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Innovation on Student Training Mode of Medical Information Engineering Combined with Curriculum Ideological and Political Education

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Abstract

As an interdisciplinary major that integrates medicine and engineering, medical information engineering has drawbacks such as vague objective, insufficient teaching team and teaching materials. Curriculum ideological and political education is an important way to realize the " Three All-round Education". Combining curriculum ideological and political education into the student training mode of medical information engineering, and keeping up with the state-of-the-art technology developments, this study focuses on aspects including teaching material construction, training process and others. It will help improve the capability of graduates, and promote the development of medical informatics.

Keywords

Medical Information Engineering; Curriculum Ideological and Political Education; Training Mode.

1. Introduction

With the advances in the fields of medical and health informatics, the demand for medical information talents continues to grow in China. In order to cultivate such specialized talents, in 2012, in the newly-added undergraduate teaching catalogue, the Ministry of Education in China officially confirmed the code of medical information engineering as “080711T”, marking that the professional education of medical information engineering has officially entered the higher education system in China. Currently, more than 40 colleges and universities in China have established the major of medical information engineering, and sent many talents in this field to the society.

The major of medical information engineering mainly studies how to use information technology such as software and hardware development, big data and artificial intelligence to realize innovation and breakthroughs in the field of public health and medicine, and to promote the fluent transition from "traditional medicine" to "intelligent medicine". As a new profession that embodies the integration of medicine and information technology, there are still many areas that can be improved. Since the 19th National Congress of the Communist Party of China, focusing on realizing the all-round education for Chinese students, the Ministry of Education launched a comprehensive reform pilot called the "Three All-round Education", aiming to vigorously promote theoretical innovation and practical exploration [1,2]. Curriculum ideological and political is an important means to practice " Three All-round Education". In order to meet the needs of social development and strengthen the innovative ability of the medical information talent team, it is necessary to study the innovative methods of reforming the student training mode of medical information engineering. In this study, we propose a method that combines curriculum ideology and politics education into the student training mode, in order to cultivate talents across the medical and information disciplines with innovative consciousness and innovative capabilities.

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2. Background

In the past 10 years, a lot of students had graduated from the major of medical information engineering in China, establishing careers in hospitals, government bureaus, institutions and the industry. In the same time, some drawbacks were revealed, such as unclear major objective and insufficient innovation ability of students [3]. By studying the education modes of the major of medical information engineering in different colleges and universities, we discovered the following aspects that need to be improved:

1) The major of medical information engineering is interdisciplinary as it spans the two fields of medicine and computer sciences. Currently, many universities offer this major in China, including medical universities and comprehensive universities. In the formulation of training programs and the setting of courses, there exist quite big differences among these universities, and there has not yet been a unified understanding on the core knowledge and abilities that students of this major should have. In other aspects such as the distribution of computer science versus medical knowledge in course setting, major characteristics, and career orientation, it is still unclear and difficult to reach agreements, which have seriously affected the quality of medical information engineering education.

2)Lacking of excellent works and textbooks. The major of medical information engineering has been established in China for less than 10 years, however, it is rich in connotation and extensive extension. Therefore, the construction of teaching materials is not enough, which not only affects the quality of teaching, but also hinders the development of students' innovation awareness and ability. As a result, under the circumstances of the rapid development of medical informatics, current works and textbooks of this major is not sufficient, which needs to be paid attention to and solved.

3)Lacking of interdisciplinary teachers. For the major of medical information engineering, not only textbooks are lacking, qualified teachers are also not enough. Teachers for this major need backgrounds in both medicine and information sciences. Technology teachers need to bear in mind the application of technologies into the field of medicine. As a result, the requirements for teachers are very high, thus the construction of the teacher team is not easy. Besides, it has also to be coordinated with the setting of courses.

4)Students have insufficient knowledge about medical informatics thus lack initiative in learning. As mentioned earlier, this major is interdisciplinary. The professional courses include both informatics courses and medical courses, and the course content and education standards of this major vary greatly among universities. In addition, postgraduate programs in accordance with the major of medical information engineering are lacking and career plans for the students are not clear. Some graduates choose computer science jobs after graduation, which does not reflect the characteristics and advantages of this interdisciplinary major. As a result, students' understanding of the major is unclear and superficial, which may reduce their interest about the major in the learning process.

5)Engineering education is not sufficiently connected with the professional certification system for college students, and the evaluation criterias are not yet clear. The goal of medical information engineering education is to deliver high-quality compound medical information talents to medical-related enterprises and institutions. Therefore, a standard system is needed to identify medical information engineering talents, and the social needs reflected by the standards will in turn to be used to guide the education of talents of the major of medical information engineering.

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3. Methods

Innovating the training mode for medical information engineering students can be carried out from the aspects of training plan, curriculum construction, education team construction, teaching material construction, and training process.

1)Determining the core competencies that medical information engineering students should possess is the prerequisite for building a reasonable and effective medical information training program. Professional core competence lists a set of core and widely recognized skills, knowledge and ways of thinking necessary to engage in related professional work, which is an important guide for the design of professional curriculum system. In fact, international organizations such as the International Medical Informatics Association (IMIA) and the American Medical Informatics Association (AMIA) both proposed core knowledge and competence recommendations for undergraduates of medical informatics [4,5]. In addition, Canada's Health Informatics Association(Coach) and the Health Information Society of Australia (HISA) have also formulated and updated from time to time a list of core competences in medical informatics that meets their national conditions [6,7]. At present, similar work is still lacking in China. Therefore, it is urgent to determine the core competencies that Chinese medical information engineering students should possess, in order to guide the design of professional training programs, determine the curriculum modules for the cross-fields of the major, and provide guidance for various colleges and universities that provide the major. On top of core knowledge and abilities, each college can establish other courses based on its own characteristics and advantages.

2)To integrate ideological and political education into the whole process of education and teaching including major construction and curriculum construction, we can fully excavate the ideological and political elements in the curriculum, build a comprehensive, rich and mutually supporting curriculum ideological and political system [8,9]. Through the above methods, we can realize the goal of promoting the "Three All-round Education" through curriculum ideological and political education. While strengthening students' professional abilities, it can also cultivate patriotism, raise students' love for their home country, enhance their craftsmanship, as well as promote the coordinated development of education and major construction. In terms of methodologies, it is necessary to fully analyze the different characteristics of the various courses provided by the major, naturally incorporate ideological and political elements into the courses, and integrate the value-guided components into curriculum design and classroom teaching, so as to achieve the integration of ideological and political education with professional academic education. It is also necessary to analyze the psychological characteristics and hobbies of the students, follow the principles of educating and the growth patterns of students, and teach students in accordance with their aptitude and characteristics. We also need to use modern information technology to accelerate the construction of micro-classes, qualified online courses, mixed online and offline courses and other teaching resources, understand the hobbies of students, and carry out teaching in a way that students are willing to accept. In short, through the all-round development of curriculum ideology and politics, students' sense of belonging to the major will be strengthened, and their interests in learning will be enhanced.

3)Attention has to be paid to the construction of interdisciplinary teachers and teaching materials. Firstly, it is necessary to establish high requirements for teacher in terms of their ethics and morality, and to equip teachers with knowledge and conduct that students can respect. We also need to strengthen the awareness of teachers about the importance of ideological and political education in the curriculum and enhance their ability to integrate ideological and political education into the curriculum. Secondly, with regard to the interdisciplinary characteristics of medical information engineering, it is necessary to build a

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team of teachers with intersecting backgrounds, and make full use of collaborative education methods such as school-enterprise cooperation, and actively explore ways to guide students by visiting teachers and corporate mentors. Thirdly, we need to actively edit textbooks in the field of medical information engineering, ingeniously integrate ideological and political elements into the textbooks, and continuously optimize and adjust the content of the textbooks based on the feedbacks in the teaching process.

4)We need to closely trace the development trend of emerging technologies such as artificial intelligence and big data to optimize the curriculum. In recent years, the rise of medical big data and the breakthroughs of artificial intelligence technology have brought medical informatics to a new stage. Various emerging data acquisition methods have led to an explosive growth of medical data, such as genetic information obtained by high-throughput DNA sequencing technology, physiological signals and sign data captured by wearable devices, etc. At the same time, large-scale distributed computing and storage technology also makes it possible to analyze and explore massive medical data. With the support of massive medical data, artificial intelligence applications in fields of precision medicine, medical image analysis, clinical decision support and automatic electronic medical record based on voice input show great potential. However, currently, many training programs for students of medical information engineering have not respond to the new requirements for the students in the era of big data and artificial intelligence. Therefore, it is necessary to further adjust the training programs and optimize the curriculum and course content according to the new requirements for the core competence of talents of medical information engineering in the era of artificial intelligence and big data.

5)It is necessary to integrate the diversified rich resources of universities, hospitals and enterprises, adopt a variety of training ways and means, build a diversified talent training mode with interdisciplinary characteristics, build a trinity comprehensive medical information engineering teaching system on "academic education, science research, practice", and follow the progressive teaching and training goal of "basic ability → basic scientific research ability → practical ability → comprehensive ability". We need to adopt the project-based teaching method and advisor system, pay close attention to the construction of curriculum, scientific research laboratory, school-hospital cooperation platform and school-enterprise cooperation practice base, and encourage students to actively participate in advisor's scientific research projects, various science and technology competitions and practical projects based on their own interests and the development prospect of medical information, so as to greatly improve students' comprehensive ability and employability.

6)We need to establish quality evaluation standards for engineering education, develop an evaluation system to verify the training effect of cultivating medical information engineering students, and evaluate both the teachers and the students. By setting the corresponding scores or weights for each evaluation indicators, we can finally form a quantifiable comprehensive evaluation table. On the one hand, it promotes teachers to improve their own quality and enhance their teaching level. On the other hand, the evaluation system can encourage students to work towards their predetermined goals, so that students' development can remain dynamic and continuous.

4. Conclusion

With the gradual strengthening of the integration between big data and artificial intelligence technology and medicine, the demand for medical information talents is also increasing. Firstly, innovating and improving the training mode of this major will help to further clarify the training objectives of the major, optimize the training plan, and enhance students' sense of major belonging and compliance. Secondly, by setting up course content that is in line with cutting-

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edge technology, and strengthening integration with hospitals, enterprises, etc., students' innovation and entrepreneurship capabilities will be further improved. Finally, the implementation of curriculum ideological and political education not only strengthens students' professional ability, but also cultivates patriotism, cultivates students' home country feelings and craftsmanship, and promotes the coordinated development of education and professional construction.

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