



Application of Delphi method in the construction of holistic integrative pharmacy elective course system

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[Abstract] Objective The proposal and practice of holistic integrative pharmacy plays an important role in guiding the higher education of pharmacy in China. The purpose of this study is to establish an elective course system in line with holistic integrative pharmacy talent training. **Methods** A project research team was established, responsible for compiling the expert consultation questionnaires. The Delphi method was used to conduct two rounds of expert consultation. After statistical analysis, the indicators were further screened and optimized. **Results** A total of 69 experts participated in the two rounds of consultation. The recovery rate of questionnaires was 100%, and the expert authority coefficient was 0.85 ± 0.12 , indicating that the experts were highly motivated and authoritative. The coordination coefficients of the two rounds of expert opinions were 0.476 ($P < 0.05$) and 0.152 ($P < 0.05$), respectively. According to the inclusion criteria of the index system, and taking expert opinions and suggestions into full consideration, the project research team decided to remove a total of six courses and add six courses to replace them. Finally, the pharmacy elective course system of "24 + X" courses was established. **Conclusion** The Delphi method is used to construct a more scientific and reasonable pharmacy elective course system that conforms to the goal of holistic integrative pharmacy personnel training. This system needs to be further improved in practice.

[Key words] Holistic integrative pharmacy; Elective courses; Delphi method

1 Introduction

In recent years, adhering to the concept of

holistic integrative medicine, holistic integrative pharmacy has gradually penetrated into basic research, new drug research and development, clinical pharmacy practice, pharmacy discipline construction and personnel training, policy formulation and many other fields^[1]. It is important to regard holistic integrative pharmacy as an educational concept and put it into practice in

[Research Funding] This work was supported by Key Project of the 14th Five-Year Plan of Heilongjiang Provincial Planning Office (GJB1421295).

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pharmaceutical education, which will guide the innovation and development of pharmacy education. Pharmacy colleges and universities combine their own educational basis and characteristics to find a fulcrum from the construction of talent training system to promote the development of holistic integrative pharmacy^[2].

In the practice path of holistic integrative pharmacy, the integration of pharmacy curriculum group and the reform of teaching content is a very important part. The teaching content revolves around the goal of talent cultivation. Each course group usually contains compulsory courses and elective courses, and the courses are interrelated and mutually supportive. The compulsory courses impart basic scientific and cultural knowledge and skills, emphasizing basic, systematic and integrity. The content is relatively fixed. The specific compulsory courses for pharmacy undergraduate are shown in Table 1. However, elective courses emphasize the expansion and deepening of subject knowledge, and focus on newer and broader knowledge and skills with greater flexibility. It is timely adjustment in response to the changes in the times and the requirements of students. In view of the

characteristics of the elective courses, a new holistic integrative thinking is used to design and develop a scientific and reasonable pharmacy elective course system that keeps pace with the times. It is a powerful entry point for the implementation of holistic integrative pharmacy, and also the key to the implementation of compound pharmacy talent training.

The Delphi method is a unique expert consulting and decision-making technology. Based on the theoretical knowledge and rich experience of experts, suggestions for some unclearly defined problems that cannot be quantitatively analyzed are collected through multiple rounds of questionnaires by anonymous. After a series of processes including statistics-feedback-revision, a certain authoritative, representative, and scientific conclusion is finally obtained. In recent years, the Delphi method has been widely used in the construction of curriculum system in the field of medical education^[3]. The aim of this article is to optimize the existing elective course system by the Delphi method, using the experts' theoretical knowledge and practical experience to further establish an elective course system in line with holistic integrative pharmacy talent training.

Table 1 Compulsory courses for pharmacy undergraduate

Curriculum group	Compulsory courses
Public basic course	English, Physical education, Advanced mathematics, Physics, Computer fundamentals and applications, Medical statistics
Humanities and occupational quality course	Situation and policy, Thought morals tutelage and legal foundation, College students' career development and employment guidance, Military theory, Basic principle of Marxism, College students' mental health education, Chinese modern and contemporary history, College students entrepreneurial foundation, Introduction to Mao Zedong thought and theoretical system of socialism with Chinese characteristics, General Secretary Xi Jinping's series of important speeches
Basic medical course	Systematic anatomy, Histology and embryology, Physiology, Cell biology, Biochemistry, Medical immunology, Medical microbiology, Microbial and genomic pharmacy, Pathology, Pathophysiology, Pharmacology, Biotechnology experiment, Functional experiments, Introduction to clinical medicine
Professional basic course	Inorganic chemistry, Inorganic chemistry experiment, Organic chemistry, Organic chemistry experiment, Analytical chemistry, Analytical chemistry experiment, Physical chemistry, Physical chemistry experiment
Professional course	Introduction to pharmacy, Spectrum analysis of organic compounds, Medicinal chemistry, Natural medicinal chemistry, Pharmaceutical molecular biology, Biopharmaceuticals and pharmacokinetics, Pharmaceutical English, Biotechnology pharmacy, Pharmaceutical analysis, pharmacy, Pharmacy management, Clinical pharmacology, Medicinal plants and pharmacognosy, Computer aided drug design, Pharmaceutical bioinformatics, Pharmacoeconomics

2 Methods

The Delphi method was used to conduct two rounds of expert consultation. Comprehensive with expert opinions and suggestions, we formed a pharmacy elective course system conforming to the goal of holistic integrative pharmacy personnel training, and determined target course contents. Fig. 1 provides an overview of the Delphi process used for this study.

2.1 Establishing a project research team

The project research team is mainly composed of four kinds of members, including pharmacy expert, pharmacy teacher, academic staff, and clinical pharmacist, respectively. The main responsibility is to establish the original indicators, determine the list of consulting experts, and compile the expert consulting questionnaire. After collecting the questionnaires, the team conducts statistical analysis and feeds the results back to the experts.

2.2 Establishing original indicators

According to the Pharmacy Professional Talent Training Program of the School of Pharmacy of Harbin Medical University, the pharmacy undergraduate courses include public basic courses, humanities and occupational quality course, basic medical course, professional basic course and professional course. Based on the above five major course groups, the initial pharmacy undergraduate elective course indicators are established, with a total of 24 elective courses.

2.3 Expert consultation

The inclusion criteria of consulting experts include: engaging in pharmacy education or pharmacy related fields in Harbin Medical University and its affiliated hospitals; owning rich teaching and practical experience; willing to participate in the research of this project. Questionnaire star was used for two rounds of consultation. Before the first round of expert consultation, the background and purpose of the research are introduced to the experts, and all experts have informed consent to the research content. The content of the questionnaire includes basic expert information, project familiarity, and judgment basis in the first round. In accordance with the Likert 5-level scoring method, the importance of the indicator is scored, divided into 5 levels: very recommended, recommended, general, not recommended, and very not recommended, and assigned 5, 4, 3, 2, and 1 points in turn^[4]. At the same time, experts need to give modifications and suggestions. After sorting out and analyzed the first round of expert opinions, the research team then formed the second round of questionnaires to score the importance of the indicators again. In the second round of questionnaires, the first round of expert opinions and research team discussion results will be attached. After statistical analysis of data, the original indicators were modified and improved to build an elective course system for pharmacy undergraduate in line with the goal of integrative to build an elective course system for

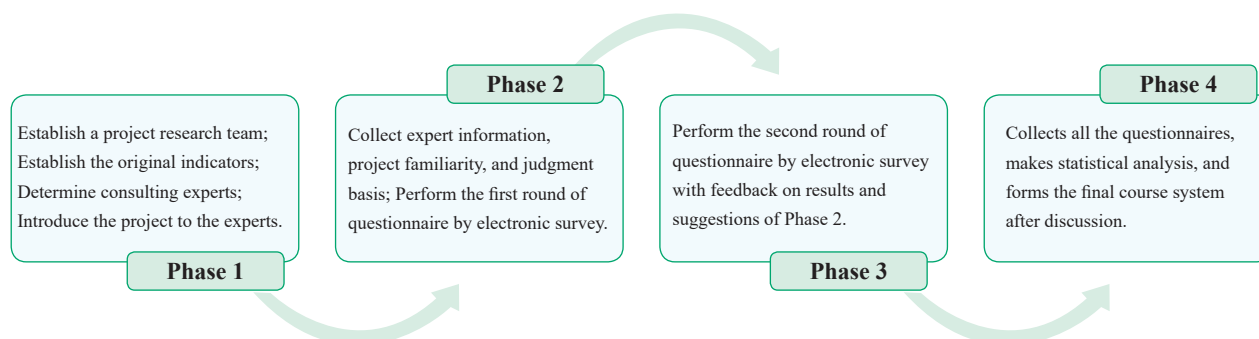


Fig. 1 Study method

undergraduate pharmacy in line with the holistic goal of holistic integrative pharmacy talent training.

2.4 Statistics

SPSS 23.0 and Microsoft Excel 2016 were used for statistical analysis. The specific contents include: (1) The positive coefficient of experts is usually expressed by the questionnaire recovery rate (%). The greater the recovery rate, the higher the degree of interest the experts are concerned about the research. (2) The degree of expert authority is represented by the authority coefficient (Cr), which is the average value of the judging basis coefficient (Ca) and the familiarity coefficient (Cs). $Cr \geq 0.7$ represents that the result is acceptable, and $Cr \geq 0.8$ represents a high degree of authority. According to the degree of influence, the influencing factors of the judgment basis are assigned in sequence: practical experience 0.5, 0.4, 0.3, theoretical analysis 0.3, 0.2, 0.1, reference 0.1, 0.1, 0.05, intuitive feeling 0.1, 0.1, 0.05^[5]. When Ca is greater than 0.8, it indicates that the judgment basis has a great influence on experts. The experts' familiarity with the project is divided into very familiar, familiar, relatively familiar, generally familiar, not very familiar and unfamiliar, assigned 1, 0.8, 0.6, 0.4, 0.2 and 0 in turn. (3) The concentration of expert opinions is represented by the mean of the index importance score (M_j). (4) The coordination degree of expert opinions is represented by coefficient of variation (CV) and Kendall coordination coefficient (W)^[6]. With reference to relevant literature, $M_j > 3.5$ and $CV < 0.25$ are used as the criteria for inclusion in the index system^[7]. Following the principles of scientificity, comprehensiveness, and feasibility, the project research team makes choices about the indicators fully considers the opinions of experts.

3 Results

3.1 Basic information of experts

A total of 69 experts participated in the

consultation, including 16 males and 53 females, with an average age of 41.88 ± 8.47 years old. Experts were all master's degree or above, with senior professional titles. The average working years was 15.65 ± 9.93 , and 33 experts worked for more than 15 years.

3.2 Positivity and authority of experts

Sixty-nine questionnaires were sent out and all were recovered in the two rounds of consultation. The recovery rate was 100%. Some experts put forward valuable revision opinions and suggestions in the consultation, indicating that the experts have a high positivity for this research. The familiarity coefficient (Cs) for indicators was 0.78 ± 0.22 , and the judging basis coefficient (Ca) was 0.91 ± 0.08 , among which practical experience was 0.47 ± 0.05 , theoretical analysis was 0.27 ± 0.05 , references were 0.09 ± 0.02 , and intuitive perception was 0.08 ± 0.02 . By calculation, the authority coefficient (Cr) was 0.85 ± 0.12 , indicating that the expert evaluation has a high degree of authority, and the result is reliable.

3.3 Construction of pharmacy elective course system

The first round of questionnaires included 24 elective courses, and nine of them did not meet the inclusion criteria. After discussion by the project research team, "Introduction to art", "Calligraphy appreciation" and "Art appreciation" were retained, and other appreciation courses were deleted. Meanwhile, "Japanese" in the public basic course group was deleted. A total of six courses have been deleted. Combining with the expert opinions and suggestions in first round, some courses were supplemented in the second round of consultation. "Introduction to Common Software" was added to the public basic course. "Chinese traditional culture" and "Communication skills" were added to humanities and occupational quality course group. "Epidemiology was added to

basic medical course group. "Drug clinical trials" and "Drug clinical comprehensive evaluation" were added to professional course group. There were still 24 elective courses in the second round

of questionnaires. All courses met the criteria for inclusion in second round. The specific index scores and coefficient of variation of the two rounds of questionnaires were shown in Table 2.

Table 2 Importance score and coefficient of variation of elective courses

Curriculum group	course	First round			Second round			
		M_j	SD	CV	course	M_j	SD	CV
Public basic course	Japanese	2.971	0.816	0.275	Medical literature retrieval	4.449	0.753	0.169
	Medical literature retrieval	4.522	0.628	0.139	Writing research thesis	4.478	0.754	0.168
	Writing research thesis	4.522	0.651	0.144	Introduction to common software	4.246	0.841	0.198
Humanities and occupational quality course	Introduction to art	3.609	0.904	0.251	Introduction to art	3.826	0.884	0.231
	Art appreciation	3.609	0.904	0.251	Calligraphy appreciation	3.623	0.886	0.245
	Drama appreciation	3.188	0.905	0.284	Art appreciation	3.754	0.923	0.246
	Dance appreciation	3.116	0.877	0.281	How to learn effectively	4.174	0.884	0.212
	Opera appreciation	3.101	0.764	0.246	Time management	4.101	0.854	0.208
	Film and television appreciation	3.551	0.941	0.265	College students' innovation Basis	4.159	0.878	0.211
	Music appreciation	3.609	0.951	0.264	Sex, gender and health	4.087	0.847	0.207
	Calligraphy appreciation	3.319	0.789	0.238	Logic and critical thinking	4.275	0.740	0.173
	Introduction to college students' innovation and entrepreneurship	4.232	0.745	0.176	Introduction to college students' innovation and entrepreneurship	4.101	0.919	0.224
	How to learn effectively	4.188	0.873	0.208	Health education	4.145	0.821	0.198
	College students' innovation Basis	4.290	0.683	0.159	History of science	4.029	0.816	0.203
	Time management	4.261	0.792	0.186	Chinese traditional culture	4.174	0.741	0.178
	Logic and critical thinking	4.072	0.729	0.179	Communication skills	4.275	0.814	0.190
	Sex, gender and health	3.942	0.866	0.220				
	Health education	4.188	0.873	0.208				
History of science	4.087	0.812	0.199					
Basic medical course	Emergency and self-rescue and mutual rescue	4.652	0.534	0.115	Emergency and self-rescue and mutual rescue	4.638	0.564	0.122
	Medical psychology	4.565	0.625	0.137	Medical psychology	4.464	0.672	0.151
					Epidemiology	4.232	0.801	0.189
Professional basic course	Medical students study and choose careers	4.072	0.748	0.184	Medical students study and choose careers	4.188	0.821	0.196
	Medical marketing	3.826	0.816	0.213	Medical marketing	3.812	0.921	0.242
	Clinical pharmacotherapy	4.333	0.695	0.160	Clinical pharmacotherapy	4.493	0.694	0.155
					Drug clinical trials	4.275	0.778	0.182
					Clinical comprehensive evaluation of drugs	4.188	0.785	0.187

M_j , the mean of the index importance score; SD, standard deviation; CV, coefficient of variation.

The coordination coefficients for the two rounds of consultation were 0.476 ($P < 0.05$) and 0.152 ($P < 0.05$), respectively, indicating that the expert evaluation opinions were well coordinated and the results are desirable (Table 3). Finally, pharmacy elective course system containing 24 courses was established.

Table 3 Kendall coordination coefficient and chi-square test

Item	First round	Second round
W	0.476	0.152
χ^2	755.639	240.997
df	23	23
P	0.000	0.000

4 Discussion

To integrate the training of pharmacy talents, we should pay attention to the integrity, hierarchy and adaptability of knowledge at the knowledge level, emphasize the extensiveness of thinking, the comprehensiveness of methods and the diversity of abilities at the ability level, and require good ideological and moral, political accomplishment, scientific spirit and professional accomplishment at the quality level. Starting from the integration of pharmacy theory, the undergraduate elective course system of pharmacy was constructed to highlight the characteristics of pharmacy specialty. Based on the holistic integrative pharmacy

theory, Delphi method was used to construct a pharmacy elective course system. Two rounds of questionnaires were performed to demonstrate the indicators of pharmacy elective course system. 69 experts participated in the consultation have rich experience in pharmacy education and related fields. Both rounds of questionnaires were all returned, and some experts put forward many valuable opinions and suggestions, indicating that experts are motivated to participate in the research and have a high degree of reliability.

Finally, 24 pharmacy elective courses were determined. The 24 courses are divided into strong recommendation, medium recommendation and weak recommendation according to the indicator importance scores, as shown in Fig. 2. "Emergency and self-help and mutual rescue", "Medical psychology", "Medical literature retrieval", "Scientific research paper writing", and "Clinical pharmacotherapy" were ranked in the top five, belong to strong recommendation. It is indicated that the education of safety, scientific research ability, and clinical application of drugs are becoming more and more important.

Humanistic quality is the most fundamental and basic quality among many qualities of college students. Starting from top-level design, strengthening humanistic education is an important practice path in the construction of holistic

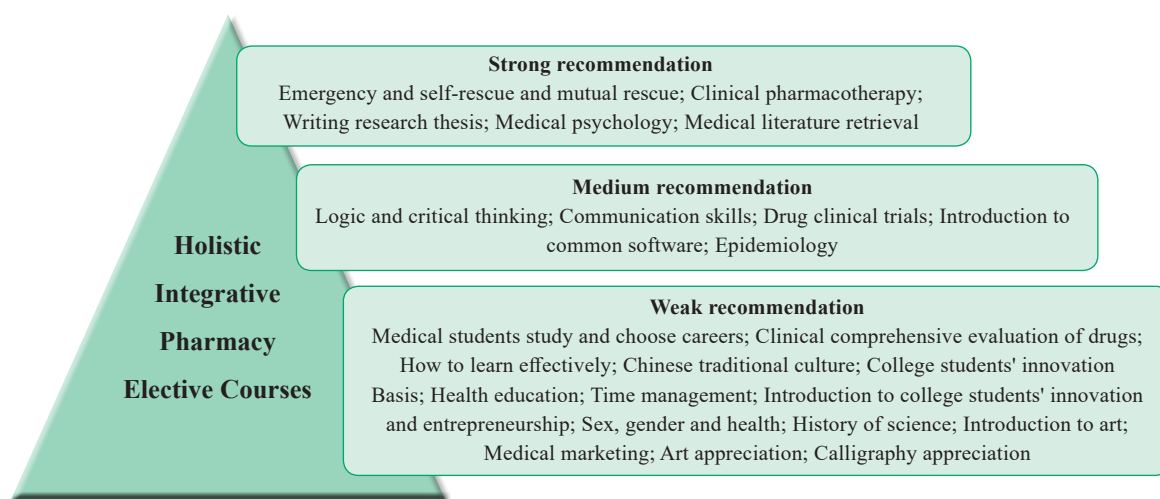


Fig. 2 Recommended grading of holistic integrative pharmacy elective courses

integrative pharmacy talent training system, and also an important guarantee for the formation of pharmacy ethics^[8]. Art education is the main channel of humanistic education. It helps students to understand the connotation of humanistic spirit in practice. We use "Introduction to art" course as a guide, and retain "Art appreciation" and "Calligraphy appreciation" as representatives, appropriately combined courses content such as "Medical aesthetics". At the same time, the cultural environment is constructed by increasing the appreciation of traditional Chinese culture, exploring local classic national characteristics, and carrying out extracurricular cultural and sports activities, thereby enhancing the aesthetic experience and awareness of pharmaceutical students^[9]. With the development of new medical model, the importance of communication ability of medicine students is also increasing. The opening of the course "Communication skills" is the direct way to improve the training gap of communication ability^[10].

Among five major course groups, only professional basic course group not set elective courses. The reason is that professional basic course group mainly covers the chemistry and its experiment courses, which are the basic knowledge and skills of pharmacy students. It is still dominated by compulsory courses without setting elective courses. With the advancement of the reform of pharmacy education, the traditional pharmacy education model based on the chemistry has changed to a great extent. Chemistry theory courses have been reduced, and the proportion of experimental courses has been increased. More emphasis has been placed on the combination of theory and practice, especially on practical learning^[11].

The newly added "Drug clinical trials" and "Drug clinical comprehensive evaluation" are courses for cultivating the comprehensive ability of pharmacists under the holistic integrative pharmacy

concept, which play an important role in hospital pharmacy and transformational pharmacy^[12]. The main development direction of pharmacy in the future focus on the creation of new drugs and pharmaceutical services. The background of drug clinical trials and drug clinical comprehensive evaluation become a new trend in the training of high-level applied pharmacy talents. At present, there are more than 1 000 centers for the quality management of drug clinical trials in China, and new contract research organizations and clinical institution management organizations are also developing rapidly^[13]. However, there is a relative lack of knowledge training for drug clinical research. It is necessary to integrate the content system into the current curriculum system, to understand the role orientation of pharmacists in drug clinical research, and develop corresponding abilities in a targeted way. The clinical comprehensive evaluation of drugs promotes the return of drugs to clinical value, improves the efficiency of the use of limited resources, and provides reference for decision-makers in the health departments^[14]. Through this course, we can have a general understanding of the policy evolution, evaluation dimensions and procedures, evaluation methods and achievement transformation of drug clinical comprehensive evaluation.

In this study, a more scientific and reasonable pharmacy elective course system was established by the Delphi method. However, there are still some limitations: (1) The Delphi method still lacks a unified standard. We can only learn from previous studies, so it is necessary to further formulate relevant research norms. (2) The consulting experts are limited to Harbin Medical University, and lack of opinions and suggestions from other regions. We can further expand the scope of consultation, and learn from other pharmacy schools to optimize the setting of elective courses. (3) Restricted by multiple factors such as class hours and teachers, it is suggested to form a "Pharmacy+X" elective

course system by fully combining with public elective courses of colleges and universities, to enrich the categories of public elective courses. However, strict teaching management and quality control are required to strengthen the guidance of students' selection of courses to avoid blindly selecting courses. (4) At present, the research is still at the level of theoretical research. The teaching method, syllabus, class setting, assessment form and other issues have not been explained in detail, which need to be further enriched and perfected in practice.

5 Conclusion

Holistic integrative pharmacy is still in its infancy in China. Promoting the discipline construction and personnel training is one of the future development strategies of holistic integrative pharmacy^[1,15]. The reform of pharmacy elective courses is a preliminary attempt to holistic integrative pharmacy. The project incorporates the current concepts of interdisciplinary and college students' innovation and entrepreneurship training to build an elective course system. The cultivation of holistic integrative pharmacy talents should be continuously explored and improved in the practice of theoretical exploration, application practice, system establishment, training mode and team building.

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