

instructors is increasing, indicating that the degree of involvement of enterprises and industries in the cultivation of students' engineering practice ability is slowly increasing. In the way of carrying out graduation design (thesis), the graduation design (thesis) combined with scientific research topics is generally on the rise, indicating that while our school has made rapid progress in scientific research, it has a back-feeding effect on undergraduate teaching.

Table 1. Summary of the way of graduation design (thesis) and the situation of instructors in recent years.

Grade	Number of graduates/person	How to proceed				Number of instructors/person							
						On campus			Off campus				
		Combine scientific research topics/%	Combine actual production/%	Combine innovative experiment SRTP, subject	other/%	professor	Associate Professor	lecturer	professor	Associate Professor	lecturer	Subtotal	Average number of mentors
2019	5406	77.3	7	5.6	10.11	960	937	209	52	29	39	2226	2.43
2018	5091	78.1	5.5	3.2	13.12	1048	885	196	25	9	10	2173	2.34
2017	5115	72.4	4.3	5.1	18.32	893	910	197	36	14	10	2060	2.48
2016	5076	68.2	4	2.9	24.19	928	858	203	45	24	9	2067	2.46
2015	5216	76.8	6.8	4.5	11.29	955	940	291	51	5		2242	2.33
2014	5163	67.8	5.8	5.1	21.43	931	934	283	46	14	1	2209	2.34
2013	5389	71.3	5.3	4.9	18.15	800	834	275	20	13		1942	2.77
2012	5459	60.9	9.2	6.4	23.45	814	830	311	33	27	5	2020	2.7
2011	5682	62.8	4.2	8.3	24.72	757	870	357				1984	2.86
2010	5212	58.8	10.4	6	24.81	704	837	300				1841	2.83
2009	5562	53.3	7.2	4.8	34.72	726	955	331				2012	2.76

2.4. Practical teaching conditions

The connotation of the practical teaching conditions discussed in this article has been expanded. It includes not only laboratories and equipment, practice and training bases, but also practical teaching funds, practical teaching instructors and practical courses provided. It is multi-factor resonance. General practice teaching conditions. Zhejiang University has invested heavily in practical teaching funds, with a substantial increase of more than 100% in the past two years, which provides a good financial guarantee for the smooth implementation of practical teaching reforms, such as the addition and updating of laboratory equipment, the use of consumables, and the construction of internship training bases Wait.

The following evaluations are made for the effect of practical teaching conditions:

There is a multi-index evaluation system composed of n encrypted objects $u_1, u_2, \cdots, u_n$. m indicators $x_1, x_2, \cdots, x_m$ to be evaluated, $x_{ij} = x_j(x_i)(i = 1,2,\cdots,n; j = 1,2,\cdots,m)$ is the observation value evaluation data matrix (decision matrix) of the evaluated object u_i on the index x_j , which can be expressed as shown in formula (1) :

$$A = [x_{ij}]_{n\times m} = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1m} \\ x_{21} & x_{22} & \cdots & x_{2m} \\ \cdots & \cdots & \cdots & \cdots \\ x_{n1} & x_{n2} & \cdots & x_{nm} \end{bmatrix} \quad (1)$$

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TEST Engineering & Management

July - August 2020
ISSN: 0193-4120 Page No. 5745 - 5752

Among them, the data in $m,n \geq 3$ and A are normalized data after preprocessing.

3. The characteristics of the reform path of university practice teaching under the guidance of multi-dimensional education certification standards

Looking at the path of practical teaching reform in a certain university, there are several main characteristics as follows.

3.1. Internship mode: multi-layered alternate, intra-campus-out-campus-intra-school cycle

Our school follows the dialectical acquisition path of knowledge and skills, and establishes diversified internship modes according to major and grade characteristics. Different grades of students adopt different forms of internships due to their different levels of theoretical accomplishment. For example, lower-grade students use more short-term internships to gain perceptual experience on career development, social issues, and professional fields, which can help them strengthen their university learning adaptability and professional identity, thereby improving the quality of students' learning and employment. Senior students have a heavier accumulation of professional theories and experimental knowledge, their main objectives of internship are higher, and they are more inclined to acquire vocational skills, emotional intelligence improvement and social service ability acquisition, so they have more internship time and content arrangements. Consider more about matching its internship goals, longer time and higher professional relevance. If some internship courses are arranged to be completed in a company, some are arranged to be completed in a group of enterprises; some are completed during the summer intensive period, and some may be carried out alternately.

On the learning site, it is manifested as a cyclical process within the school-outside the school-in the school, that is, theoretical and experimental learning in the school, the acquisition of theoretical knowledge and experimental skills; internship and work outside the school is a kind of empirical learning, the acquisition of practical skills and Social service skills, including communication skills, computer/technical skills, leadership, teamwork, interpersonal skills, etc.; return to school to improve the theoretical level.

3.2. Internship form: strong concentration tends to weak concentration, strong dispersion tends to weak dispersion

Data shows that the current institutional arrangements for internships in colleges and universities are single, and the time is concentrated on winter and summer vacation internships is still the main mode. Vocational colleges, "211 Project" colleges and undergraduate teaching colleges, and "985 Project" colleges and universities holiday internship ratio They are about 60%, 70% and 80% respectively. Before the reform of practical teaching, a university showed the two main modes of strong concentration and strong dispersion from the perspective of the distribution density of intern students in the internship unit. The first is centralized internship, that is, the entire major or the entire class gathers together to practice in the same internship unit at the same time. The density is very high, reflecting the so-called "strong concentration", mostly in science, engineering, and agriculture majors; the second is decentralized Internship, that is, the students are allowed to contact the internship unit by themselves, and submit an internship report or other forms of certification at that time. The academic department is not involved. In this case, the distribution of internship students is extremely scattered. In most cases, there is only one internship for an internship unit. The density of students is extremely low. This so-called "strong dispersion" is mostly in humanities and social sciences.

From the perspective of the trend of internship teaching reform, the mode of concentrated internship with concentrated time and concentrated students has changed to the direction of weak concentrated internship with diverse time choices and moderate number of people. In the context of

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July - August 2020
ISSN: 0193-4120 Page No. 5745 - 5752

strengthening internship teaching organization and quality inspection, consider the internship unit The reception ability of each student, the strong decentralized internship mode of one internship unit for each student will change to the direction of student group and group internship cooperation. Strong concentration tends to weak concentration, and strong dispersion tends to weak dispersion. Take the School of Animal Science as an example. All students' professional internships are arranged in the autumn and winter semester of the fourth academic year. The college has signed internship base agreements with more than 30 companies. All fourth grade students are divided into two batches, with three or five students as an internship group, each of more than ten groups, each group to an internship base, the internship duration is the entire Fall semester or the entire winter semester. In the past three years, three years of students have participated in this kind of professional internship, and the effect is very good, and the internship process has become smoother and smoother from start to finish.

3.3. Partnerships and departmental cooperation: collaboration between the academic department and the student affairs department

The training process of higher education for students can be divided into two categories from the perspective of transactional management. One is academic affairs and management based on course learning and academic training, that is, academic affairs; the second includes registration, financial support, and career development. Non-academic affairs such as guidance and living accommodation guidance are student affairs. For a long time, the estranged relationship between academic affairs and student affairs hindered the integration of educational resources to enhance the effectiveness of students' learning progress. Student learning theory believes that various experiences inside and outside the classroom and inside and outside the campus will have an impact on student learning and personal development, and any purposeful educational experience can bring expected results. However, only under certain conditions, such as active participation and cooperation with other people (faculty, classmates, colleagues, etc.), can the best benefits be achieved. Student learning also involves every aspect of the school's work. Therefore, only through the cooperation of teachers, administrators, and student affairs professionals, can we create a good learning environment and atmosphere for students, and stimulate students' learning vitality and enthusiasm.

Departmental cooperation has improved the initiative of students to participate in internships and smoothly promoted the reform of internship teaching. For example, the School of Law, through the collaboration of the Undergraduate Department and the Youth League Committee, has carried out mobilization work many times, and extensively recruited practice groups among students through multiple student organizations such as the Student Union, Student Law Research Association, Undergraduate Youth League Branch, Undergraduate Party Branch, and Class Youth League Committee. Members, organized a number of summer social practice teams to carry out practice activities with themes such as law popularization, grassroots exercises, judicial unit internships, education support, and research on hot social issues. In the practice of practical teaching, we have deeply realized that based on the same starting point and common goal, the academic affairs department and the student affairs department are neither a competitive relationship nor a vassal relationship, but an educational partnership. This partnership includes The complete service and learning from enrollment to graduation, classroom to extracurricular, is conducive to improving students' satisfaction with the school, sustaining academic achievement, increasing graduation rate, and strengthening students' understanding of general education, service learning, extracurricular activities, and psychosocial development And strengthen the integration between academic and society. Through joint cooperation, we can create a powerful learning

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July - August 2020
ISSN: 0193-4120 Page No. 5745 - 5752

environment to help students develop their potential.

3.4. Exploratory experiment: both open and innovative

On the basis of ensuring basic and standardized experimental teaching, a university changed the experimental teaching model to a comprehensive design and research and exploratory model, and expanded the exploratory experimental teaching model with both openness and innovation, that is, to cultivate innovation ability and improve research For the purpose of literacy and broadening the knowledge base, relying on an open experimental teaching environment, design student-centered guided and experiential teaching to achieve the integration of in-class and extra-curricular, integration of openness and innovation, and the combination of experiment and practice. A new model of experimental teaching that independently completes the whole process of knowledge construction. The model has three basic characteristics: generalized experimentation, classroom integration, and student body. Scientific research training plans, innovation and entrepreneurship plans, and subject competition plans are all included in the scope of experiments, and practical activities for different disciplines are also included in the scope of experiments; theory; The integration of the class and the experimental class, the integration before, during and after the class, the integration of the first class and the second class, pay attention to the process, tolerate failure; stimulate students' interest in learning, "interest is the best teacher", and encourage students to actively participate in learning .

3.5. Graduation project (thesis): school-enterprise collaboration, real guns and live ammunition

It can be seen from Table 1 that more than 80% of the undergraduate graduation design (thesis) combines scientific research topics and production practices, directly or indirectly related to industry enterprises. In the process of completing the graduation project (thesis), the company, as an invisible training party, cooperates with the school to complete this comprehensive test. In particular, the graduation project (thesis) completed by the company's production department directly providing the subject, the student's on-site internship in the company, and the completion of the graduation project (thesis) under the guidance of the mentor group formed by the company and the school can be said to be a real job preparation. The undergraduate study has entered the final year, and the physical and mental development of students has been quite mature. The process of undergraduate knowledge storage is basically completed, and the psychological preparation process for entering the workplace is about to begin. Enterprises involved in the cultivation of students' engineering practice ability at this stage can get twice the result with half the effort. It is not only an excellent opportunity for self-exhibition, but also advances the opportunity to recruit talents. Enterprises or industries provide real production and management research topics as graduation design topics, and the school-enterprise tutor team will jointly guide the graduation design. Students go to the enterprise to spend the graduation design stage, feel the real engineering environment and engineering process, and deeply understand the school and the workplace. There are huge differences between study and work, students and employees, which help college students adjust their behaviors and mental thinking paths more quickly in the process of role transformation that they must undergo in employment. What they gain is not only knowledge and practical skills, but also broadened horizons, richer life experience, higher independent survival ability and a grateful heart. Such as understanding and abiding by engineering ethics and regulations in engineering practice, and fulfilling relevant responsibilities; assuming the roles of individuals, team members and leaders in a multi-disciplinary team; being able to work with industry colleagues and the public on complex engineering issues Effective communication and exchange, including writing reports and design manuscripts, making statements, expressing clearly

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July - August 2020
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or responding to instructions; communicating and communicating in a cross-cultural context, etc.

3. Conclusions

This article discusses the issue of multi-dimensional education certification based on space vectors, puts forward four consideration factors, and explores the characteristics of practical teaching reform, aiming to provide decision support for multi-dimensional education certification.

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