



## Strategies to design a program for cultivating holistic integrative pharmacy professionals

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**[Abstract]** After reviewing the advancements about "holistic integrative pharmacy" (HIP) and the goal of HIP education, we propose five strategies to design a program for cultivating HIP professionals. The following strategies are believed to offer a reference for domestic and foreign educational community counterparts to explore the suitable cultivation mode for HIP professionals. These strategies entail establishment of a multidisciplinary teaching team, reconstruction of teaching organization structure, design and integration of the curriculum system, construction of textbooks, and the shift of teaching and examination mode.

**[Key words]** Holistic integrative pharmacy(HIP); Cultivation mode; Teaching reform

### 1 Introduction

As medicine has continued to evolve, the medical community has faced challenges in the diagnosis and treatment of diseases resulting

from the over-specialization, over-division, and fragmentation of medical knowledge<sup>[1]</sup>. To overcome these problems, Professor Fan Daiming first proposed the concept of "holistic integrative medicine (HIM) " in 2012, suggesting practitioners to "organically integrate the most advanced knowledge theories in various branches of medicine and the most effective practical experience in clinical specialties, and modify and adjust them to the reality of society, environment and psychology, so as to make it a new medical system that is more suitable for human health and disease treatment"<sup>[2]</sup>. In recent years, under the initiation and guidance of Professor Fan, the concept of HIM has been widely recognized in the medical and educational community<sup>[3]</sup>. With the attention being shifted from the medical field to the inextricably related

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pharmacy field, we will find similar problems. For instance, the major pharmacy is becoming more and more subdivided, pharmacy knowledge is becoming more and more fragmented, and in the process of cultivating pharmacy professionals, the separation between pharmacy and medicine, between traditional Chinese medicine and western medicine, between experiment and clinic, and between research and industrialization has expanded, resulting in difficulties to cultivate highly qualified pharmacy professionals. Therefore, the concept of "holistic integrative pharmacy" (HIP) has also been proposed under the inspiration of the concept of HIM. It was first defined by Guo et al. as a new pharmaceutical theory and practice system more in line with the needs of human health on the basis of integrative medicine with the idea of human-oriented by taking "making good drugs and using drugs rationally" as the core goals, integrating pharmacy with traditional medicine, modern medicine, modern emerging technologies and humanities, combining the methods and knowledge of various related disciplines of pharmacy, breaking through barriers among different disciplines and barriers between basic research and application development<sup>[4]</sup>. Guo et al. also discussed the necessity and prospective of implementing HIP education, believing that it would be the future development direction of pharmaceutical education<sup>[4]</sup>. The goal of HIP education is to cultivate innovative, compound, applied professionals for pharmaceutical and healthcare industries. In recent years, universities in China have begun to explore HIP teaching practices. For example, Hangzhou Normal University established the first HIP College in China in 2017; Guangdong Pharmaceutical University started to implement the teaching reform of HIP program in 2016, and more than 200 students selected from the pharmacy undergraduates from 2016 to 2019 have been admitted to the HIP innovation classes. Although a few colleges and universities have accumulated

some experience through the teaching reform of HIP program, this reform is still in its initial stages with much room for improvement. In view of this, based on the understanding of the implication of HIP and the goal of HIP education, this paper proposes five strategies to design a program for cultivating HIP professionals, attempting to provide a reference for domestic and foreign counterparts in the educational community in terms of exploring a suitable cultivating mode for HIP professionals.

## **2 Design for the HIP education program**

### **2.1 Establishing a multidisciplinary teacher team**

Since HIP requires the organic integration and deepening of knowledge and practice in various fields of pharmacy, a highly qualified multidisciplinary teaching team is an important foundation for cultivating excellent HIP professionals. However, owing to over-division of pharmaceutical disciplines and teachers' limited time and energy, the teachers generally tend to pursue professional knowledge and skills only in their own fields instead of other disciplines. Under this circumstance, it is urgent and important to organize a multidisciplinary teaching team by means of "internal integration and external introduction" to meet the cultivating requirements of HIP students. In terms of internal integration, unified leadership and coordination at the school level is required to integrate teachers originally dispersed in various departments to form a multidisciplinary teacher team, including chemistry, pharmacy, traditional Chinese medicine, basic medicine, clinical medicine, life sciences, information science, and pharmacy administration, etc.. In terms of external introduction, universities should invite or employ experts in different fields (including new drug R&D, drug production, drug applications, and pharmacy administration) from various types

of institutions (e.g. enterprises, universities, research institutions, hospitals, and governments) as part-time or full-time teachers. Establishing a multidisciplinary teaching team via "internal integration and external introduction" will improve its professional knowledge structure and enhance its competency in cultivating the HIP professionals.

## 2.2 Reconstruction of teaching organization structure

As HIP education is a new attempt in reform in the field of pharmaceutical education, the existing teaching organization structure does not meet the requirements of cultivating the HIP professionals. It is necessary to redesign the entire teaching organization using a matrix structure (Fig.1).

The teaching organization structure includes both a vertical and a horizontal system. In the vertical system, because cultivating HIP professionals may require various types of teaching resources distributed in different departments, including teaching teams, teaching platforms, equipment, and practice bases, it is necessary to establish a leading group for coordinating these teaching resources, with vice-principal in charge of teaching or dean as the group leader and the

teaching directors of the relevant secondary departments as the members. This leading group is mainly responsible for the unified allocation of teaching resources. In the horizontal system, as the HIP curriculum intends to break the boundaries among different disciplines and strengthen organic integration, it is necessary to create several teaching work groups based on curriculum units. Each teaching work group consists of several teachers responsible for one course. These teachers may come from the same department or different ones according to the need of integrating the course's contents. They would not only maintain their relationship with the original departments but also work part-time in the work group to perform the specific teaching tasks. Each work group needs to select a group leader and implement the group leader responsibility system. The leader of each work group needs to organize and coordinate the teaching work as follows: selection and establishment of the teaching members responsible for a certain course; design of teaching content; preparation for lessons, giving lectures, examination, and so on. The curriculum teaching work groups would be organized on an ad hoc basis and would be automatically disbanded

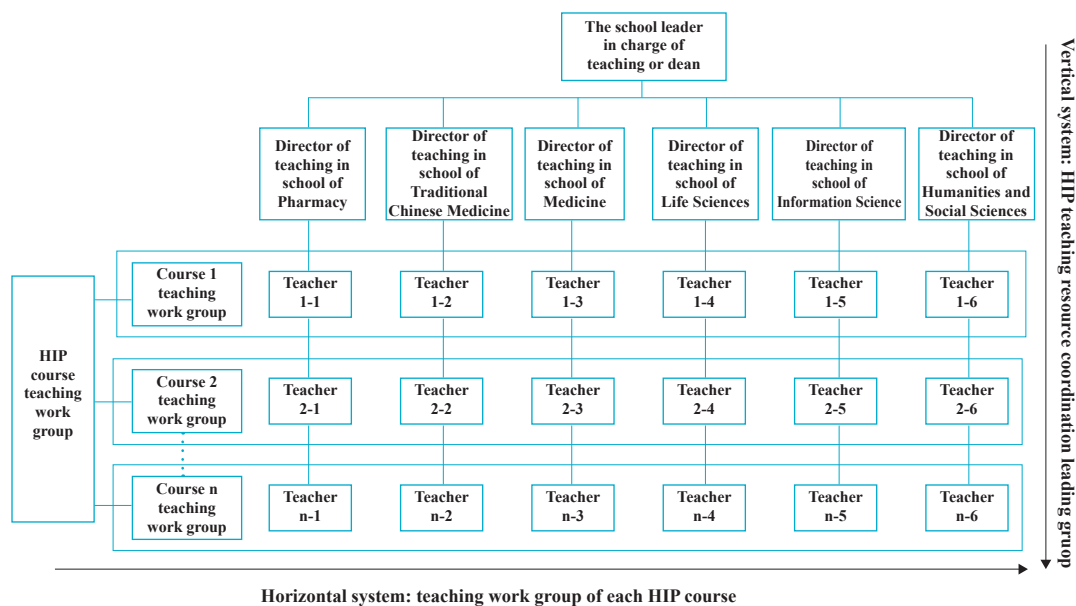


Fig. 1 Teaching organization structure for a HIP education program

upon completion of their course-teaching tasks. When there is a new course-teaching task, the new members of another teaching group will be reorganized according to the teaching contents. Obviously, because the content of different courses may intersect, the same teacher may participate in different course-teaching work groups at the same or different periods. The teaching organization redesigned to a matrix structure will effectively ensure the allocation of teaching resources and the orderly completion of daily teaching tasks for cultivation of HIP professionals.

### **2.3 Design and integration of HIP curriculum system**

Commonly, the traditional pharmacy curricula are a collection of different independent courses that ignore the inherent connection with each other. However, the integrated HIP curriculum system is one that the summation of different disciplines forms a coherent whole and, importantly, the relationships among the different disciplines have been considered carefully and strategically<sup>[5]</sup>. Curriculum integration is important because it can provide students with the capacity to apply their knowledge to a range of complex problems. Therefore, in the process of redesigning the HIP curriculum system, more efforts should be made on deep-seated issues such as cross-disciplinary material, penetration of knowledge, and fusion of disciplines. To achieve this goal, it is necessary to comprehensively comb the intrinsic relationship on correlation and cohesion among the general education courses, the basic courses of the pharmacy specialty, and the specialized courses; break the boundaries among disciplines; demonstrate and formulate the feasibility plan and concrete implementation measures on setup of the HIP curriculum system, including theoretical, experimental, and practical courses; and finally rebuild a new curriculum system for HIP education in theory, experiment, and practice.

Curriculum content integration could be carried out from either the horizontal integration<sup>[6]</sup> or the longitudinal integration plan<sup>[7-8]</sup>. For example, in horizontal integration, the three courses— organic chemistry, medicinal chemistry, and natural medicinal chemistry—have some repetitive theoretical knowledge or knowledge intersections, and the experimental courses are similar in terms of laboratory requirements, equipment, operating skills, etc.. Thus, schools could consider integrating the theoretical knowledge or the experimental contents of these three courses and redesign the corresponding syllabi for theoretical and experimental teachings. In longitudinal integration, some different stages in the longitudinal process of drug R&D and drug use could be integrated. For instance, we could integrate the experimental contents of medicinal chemistry, pharmaceutical analysis and pharmacology and then design a series of comprehensive experiments. Each comprehensive experiment should be designed to span the content and methods of at least two secondary disciplines of pharmacy. Let us take the following comprehensive experiment as an example—students could be asked to design a route to synthesize a new compound, or obtain a new component using extraction and separation techniques, and then select the right pharmaceutical analysis methods to conduct structural identification and content determination, finally establish the appropriate animal models for pharmacological activity and toxicity tests. In short, in the integration of curriculum content, no matter how it is accomplished, the experiment should become a course rather than a patchwork of several courses in form. Generally, the purpose of curriculum content integration is to achieve interdisciplinary content integration, to change the traditional subject-centered teaching methods, to reduce the duplication and fragmentation of knowledge, to help students in establishing a holistic and systematic view on drug R&D and clinical use, and

to enhance the abilities to flexibly use knowledge to solve practical problems.

## 2.4 Construction of textbooks

Textbooks form a core part of the curriculum resources and the medium of teaching activities. To some extent, the quality of a textbook is directly related to the teaching quality. Therefore, the textbook development is a key component of teaching reform for HIP. Presently, the curriculum textbooks for the pharmacy specialty in China are based on a certain specialized field; they are lack of interdisciplinary connections, and no series of textbooks specializing in the HIP curriculum are available on the market.

There are two solutions for improving the textbook content. First to organize relevant experts and scholars at home and abroad to compile the HIP textbooks. National education authorities or association organizations for instance, the China Holistic Integrative Pharmacy Alliance should actively promote the establishment of a National Holistic Integrative Pharmacy Textbook Compilation Committee and organize experts to compile a series of textbooks for HIP curricula as soon as possible. The content should feature characteristics of "integration" to the maximum extent. In this regard, we could draw lessons from the compilation methods of the series of textbooks for medical integration curriculum published by Elsevier Corporation, a world famous medical publishing group. While maintaining the integrity of the subject's knowledge system, numerous "integration frames" are inserted in the textbooks. These "integration frames" which use concise and informative language, appear in the textbooks where readers need to link to the relevant knowledge of other disciplines. This is not only convenient for students but also reflects the idea of integration of different disciplines. Another solution is to directly introduce and use some published textbooks, particularly for the integrated

medicine curriculum, from the foreign market as a supplement. Currently, Elsevier has published a series of "integrated" medicine textbooks, including Integrated Physiology, Integrated Pathology, Integrated Pharmacology, and Integrated Biochemistry. These textbooks could be introduced into the classroom directly after experts' review and discussion.

## 2.5 The shift of teaching and examination mode

In the teaching preparation session, teachers from different professional fields, such as chemistry, pharmacy, traditional Chinese medicine, general medicine, clinical medicine, biology, information science, and pharmacy administration, could be organized by the school's leading group. Taking the teaching contents of each course as a unit, let the teachers from the same teaching work group prepare lessons together, focusing on what and how many hours to teach in each course, how to organically connect the contents, and finally prepare the syllabus, teaching plans, and teaching materials.

In the teaching implementation session, the lessons should not be confined to the classroom and each lecture should not be limited to only one teacher. Instead, according to the needs of the teaching content, the teaching place can be arranged in hospital wards or pharmacies, pharmaceutical factories, drug R&D labs, and so on, which contain the scenes of drug R&D, production, and use, so that students can study in the real world of knowledge exploration and application. The number of teachers per lecture can also depend on the number of subjects involved, and several teachers with corresponding professional backgrounds can be assigned to teach jointly in each lecture.

In the examination session, the students' performance should be assessed by taking the examinations of each integrated course, and the



members of each teaching work group should determine the form and content of the examination together. Examination forms should be diversified, such as theoretical written examination, experimental operation, comprehensive experimental design, and essay writing. As for the examination content and assessment model of each integrated course, the practices of some scholars could be used for reference<sup>[9-10]</sup>, regardless of the form of examination. Furthermore, in order to combine the knowledge points of different subjects to form the examination content, the teaching work group should emphasize the connection and comprehensive application of the knowledge that comes from different subjects.

### 3 Conclusion

As mentioned above, owing to the over-division of the current pharmacy specialty and the fragmentation of pharmacy knowledge, it has become increasingly difficult for traditional pharmaceutical education to cultivate outstanding pharmacy professionals who can deeply understand and comprehensively apply the acquired knowledge to solve practical problems. In this realistic context, it is extremely necessary to carry out HIP education. However, globally, HIP education is a new attempt at educational reform because the traditional program for training pharmacy professionals may no longer be able to adapt to the requirements for cultivating HIP professionals. It must be noted that the design of the program in this paper is based on an ideal presumptive set of circumstances and is yet to take into account the constraints of realistic teaching conditions. Thus, the accomplishment of the above-proposed strategies in the realistic teaching practice would depend on the joint efforts

of all persons concerned. This undertaking is hard to accomplish. However, we believe that as long as the goal is set and practitioners move firmly toward the established goal, it is possible to overcome all kinds of difficulties and finally achieve the success of HIP education reform.

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