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Construction and Verification of Learning Outcome Evaluation Index System for Students Majoring in Chinese Pharmacy in Higher Vocational Colleges

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Abstract: As an important part of traditional Chinese medicine, TCM has experienced rapid development in the past few decades. As the study of TCM continues to deepen, the assessment of student learning outcomes has become increasingly important. However, there is currently a lack of a systematic evaluation index system to evaluate the learning outcomes of Chinese pharmacy students. Therefore, this study aims to fill this gap. This study identified relevant evaluation indicators and criteria. Then the opinions and suggestions of the evaluation index system were collected through questionnaire survey. The collected data were verified and analyzed by statistical analysis methods to ensure the validity and reliability of the evaluation index system. The research results show that the evaluation index system constructed can comprehensively evaluate the learning outcomes of students majoring in Chinese pharmacy, and provide an effective reference for schools and industries. The verification results show that the evaluation index system has good stability and reliability in different samples. The evaluation index system for learning outcomes of Chinese pharmacy students in higher vocational colleges constructed in this study has certain theoretical and practical significance. It provides scientific methods and tools for the evaluation of learning outcomes of students majoring in Chinese pharmacy, which is helpful to improve the quality of education and cultivate excellent talents of Chinese pharmacy.

Keywords: Higher Vocational Colleges; Chinese Pharmacy Major; Learning Outcomes; Evaluation Indicators.

1. Introduction

In recent years, with the rapid development of higher education and the continuous improvement of social requirements for the quality of personnel training, the evaluation of learning outcomes has become an important part of the professional education of Chinese pharmacy in higher vocational colleges [1]. The establishment and verification of the learning outcome evaluation index system is a key link in improving the quality of education and cultivating outstanding talents [2]. However, there are still some problems in the evaluation index system of learning outcomes for students majoring in Chinese pharmacy, such as the evaluation criteria are not clear enough, the evaluation method is single, etc., which need further research and improvement [3].

In the research of relevant scholars, some research conclusions about the evaluation index system of learning outcomes have been put forward. For example, Ji S studied the incentive status of vocational colleges participating in modern apprenticeship and the evaluation of key influencing factors based on artificial neural network, and found many aspects of influence [4]. Naim A achieves student learning outcomes by applying e-learning tools [5]. Kolmos A aims to evaluate learning outcomes through student self-assessment [6]. These studies provide us with valuable theoretical basis and enlightenment, and provide a reference for further improving and optimizing the learning outcome evaluation index system.

The purpose of this study is to construct and verify the learning outcome evaluation index system for Chinese pharmacy students in higher vocational colleges, so as to improve the quality of education and cultivate outstanding talents. Specifically, we will collect the data of TCM students majoring in a vocational college through a questionnaire. At the same time, we will strengthen the formulation and guidance of evaluation standards, provide diversified evaluation methods, research and develop scientific and effective evaluation tools and indicator systems, and strengthen teachers' evaluation awareness and ability training. Through the comprehensive use of various elements of the evaluation index, we will comprehensively evaluate the learning outcomes of students and provide targeted improvement and optimization measures for teaching.

2. Evaluation of Learning Outcomes of Students Majoring in Chinese Pharmacy

In today's society, the specialty of Chinese pharmacy plays an important role in the medical field and has trained a large number of Chinese medicine talents [7]. However, with the development of society and the continuous update of medical knowledge, how to evaluate the learning outcomes of students majoring in Chinese pharmacy has become an urgent problem to be solved. The importance of learning outcome evaluation for students majoring in Chinese pharmacy is self-evident [8]. First of all, evaluating students' learning outcomes can help teachers and educational institutions understand students' learning situation and level, so as to provide targeted guidance and improvement measures for teaching. Secondly, the assessment of student learning outcomes can provide students with opportunities for self-awareness, help them understand their learning abilities and potential, and promote personal growth and development [9]. In addition, evaluating students' learning outcomes is also of great significance to employers, which can provide them with references about students'

abilities and qualities, so as to better choose jobs and cultivate talents [10]. Therefore, it has important theoretical and practical significance to construct and verify the evaluation index system of learning outcomes of Chinese pharmacy students.

2.1. The Importance of Learning Outcome Assessment for Students Majoring in Chinese Pharmacy

The importance of evaluation of learning outcomes of students majoring in Chinese pharmacy is reflected in many aspects. First, assessing student learning outcomes can provide teachers with feedback to help them understand teaching effectiveness and student learning [11]. Through the evaluation results, teachers can adjust teaching strategies in time, provide more effective teaching methods, and promote students' learning progress.

Secondly, the assessment of student learning outcomes is also crucial to the development and growth of students themselves [12]. The evaluation results can help students understand their own learning ability and knowledge level, discover their own strengths and weaknesses, so as to better formulate learning plans and goals. In addition, assessment can also stimulate students' learning motivation and self-confidence, and encourage them to continuously strive to improve their abilities [13].

In addition, the evaluation of learning outcomes of students majoring in Chinese pharmacy is also of great significance to employers [14]. The evaluation results can provide employers with references to students' abilities and qualities, helping them better select suitable talents. For Chinese pharmacy majors, the establishment of an evaluation index system can ensure that students have the necessary professional knowledge and skills and improve their employment competitiveness [15].

To sum up, the importance of learning outcome evaluation of students majoring in Chinese pharmacy is not only reflected in teaching improvement and students' personal development, but also has great significance for the development of the industry and society. Therefore, it is an urgent research task to construct and verify the evaluation index system of learning outcomes of students majoring in Chinese pharmacy.

2.2. The Status Quo of Learning Achievement Evaluation of Students Majoring in Traditional Chinese Pharmacy in Higher Vocational Colleges

At present, there are some problems and challenges in the evaluation of learning outcomes of Chinese pharmacy students in higher vocational colleges [16]. Here are some common situations:

Lack of uniform evaluation standards: Due to the diversity and particularity of Chinese pharmacy majors, vocational colleges lack uniform standards and guidance in the evaluation of students' learning outcomes [17]. This leads to poor comparability of evaluation results, and it is difficult to conduct horizontal comparison and comprehensive evaluation.

Single evaluation method: At present, the evaluation of students' learning outcomes of Chinese pharmacy majors in many higher vocational colleges mainly adopts traditional written examination and experimental operation evaluation methods, ignoring the evaluation of students' comprehensive quality and practical ability [18]. This assessment method cannot fully reflect the learning outcomes and ability levels of students.

Lack of effective evaluation tools and index systems: At present, the research on specific index systems and evaluation tools for the evaluation of learning outcomes of Chinese pharmacy students is still relatively limited [19]. The lack of scientific and effective assessment tools and indicator systems limits the accuracy and reliability of the assessment.

Teachers' awareness of evaluation is not strong: Some teachers do not pay enough attention to the importance and methods of student learning outcome evaluation, and lack systematic evaluation training and guidance [20]. This leads to a high degree of subjectivity in the evaluation results, and there are certain deviations in the evaluation process.

In order to improve the current situation of the evaluation of learning outcomes of students majoring in Chinese pharmacy, it is necessary to strengthen the formulation and guidance of evaluation standards, provide a variety of evaluation methods, and research and develop scientific and effective evaluation tools and index systems. At the same time, teachers should strengthen the cultivation of assessment awareness and ability, and improve the objectivity and accuracy of assessment.

3. Constructing an Evaluation Index System for the Learning Outcomes of Students Majoring in Chinese Pharmacy in Higher Vocational Colleges

3.1. Evaluation Objectives and Content

This paper aims to construct and verify the framework of the evaluation index system for the learning outcomes of students majoring in Chinese pharmacy in higher vocational colleges. In the current educational environment, the evaluation of student learning outcomes is a crucial task, which can not only evaluate the learning effect of students, but also guide the improvement and optimization of the teaching process.

The evaluation goal is to ensure that the students majoring in Chinese pharmacy can reach the expected level in terms of knowledge, skills and comprehensive quality. Through the evaluation, we can fully understand the performance of students in the field of Chinese pharmacy knowledge mastery, skill application ability, innovation ability, problem solving ability, teamwork ability and so on. The evaluation objectives also include the evaluation of students' comprehensive qualities, such as academic ethics, professionalism, and communication skills.

The assessment content will cover the core knowledge and skills of TCM major. As for the evaluation of knowledge level, students can examine the mastery of basic theories of Chinese pharmacy, identification and quality evaluation of Chinese medicinal materials, and formulas and preparations of Chinese medicinal materials. Skill application assessment can be carried out through practical links such as experimental operation, preparation of pharmaceutical preparations and quality control. The evaluation of innovative ability can be realized through the participation of students in scientific research projects and the display of innovative achievements. The evaluation of problem-solving ability can be carried out

through case analysis, problem-solving in practical operation, etc. Teamwork Assessment Students' ability to work in teams can be assessed through groupwork projects. Comprehensive quality assessment can be carried out through academic paper writing, oral report and comprehensive quality assessment.

By constructing and verifying the framework of the evaluation index system for students majoring in Chinese pharmacy in higher vocational colleges, it can provide teachers with scientific and effective evaluation tools and guidance, help schools establish a unified evaluation standard, and improve students' learning quality and teaching effect. At the same time, it can also promote the cultivation of teachers' evaluation awareness, promote teaching reform and innovation, and lay a solid foundation for the cultivation of excellent Chinese pharmacy professionals.

3.2. Components of Evaluation Indicators

The elements of the evaluation index system in this paper include knowledge level evaluation, skill application evaluation, innovation ability evaluation, problem solving ability evaluation, teamwork evaluation and comprehensive quality evaluation. These constituent elements cover many aspects of the learning outcomes of students majoring in Chinese pharmacy, aiming to comprehensively evaluate students' knowledge level, skill application ability, innovation ability, problem-solving ability, teamwork ability and comprehensive quality, so as to ensure that students in Chinese pharmacy major domain achieves expected learning outcomes. Through the comprehensive use of these evaluation indicators, we can fully understand the learning situation of students, and provide targeted improvement and optimization measures for teaching.

3.3. Hierarchy of Evaluation Indicators

The hierarchy of evaluation metrics is shown in Table 1.

Table 1. Hierarchy of evaluation metrics

Level 1 indicators	Level 2 indicators	Evaluate
Knowledge Assessment	Mastery of theoretical knowledge	1
	Ability to apply practical knowledge	2
	Mastery of basic subject knowledge	3
Skills Application Assessment	Experimental skills	4
	Ability to apply clinical skills	5
	Pharmaceutical preparation operation skills	6
Innovation Capability Assessment	Research ability	7
	Innovative thinking ability	8
	Innovation project implementation ability	9
Problem Solving Assessment	Problem analysis ability	10
	Solution Design Capabilities	11
	Ability to implement and evaluate solutions	12
Teamwork Assessment	Team communication and collaboration skills	13
	Team role division and cooperation ability	14
	Ability to achieve team goals	15
Comprehensive Quality Assessment	Academic Ethics and Professionalism	16
	Comprehensive quality development and self-management ability	17
	Awareness of social responsibility and public service ability	18

3.4. Evaluation Index Weight

Due to the characteristics and diversity of the evaluation indicators, this paper will divide the weights of the selected evaluation indicators, as shown in Figure 1.

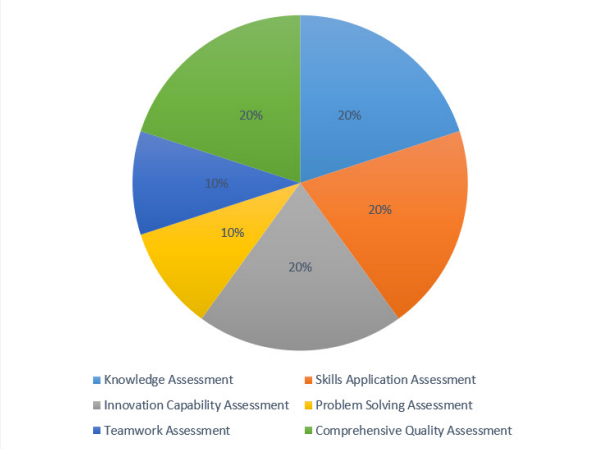


Figure 1. Evaluation index weight division

4. Verify the Effectiveness of the Evaluation Index System

4.1. Data Collection

This paper uses a questionnaire to obtain the views and feedback of TCM students majoring in a vocational college. In order to ensure the reliability and representativeness of the data, we will design corresponding questions based on each element of the learning outcome evaluation index system, so that students can accurately reflect their learning situation and views. In this paper, a certain number of samples are selected from the students majoring in traditional Chinese medicine in a vocational college. The collected data will be statistically analyzed to obtain students' overall cognition and views on the evaluation index system of learning outcomes. By collecting the data of the students majoring in traditional Chinese medicine in a vocational college, we will be able to have a more comprehensive understanding of the students' cognition and evaluation of the learning achievement evaluation index system. This will provide an important reference and basis for us to further improve and optimize the index system. At the same time, it can also provide teachers with targeted teaching improvement suggestions to improve students' learning effect and results. Data collected in this paper are shown in Figure 2.

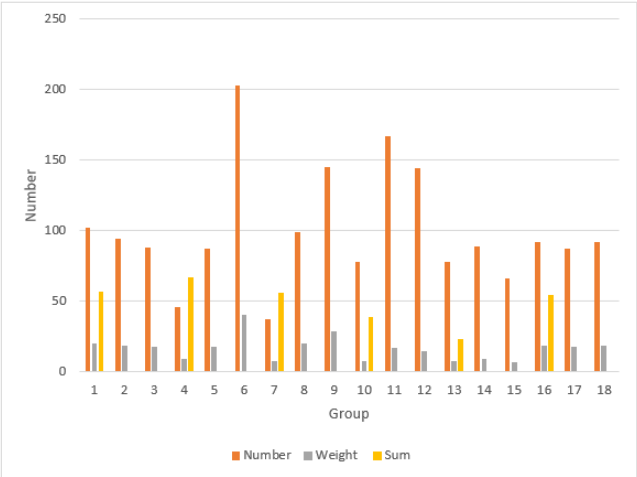


Figure 2. Questionnaire survey data of a vocational college student

4.2. Analysis and Statistics

The data collected from Figure 2 shows that the students showed obvious concern and emphasis on the development of knowledge level, skill application ability and comprehensive quality. This discovery has important enlightenment and guiding significance for schools and teachers. Students' focus on knowledge levels indicates that they recognize knowledge as a foundational and central element of learning. They aspire to acquire solid subject knowledge in order to be able to understand and apply what they have learned in various fields. Schools and teachers can support students' intellectual pursuits by providing challenging learning tasks, encouraging inquiry and critical thinking, and providing diverse learning resources and opportunities. Students' focus on the ability to apply skills indicates that they hope to be able to apply what they have learned to practical problems and develop practical and problem-solving abilities. Schools and teachers can develop students' innovative thinking, communication skills, teamwork, and problem-solving skills by designing tasks and projects that are relevant to real-life and professional needs. In addition, providing practical opportunities and internship experience is also an effective way to cultivate students' ability to apply skills. Students' attention to comprehensive quality shows that they realize the importance of comprehensive quality, including moral character, leadership ability, interpersonal communication and cross-cultural awareness, etc. Schools and teachers can help students become responsible, resilient, and well-rounded individuals by developing their social-emotional competencies, moral values, leadership, and global awareness. In addition, the evaluation method should also fully consider the development of comprehensive quality, not only limited to traditional test scores, but also includes various forms of evaluation, such as project works, exhibitions, practical performance, etc. To sum up, students' attention to knowledge level, skill application ability and comprehensive quality provides important guidance for schools and teachers. Schools and teachers should pay more attention to and pay more attention to the teaching and assessment of these aspects in order to meet the needs and expectations of students, promote their overall development and achieve their learning goals. By providing a challenging learning environment and cultivating practical skills and comprehensive qualities, schools and teachers can lay a solid foundation for students' future success.

4.3. Validity and Reliability Verification of the Evaluation Index System

In order to verify the validity and reliability of the evaluation index system, this paper adopts methods and measures such as internal consistency analysis, external validity analysis and test-retest reliability analysis. First, we conducted an internal consistency analysis to evaluate whether the index system has internal consistency by checking the correlation between various indicators within the evaluation index system. We used statistical methods to calculate the consistency level of each indicator within the indicator system. The index coefficient of the statistical value in this paper is high, indicating that there is a high consistency among the various indexes within the index system.

Second, this paper conducts an external validity analysis to determine whether the evaluation indicator system is associated with other relevant variables or measurement tools. We compare against other widely accepted assessment tools, such as student academic performance, teacher assessments, and student feedback. By analyzing the relationship between the evaluation index system and these variables, we can evaluate the external validity of the evaluation index system.

In addition, this paper also conducted a test-retest reliability analysis to evaluate the reliability of the evaluation index system. By repeatedly measuring the same group of students at different time points, we can calculate the test-retest reliability of the evaluation index system. A high test-retest reliability indicates that the measurement results of the evaluation index system at different time points have high consistency and stability.

Through the above analysis and verification methods, we can comprehensively evaluate the validity and reliability of the evaluation index system. This will provide us with information about the reliability and validity of the assessment indicator system, thereby ensuring that we can accurately and reliably assess student learning outcomes and provide a scientific basis for teaching improvement.

4.4. Results and Discussion

In this study, we found through data analysis that students showed obvious concern and emphasis on the development of knowledge level, skill application ability and comprehensive quality. This finding has important implications for schools and teachers. First of all, students' pursuit of knowledge shows that they realize that knowledge is the core of learning, and schools and teachers should provide corresponding learning resources and opportunities to meet students' knowledge needs. Secondly, students' focus on the ability to apply skills means that they hope to apply the knowledge they have learned to practical problems. Schools and teachers can develop students' practical ability by designing related tasks and projects. Finally, students' attention to comprehensive quality shows that they realize the importance of comprehensive quality, and schools and teachers should pay attention to cultivating students' moral character, leadership ability and cross-cultural awareness. The significance of this study is that it provides insight into student concerns, providing guidance for schools and teachers to better meet student needs and expectations. By paying attention to and emphasizing the teaching and assessment of knowledge, skills and comprehensive qualities that students care about, schools and teachers can help students achieve all-round development and improve learning outcomes. However, this study has some limitations. First, we relied solely on the data in Figure 2 for our analysis, and more comprehensive data collection and analysis may provide deeper insights. Second, we did not explore the reasons and motivations for students to pay attention to these aspects, and further research can explore these factors. Furthermore, we did not address teachers' and schools' responses and responses to teaching and assessment strategies in these areas, which is an important direction for future research.

Future research can further explore the reasons and motivations of students' attention to knowledge, skills and comprehensive quality. At the same time, the study could expand the sample size to cover more schools and student groups to obtain more representative results. In addition, research can provide insight into how teachers and schools address student concerns in teaching and assessment, and examine their impact on student learning outcomes and development. In conclusion, the findings of this study emphasize students' concern for the development of

knowledge level, skill application ability and comprehensive quality, which has important guiding significance for schools and teachers. Further research can deeply explore the reasons and motivations of students' concerns, and examine teachers' and schools' coping strategies in teaching and assessment to promote the overall development of students and the improvement of learning outcomes.

5. Conclusion

The study found that there are some problems in the application of the existing learning outcome evaluation index system in the specialty of Chinese pharmacy, such as the evaluation criteria are not clear enough, the evaluation method is single, and the evaluation tools and index system are not scientific and effective enough. In order to solve these problems, this study proposes an improved evaluation index system, including knowledge level evaluation, skill application evaluation, innovation ability evaluation, problem solving ability evaluation, teamwork evaluation and comprehensive quality evaluation. The comprehensive use of these indicators can comprehensively evaluate students' learning outcomes and provide targeted improvement and optimization measures for teaching. This article not only helps to improve the accuracy and objectivity of assessment, but also promotes the cultivation of students' comprehensive quality and ability. By evaluating students' knowledge level, skill application, innovation ability, problem-solving ability, teamwork and comprehensive quality, we can better understand students' learning status, provide teachers with targeted teaching improvement suggestions, and improve teaching quality. The findings and conclusions of this study provide useful guidance and inspiration for the evaluation of learning outcomes of students majoring in Chinese pharmacy, and are of great significance and contribution to improving the teaching quality and cultivating high-quality Chinese pharmacy professionals. Future research can be further improved and expanded on the basis of this study to provide better support and guidance for the teaching and evaluation of Chinese pharmacy in higher vocational colleges.

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