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A Probe into the Reform of the Curriculum System of Higher Education in Information Technology from the Perspective of Informatization

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***Abstract*—The rapid development of the Internet and information technology has hastened the arrival of the era of "artificial intelligence and big data", which has prompted the reform of the curriculum system and teaching content of the teaching of the information science specialty to meet the diversified and differentiated needs of the information environment for the technical capabilities of the information science professionals. This paper analyzes the differences between traditional education and information education, and the characteristics of information education from the perspective of information technology. It expounds the problems existing in the higher education of the information science specialty, and advances some strategies for solving these problems.**

***Index Terms*—Curriculum system, higher education, informatization, information science, reform**

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I. Introduction

The rapid development of the Internet and information technology has hastened the arrival of the era of "artificial intelligence and big data", which has driven the self-innovation of the information science profession. At the same time, it has also proposed new topics for the cultivation of information science professionals in the information intelligent era, which has promoted the reform of the curriculum system and teaching content of the information science profession, so as to adapt to the diversified and differentiated needs of the information environment for the technical capabilities of information science professionals.

II. Characteristics of Education from the Perspective of Informatization

There are the following differences between traditional education and information education. The extensive application of educational technology has promoted the development of educational informatization. Compared with traditional education, informatization education emphasizes that students use information technology to establish the goal of lifelong continuous learning, pay attention to students' learning effects, pay attention to what learners can do after learning, whether their ability has been improved, and whether their skills can be mastered. Informatization education emphasizes that students are the main body and teachers are the leading part. Teachers are the guides, collaborators and consultants of students' learning. They can participate, communicate and help each other equally to realize the humanistic value of knowledge. Informatization education breaks the regional restrictions, emphasizes cross domain and cross-border cross learning, and aims to achieve diversified learning objectives according to different levels of students' knowledge and needs.

The characteristics of information education are as follows. First, the learning style is flexible and autonomous. Informatization education takes the Internet, multimedia technology and network technology as the means to realize distance learning, break through the time and space constraints, and is not subject to occupational and regional restrictions. It provides support for the construction of a lifelong learning system, which is conducive to the formation of a learning society. Second, multi-dimensional directivity. By using modern information technology, learners can realize two-way information exchange and communication in multiple dimensions, such as teachers and teachers, teachers and students, teachers and teaching resources, students and students, students and learning resources, so as to efficiently transmit information in different time and space, and improve the communication efficiency between teachers and students and the learning efficiency of students. Third, interaction. Information technology can stimulate learners' interactivity in learning. It can not only answer questions and solve doubts through teachers, but also communicate with other learners to achieve inquiry based learning, discovery based learning, and active learning, improve learning effects, and truly achieve student-centered curriculum exploration. Fourth, controllability. Information education, like other forms of education, must provide necessary monitoring for teaching. The two-way and interactive features of information technology can timely and accurately monitor students' learning effects, achieve objective evaluation, and provide a reasonable basis for curriculum evaluation.

III. Analysis on the Present Situation and Problems of Higher Education of Information Science

By means of questionnaires, on-site interviews and other research methods, it is found that there are many problems in the current information science major that need to be solved.

1. The design objective of the curriculum system is vague, and the proportion of the curriculum modules is set unreasonably

The essence of the major of information science should aim at surpassing the development of career orientation, cultivate high-quality technical and skilled talents, and carry out curriculum setting on this basis. However, an anonymous questionnaire survey was conducted among students majoring in information science, and the results showed that 71% of them believed that the current practice rate of continuing education courses was low, 23% thought it was appropriate, and 6% thought it was too high. It was found in the interview that 81.2% of the students did not have a clear understanding of the objectives of the courses they learned, and had a low evaluation of some of the courses, believing that it was useless and a waste of time. This shows that the curriculum setting objectives of the science and technology majors are not functional enough, and the proportion of curriculum modules is not set in line with the students' professional development needs. The design of the curriculum system and the setting of the curriculum objectives failed to make accurate and scientific planning and formulation according to the characteristics of the discipline, industry and students' needs. The curriculum system of some colleges and universities is relatively old, which generally stays at the level of traditional information science curriculum. The curriculum system is not perfect, and there are no frontier courses related to big data, artificial intelligence and other disciplines.

2. There are limitations in the course content, which does not really cover "informatization"

Informatization of information science majors is positioned as a "tool concept", which leads to the separation of information teaching of information science majors from the teaching content of other professional courses. The teaching content of this course in most colleges and universities focuses on software operation and application, rarely involves software development and design, students cannot really understand the concept of informatization, and lack the ability to analyze and solve problems arising from software application. Due to the limitation of class hours and the lack of relevant basic curriculum support, the professional changes brought about by the current new technology cannot be reflected in the curriculum content.

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3. The curriculum setting mode is single, and the input of curriculum resources is insufficient

According to the statistics of the questionnaire on the curriculum setting mode, more than 70% of the people believe that the curriculum mode of the information science major is too single and not flexible enough. In addition, students are also less satisfied with offline classroom teaching methods for information science majors. They think that the curriculum teaching methods are too boring, difficult to concentrate, and low interest, which affects their enthusiasm and initiative in learning. Some schools have insufficient investment in curriculum resources due to problems such as fund guarantee and imperfect management system. The experimental and practical training conditions cannot meet the curriculum needs. Affected by the COVID-19, the original practical courses cannot be arranged, which hinders the improvement of learning effect and practical ability, and affects students' evaluation and satisfaction of the overall curriculum system.

4. Unreasonable structure of teachers' knowledge and lack of compound teachers

The teaching staff is an important guarantee for the major of information science. A high-quality and double qualified teaching staff can not only ensure the quality of curriculum teaching, but also promote teachers to use their own technological advantages to serve enterprises and regional economy, and promote the construction of a new education module system for the major of information science. Among the existing teachers in the field of information science, those with engineering background or education experience account for a low proportion of professional teachers, and those who are proficient in computer, big data and other majors are even scarcer. Under the general trend of increasingly blurred professional boundaries and increasingly strengthened professional integration, the existing teacher structure obviously cannot meet the talent training needs of the deep integration of science and technology, which has become a bottleneck restricting the cultivation of science and technology professionals.

5. The educational concept lags behind and the educational orientation is inaccurate

The current professional education of information science mostly follows the traditional talent training mode, specialty setting and curriculum system, and the teaching philosophy and teaching orientation are similar to the old undergraduate education, which is obviously the training goal and orientation of higher education in the information society. Many colleges and universities have stopped the enrollment of information science majors because of their backward teaching concepts and unclear educational positioning, resulting in a single training model. The educational concept and orientation of the information science major fail to highlight the educational goals and characteristic education system. In the process of running a school, the lack of a clear orientation and direction of running a school and the neglect of the original intention of the cultivation of the information science education are far from meeting the social needs for the knowledge structure and skills of the information science professionals.

6. The practice teaching lags behind the social demand for the knowledge structure and skills of the professionals in the information science

Through the questionnaire, it is found that most colleges and universities have problems such as insufficient laboratory construction funds and unreasonable teacher structure. The teaching team lacks practical experience in the context of the Internet and new technologies, and the relevant practical teaching has not been effectively carried out. The school's practical teaching content cannot reflect the latest achievements of corporate social development, which is disconnected from the society's demand for the knowledge structure and skills of ICT professionals.

IV. Reform Strategy of the Curriculum System of the Information Science Major

In order to achieve educational goals, the curriculum system should design learners' learning programs or curriculum planning. The scientific and systematic curriculum system design must reflect the systematicness, dynamics and progressiveness: the curriculum system design is a learning system, which should be based on the students' needs for information science education, run through the students' learning characteristics and learning laws, and ensure the systematicness of the curriculum system; To ensure the dynamic development of the curriculum system, we should take the industry development strategic goal as the guidance, meet the students' career development demands as the goal, and combine the characteristics of the times; We should take the career development and skill upgrading of students majoring in information science education as the path, and design the course difficulty progressively from easy to difficult, so as to ensure the progressiveness of the whole course system. Higher education should constantly think about the integration path of information technology and curriculum system, and generally consider the goal, content, resources and evaluation of curriculum system design.

1. Rely on information modules to reconstruct the curriculum system

With the arrival of the information age, the career development and work practice of the students majoring in information science are also inseparable from information technology. Therefore, based on the survey of the needs of middle school students for information courses and the characteristics of future information technology development, the research team reconstructs the curriculum system of continuing education. The curriculum system of information science majors is divided into four modules from the perspective of informatization: first, the general education curriculum module, which mainly includes the ideological and political courses, thinking innovation and training courses, basic writing courses, etc. stipulated by the state. Second, the professional education curriculum module is also the core module of the information science specialty, including three parts: professional basic courses, post skills courses and professional practice courses. Both the learning of basic theoretical knowledge and the improvement of practical skills meet the students' practical learning needs.

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Third, the application module of information technology meets the requirements of information technology application for current career development, including basic courses such as video editing, web page production, and innovative application of software. Fourth, the ability development course module, where students can freely choose according to their own interests, including interest courses and ability development elective courses, to achieve diversified development of students. All colleges and universities can make a reasonable proportion of courses according to their professional characteristics, industry development needs, expert opinions, etc., and establish a flexible selection mechanism to meet the needs of students who want to increase practical course modules and provide personalized curriculum design for students at different levels. [9] discussed that according to the observations in this paper, an existing mathematical model of banking capital dynamics should be tweaked. First-order ordinary differential equations with a "predator-pray" structure make up the model, and the indicators are competitive. Numerical realisations of the model are required to account for three distinct sets of initial parameter values. It is demonstrated that a wide range of banking capital dynamics can be produced by altering the starting parameters. One of the three options is selected, and the other two are eliminated. The model is generalized taking into account fractional derivatives of the bank indicators for time, reflecting the rate of their change. Based on numerical calculations, it is established that reduction of the order of derivatives from units leads to a delay of banking capital dynamics. It is shown, that the less the order of derivatives from the unit, the more delay of dynamics of indicators. In all analyzed variants indicators at large times reach their equilibrium values.

2. Reorganize the course content and integrate the information concept into the core courses

Reorient the informatization of the information science specialty from the "tool view" to the "environment view", take the informatization background and environment as the basis of the curriculum system of the information science specialty, break the traditional boundaries between courses, and integrate the core courses related to information knowledge and technology. With the help of the digital learning platform, the curriculum learning mode should be set scientifically and reasonably. For example, make full use of online learning platform and software platform, combine students' learning time and learning situation characteristics, promote the reform of course teaching mode, teaching method and assessment method, and focus on students to meet their diversified learning needs. With the help of the digital learning platform, the proportion of online and offline courses in the curriculum system should be reasonably set, and the background data of the platform should be used to reasonably evaluate the learning effect of students, so that students can learn something and promote their professional skills and career development.

3. Strengthen the construction of high-quality teaching materials

The progress of information technology has promoted the reform of information science education, which calls for high-quality teaching materials. Following the development trend of science and technology, we should systematically build the structure and content of teaching materials for the science and technology major in accordance with Internet thinking, fully reflect professionalism and integration, build a series of teaching materials with internal logical links, curriculum standards, teaching cases, reference materials and other teaching resources, and form a leading, innovative, supporting and three-dimensional teaching material system, which is connected with the curriculum system. [10] examined the development and refinement of possible mathematical models for the intellectual system of career guidance. Mathematical modeling of knowledge expression in the career guidance system, Combined method of eliminating uncertainties, Chris-Naylor method in the expert information system of career guidance, Shortliff and Buchanan model in the expert information system of career guidance and DempsterSchafer in the expert information system of career guidance method has been studied. The algorithms of the above methods have been developed. The set of hypotheses in the expert system is the basic structure of the system that determines the set of possible decisions of the expert system. This set, which is crucial in decision-making, should be sufficiently complete to describe all the possible consequences of situations that arise in the subject area. Therefore, it is important to improve the mathematical models of the intellectual system of career guidance.

4. Strengthen teacher training, introduce interdisciplinary talents, and build a scientific and reasonable structure of the teaching staff

Reasonably set the proportion of teachers of computer and other related engineering majors and information science majors, consider introducing teachers of related engineering majors, and give priority to introducing teachers with cross professional education backgrounds such as computer and big data. Colleges and universities that have difficulties in introducing senior talents can adopt their own training methods to improve the professional ability of teachers. They can learn from the innovative training model of professional talents, make full use of the teachers of local high-level engineering colleges and universities, and solve their own shortcomings in the shortage of compound teachers and unreasonable teacher structure. Cooperate with outstanding enterprises in the industry, promote the construction of the Innovation Industry College, integrate school and enterprise education resources and curriculum resources, enrich online education resources, give play to scale advantages, and realize resource sharing. Regularly carry out off the job learning and training, carry out teacher competitions, improve teachers' teaching level, establish a teacher education evaluation mechanism, introduce excellent and double qualified teachers, and constantly improve the quality of curriculum teaching.

5. Clarify the education orientation and seek the development of professional characteristics

At present, the development of the major of information science should be effectively combined with regional economic development, industry development, technology development, etc., so as to define its own enrollment

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orientation and improve its own school running quality. With the enhancement of the goal orientation of colleges and universities to serve the regional economy and society, the major of information science should clarify its unique orientation, and at the same time, combine a series of influencing factors such as the attribute of major setting, industry development and updating, and national policy support to clarify the characteristics of the major, highlight the effectiveness, technicality and practicality, and meet the needs of students' career development. Only accurate education positioning and distinctive school running concept can ensure the sustainable development of education, gradually improve their reputation, and achieve a virtuous circle of education development.

6. Build a multi-level practical teaching system and strengthen the integration of new technology of practical teaching and professional knowledge of information science

Configure experimental training courses according to the changes in the educational environment and practice environment of the information science specialty, and build a multi-level practical teaching system that conforms to the trend of the integration of information science specialty and technology. According to the different teaching objectives and required professional abilities, practical teaching is divided into three levels from low to high, corresponding to the progressive practical teaching contents: single training and traditional comprehensive training train students with basic professional skills; Cross professional platform simulation training to improve students' comprehensive ability; Post practice strengthens students' practical ability. In the second and third level of practical teaching, we should reasonably expand the practice content, strengthen the integration of new technology in practical teaching and professional knowledge of information science, promote the new technology training content represented by information sharing, intelligence, data cloud, etc., so that students can truly "apply what they learn" in their future career.

V. CONCLUSION

This era is an era of information technology. New technologies, new formats and new models emerge in endlessly. While accelerating social change and change, they also promote the self-innovation of the professional education of information science. It is of great significance to rethink the development path of higher education of information science. Curriculum is the core of higher education in the field of information science. Reconstructing the curriculum system can ensure the realization of the teaching objectives of information science. Under the background of deep integration of technology and specialty, only by following the trend, seizing the opportunity of technological development and social change, combining the development strategy of colleges and universities and talent training objectives to reconstruct and continuously optimize the curriculum system, can the knowledge structure and ability quality of talents be adapted to the changes of the times and social needs.

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