Research on Apprenticeship of Hyaluronic Acid Industry Chain in Biopharmaceutical Specialty Based on Big Data Statistical Analysis and SPSS Software

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Abstract. The apprenticeship teaching reform of biopharmaceutical specialty in Shandong Institute of Commerce and Technology was carried out based on hyaluronic acid industry. The self-developed hyaluronic acid industry chain data analysis and management platform is used for research The model processing was carried out with the help of big data, and the statistical analysis index system was constructed. Through the use of big data statistical analysis, the industry chain distribution of hyaluronic acid was summarized, and the curriculum was set based on the industry chain. Taking 70 students majoring in biopharmaceutical technology in Shandong Institute of Commerce and Technology of Commerce as the research objects, the influence of modern apprenticeship based on hyaluronic acid industry on learning satisfaction of higher vocational students was investigated by the self-developed intelligent questionnaire editing software for hyaluronic acid industry chain. SPSS 21.0 was used to analyze the survey results. It was found that participating in modern apprenticeship can significantly improve the employability of higher vocational students, and the longer the time of participating in modern apprenticeship, the higher the satisfaction with modern apprenticeship. The correlation study between overall satisfaction and various satisfaction shows that job skill ability satisfaction mainly affects the overall satisfaction of apprenticeship. Based on this, we further put forward relevant suggestions to promote the development of modern apprenticeship.

Keywords: Data statistical analysis · SPSS Software · Biopharmaceutical technology · Apprenticeship · Hyaluronic acid industry

1 Introduction

1.1 Research Background of Apprenticeship

Modern apprenticeship is a kind of vocational school according to the requirements of the Ministry of Education of the People's Republic of China, which deepens the integration of production and education, further improves the school-enterprise cooperation education mechanism, and aims to innovate the training mode of technical and skilled

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talents [4, 5]. In January 2019, the State Council of China issued the 'National Vocational Education Reform Implementation Plan, which clearly put forward to vigorously develop vocational education in the new era. On the basis of summing up the experience of modern apprenticeship pilot, it increased government support, further deepened the integration of production and education, and increased the intensity and depth of school-enterprise cooperation. Schools and enterprises share resources and complement each other's advantages, build a mutually beneficial and win-win school-enterprise cooperative education community, accelerate the cultivation of innovative and skilled high-quality compound talents, and implement modern apprenticeship [8]. It can be seen that the modern apprenticeship system has risen to the national education strategy, and the school-enterprise' double subject' cooperative education in higher vocational colleges is the main line and trend of school-enterprise cooperative education in the future.

1.2 Enterprise Background of Biopharmaceutical Specialty of Shandong Institute of Commerce and Technology Based on Apprenticeship of Hyaluronic Acid Products

Hyaluronic acid, as a dominant industry in Shandong Province of China, has ranked the world. The top five hyaluronic acid enterprises in the world are all Shandong enterprises, and the global market share of these five enterprises has reached 75%. Among them, Huaxi Biology Co., Ltd has been in the leading position in the world for 14 consecutive years. The two enterprises of apprenticeship cooperation are as follows.

1.2.1 Shandong Commercial Group Co., Ltd.

Shandong Commercial Group Co., Ltd. is now focused on retail industry and health industry, education as a support. The biopharmaceutical specialty is based on the apprenticeship of hyaluronic acid products in Shandong Furuida Pharmaceutical Group Company. The company and Shandong Institute of Commerce and Technology are affiliated to Shandong Commercial Group Co., Ltd. Shandong Furuida Pharmaceutical Group Co., Ltd. is based on the technology of Shandong Academy of Pharmaceutical Sciences, based on the development, production and sales of drugs, health food and cosmetics related to human health.

1.2.2 Huaxi Biotechnology Co., Ltd.

Huaxi Biotechnology Co., Ltd. is a platform company for the whole industry chain of hyaluronic acid, which integrates R & D, production and sales. The technology of hyaluronic acid production by Huaxi Biotechnology Co., Ltd fermentation is in a dominant position. Based on the two technical platforms of microbial fermentation and cross-linking technology, the company established a whole industrial chain business system of bioactive materials from raw materials to medical terminal products, functional skin care products and functional food, serving manufacturing enterprises, medical institutions and end users in the fields of medicine, cosmetics and food all over the world.

2 Problems in Teaching Methods of Biopharmaceutical Specialty

2.1 The Established Talent Training Programme Does Not Meet the Urgent Needs of the Rapidly Developing Biopharmaceutical Industry

In recent years, many employers frequently appear employment gap or even 'labor shortage' phenomenon. Especially the shortage of new technology and new business talents, all kinds of talent supply and demand imbalance is more and more serious [7]. The inconsistency between talent cultivation and industrial demand in colleges and universities is one of the main reasons for the structural contradiction between supply and demand of talents. The main reason is that the discipline structure of higher vocational colleges is not optimized enough, and the variability and adaptability of specialty setting are obviously insufficient, which cannot adapt to the speed and scale of industrial upgrading, and cannot adapt to the dynamic needs of economic and social development.

2.2 Current Culture Mode Can Not Meet the Needs of Hyaluronic Acid Industry in Shandong Province

The professional setting of vocational schools is lack of scientific and reasonable planning, not according to the current situation of industrial development in the region and the actual needs of enterprise human resources, which is convenient for docking industry setting specialty, docking vocational standard setting curriculum, docking production process organization teaching [9]. The current talent training mode of higher vocational education cannot satisfy both students and enterprises. In fact, only by connecting the industrial chain with the cultivation of professional talents through apprenticeship and establishing the school-enterprise cooperation mechanism, and constructing the modern vocational education curriculum system through apprenticeship, can the close combination of talent training and industrial demand of vocational colleges be realized.

3 Research Content of Apprenticeship Based on Hyaluronic Acid Industry

3.1 Exploring the Talent Training Method of Apprenticeship in Biopharmaceutical Specialty Based on Hyaluronic Acid Industry

Drawing on the experience of the implementation of the 'modern apprenticeship' in foreign countries, and according to the actual situation of biopharmaceutical technology specialty in Shandong Institute of Commerce and Technology, we explored the effective way of cultivating talents based on the modern apprenticeship in hyaluronic acid industry. With 'apprentice docking posts, schools docking enterprises, education docking industry', to achieve professional and enterprise synchronous development. In order to promote the construction of a world-class modern vocational education system and improve the quality of personnel training.

3.2 Analysis of Post Requirements in Hyaluronic Acid Industry

Data analysis is carried out based on the research and data analysis management platform of hyaluronic acid industry chain. Higher vocational education mainly cultivates moral and technical training and comprehensive development. The specialty is set on the industry, and the industrial needs of the apprenticeship cooperative enterprises are closely followed by the industrial adjustment specialty [6]. The growth law of technical and skilled talents in vocational education is deeply studied. Based on this, the talent training scheme of 'hierarchical classification and personality training' is developed, and the high-tech talents needed by the industry are concentrated [11].

3.3 Students' Satisfaction Survey of Apprenticeship

Taking 70 students majoring in biopharmaceutical technology in Shandong Institute of Commerce and Technology as the research object, the influence of modern apprenticeship based on hyaluronic acid industry on learning satisfaction of higher vocational students was investigated [10]. Among the 70 students surveyed, the proportion of female students (45.71%) was slightly higher than that of male students (54.29%). The situation of apprenticeship is as follows: one year (28.58%), half a year (35.71%); There were no apprentices (35.71%). The satisfaction is divided into five levels: very satisfied (5 points), satisfied (4 points), general (3 points), dissatisfied (2 points), and very dissatisfied (1 point). The influence of whether to participate in apprenticeship and the time of apprenticeship on students' learning satisfaction is investigated. The effects of curriculum satisfaction, interpersonal skills satisfaction, learning ability satisfaction, job skills satisfaction and employment ability satisfaction on learning satisfaction were studied. All data were analyzed using SPSS 21.0 software.

4 Results

4.1 Product-Oriented Curriculum System Reconstruction Product-Oriented Curriculum System Reconstruction Based on Computer Big Data Analysis

Data analysis is carried out based on the research and data analysis management platform of hyaluronic acid industry chain. Through big data analysis, hyaluronic acid upstream industries include raw material suppliers such as livestock, aquaculture and microbial culture. The midstream industry is hyaluronic acid R & D, production, processing and sales. Downstream is the main application of hyaluronic acid industry and consumer terminals, such as medical beauty agencies, pharmaceutical companies, health products companies, food companies, and finally consumers. Figure 1 provides the results of the hyaluronic acid industry computer big data analysis production chain. Table 1 provides teaching tasks, courses and projects for apprenticeship of biopharmaceutical specialty based on hyaluronic acid industry.

According to the characteristics of apprenticeship system, the specialty construction committee of biopharmaceutical specialty in Shandong Institute of Commerce and Technology e of Commerce is jointly constructed by schools and enterprises. Starting from

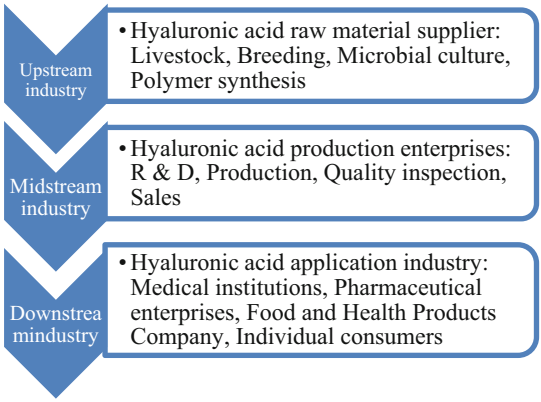

Fig. 1. Results of computer big data analysis production chain in hyaluronic acid industry

Table 1. Tasks, courses and projects for apprenticeship of biopharmaceutical specialty based on hyaluronic acid industry

Process	Raw material processing	Terminal product processing	Quality control	Product sales service
Task	Hyaluronic acid fermentation production	Preparation of granules, tablets, ointments and emulsions	Quality assure, Quality control	Sales of drugs, cosmetics and health products
Corresponding courses	Biopharmaceutical technology Technology of Biological Separation and Purification	Pharmaceutical preparation technology	Drug detection technology	Pharmaceutical e-commerce
Support projects	Production of hyaluronic acid for different applications	Production of Hyaluronic Acid Pharmaceutical Products, Cosmetics and Health Products	Hyaluronic acid product detection	Pharmaceuticals, Cosmetics and Health Products Manufactured by Shandong Commercial Group Co., Ltd.

the needs of knowledge and skills in actual positions, combined with industrial standards and professional standards, schools and enterprises jointly design talent training programs. Based on the typical working process, schools and enterprises jointly build a practical system of biopharmaceutical technology based on hyaluronic acid industry chain, implement the teaching mode of school-enterprise dual education and work-study combination.

Table 2. SPSS software analysis of satisfaction and the average of each dimension group

Dimensional	Mean value	Standard deviation	N
Curriculum satisfaction	3.29	0.983	70
Interpersonal skills satisfaction	3.30	0.597	70
Learning ability satisfaction	3.61	1.374	70
Job skills satisfaction	3.49	0.959	70
Employment ability satisfaction	3.63	1.787	70
Overall satisfaction	3.71	1.038	70

Table 3. SPSS software was used to analyze the satisfaction and the mean and t test results of each dimension group of students participating in apprenticeship and students not participating in apprenticeship

Dimensional	Mean value		t
	No participation in apprenticeship (n = 25)	Participation in apprenticeships (n = 45)	
Curriculum satisfaction	2.08	3.96	−20.875***
Interpersonal skills satisfaction	2.08	3.98	−23.376***
Learning ability satisfaction	2.96	2.44	−14.218***
Job skills satisfaction	2.44	4.07	−11.484***
Employment ability satisfaction	1.36	4.89	−21.806***
Overall satisfaction	2.16	4.58	−11.964***

Annotation: *P < 0.1, * *P < 0.05, * * *P < 0.01

4.2 Descriptive Statistical Analysis

The researchers conducted data analysis based on the intelligent questionnaire editing software of the hyaluronic acid industry chain research. The average score of 70 students' overall satisfaction with teaching is 3.71, the average score of curriculum satisfaction is 3.29, the average score of interpersonal skills satisfaction is 3.30, the average score of learning ability satisfaction is 3.61, and the average score of job skills satisfaction is 3.49. Table 2 is an analysis of descriptive statistics.

Of the 70 students surveyed, 25 did not participate in apprenticeships, Of the 45 students participating in apprenticeship, 25 students half a year, 20 students one year. There are significant differences in whether to participate in apprenticeship and the length of apprenticeship time for satisfaction. Tables 3 and 4 are SPSS software analysis of student satisfaction and each dimension group average and t test results. Data analysis shows

Table 4. SPSS software was used to analyze the satisfaction and the mean and t test results of each dimension group of students with different apprenticeship time

Dimensional	Mean value		t
	Apprenticeship time half a year(n = 25)	Apprenticeship time a year(n = 20)	
Curriculum satisfaction	3.84	4.10	−1.994*
Interpersonal skills satisfaction	3.92	4.05	−1.025
Learning ability satisfaction	3.88	4.10	−1.833*
Job skills satisfaction	3.84	4.35	−3.527***
Employment ability satisfaction	4.88	4.90	−0.179
Overall satisfaction	4.44	4.75	−1.731*

Annotation: *P < 0.1, * *P < 0.05, * * *P < 0.01

that the modern apprenticeship emphasizes the alternation of work and study, the combination of theoretical teaching and practical teaching, the combination of knowledge learning and technical learning, and sufficient time is the necessary condition to ensure the quality and effect of talent training.

5 Conclusions and Recommendations

SPSS software analysis of student satisfaction and each dimension group average and t test results Modern apprenticeship is an important education system for schools and enterprises to jointly cultivate high-quality technical and skilled talents needed by enterprises. The purpose of professional training docking with the demand of industrial chain is to enable students to learn both knowledge and technology, and to solve the two major problems of students' employment difficulty and enterprises' recruitment difficulty. Therefore, it is reasonable to take student satisfaction as an evaluation index of the quality and implementation effect of modern apprenticeship training. This paper takes 70 students majoring in biopharmaceutical technology in Shandong Institute of Commerce and Technology as the research object, and investigates the influence of modern apprenticeship based on hyaluronic acid industry on learning satisfaction of higher vocational students. The results show that participating in modern apprenticeship can significantly improve the employability of higher vocational students, and the longer the time of participating in modern apprenticeship, the higher the satisfaction of modern apprenticeship. Modern apprenticeship is positively correlated with job skill satisfaction of higher vocational students, that is, participating in modern apprenticeship can significantly improve their job skill ability.

5.1 The Establishment of Hyaluronic Acid Enterprise Information Computer Big Data Platform

The establishment of enterprise information resources platform under the background of big data is to apply statistics to the platform in order to better analyze and realize information sharing. Implementing certain relatively suitable and effective analysis methods and utilizing the optimized data structures for diverse functions based on distinctive demands, the hyaluronic acid enterprise information computer big data platform offers a direct and efficient way to process and understand the preserved data. Such platforms ensure the security of information upload of hyaluronic acid enterprises using multiple standardized encryption algorithms common in the industry and on top of that, a dedicated security layer is deployed in order to advance the reliability of entire platform and significantly lower the failure rate. Makes the hyaluronic acid enterprise huge information resources to the management, undertakes to enable it to carry on the real-time decision-making function. At the same time, it should be noted that the risk behavior of resisting information disclosure should be set as a pre-assessment condition when the instant sharing platform is established, while the latency for data transmission is kept in a comparatively low and acceptable rate to push and sync the updated stream of data throughout the platform. And on this basis, the use of big data precise control of enterprise operation.

5.2 Enhancing Organizational Security Establish 'Modern Apprenticeship' Project Team

The head of the working group is composed of school leaders and heads of enterprises, and the members are composed of heads of relevant departments, technical personnel of enterprises, and professional teachers of schools. The idea and concept of distributed system and hierarchy are deliberately practiced: subsidiary servers can be installed at multiple locations publicly or privately upon the requests of users and the security clearance can be determined individually with different levels to limit the accessibility towards the system and maximize the security. For instance, the administrator together with other top-ranked accounts on are solely distributed to personnel who passed the preset process of authentication or those registered on the whitelist by default. The working group regularly studies the problems and difficulties in the pilot work of modern apprenticeship, and forms a coordinated, rapid and efficient working mechanism [1]. Such mechanism remarkably boosts the iterations of the platform meanwhile the routine updates are executed with widely used version control tools to patch the system constantly. Develop a system of responsibilities and regular meetings of working groups and expert working groups, establish a thematic briefing system for pilot schools, communicate information in a timely manner, summarize experience, and study and solve existing problems to ensure smooth, orderly and effective pilot work [2].

5.3 Construction of Quality Evaluation System Based on Employability by Computer Software System

Construction of modern apprenticeship quality evaluation system based on employability. The construction of college graduates' employment quality evaluation system is to

realize the employment quality evaluation from the traditional 'manual operation' to the modern computer 'system realization', and strive to achieve the expected employment quality evaluation effect with the least human, material and financial resources [3]. Modern apprenticeship is a systematic project, which needs to build a series of management systems including quality evaluation system, and build the quality evaluation system of apprenticeship including employers, society, schools, students and parents of students. Dozens of algorithms are used at different stages to accomplish various functions with the assessed overall accuracy and efficiency incomparably prevail over the traditional ways. Offering an unbiased perspective towards preserved data using the mentioned methods, the platform systematically eradicates the factors that have subjective impacts on decision making process. Such system is meant to always provide positive incentives to whom enrolled in the programs, showing them the most critical parts need to be improved after weighing. On the other hand, the feedbacks from those who are evaluated by the system are necessary in data correcting and fitting works, especially at the early stages of the system.

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