Research on Curriculum Construction of Artificial Intelligence Under the Background of New Engineering

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Abstract: Under the background of new engineering, artificial intelligence courses in applied undergraduate colleges and universities face great challenges in course teaching and students' learning effect due to the comprehensive factors such as content, class hours, and students' knowledge structure. In order to improve the level and quality of talent training, this paper explores and practices the problems existing in the teaching of artificial intelligence courses in applied undergraduate colleges from the aspects of curriculum teaching objectives, contents, methods, teacher construction, and experimental teaching, promoting learning through competition and teaching assessment, and insists on taking "applied and innovative" learning training as the center. It is necessary to constantly optimize the ideas and methods of artificial intelligence course construction, and promote the development and innovation of computer education in application-oriented colleges under the background of new engineering.

Keywords: New engineering; Artificial intelligence; Curriculum construction; Innovative talent

1. Introduction

Artificial intelligence is leading the new scientific and technological revolution. The era of artificial intelligence requires a large number of practical talents who can meet the new types of jobs. As the training of talents in the new era, colleges and universities are also facing unprecedented challenges and opportunities [1,2]. Under the background of new engineering, higher education is also changing from high-speed development to high-quality development, and the development road of application-oriented undergraduate colleges is more difficult. Compared with research-oriented universities, application-oriented undergraduate colleges are facing greater challenges in obtaining funds [3]. Attracting and retaining highly qualified faculty can be challenging, especially when competitive research universities offer better pay and research conditions. However, due to the changes and diversity of market demands, applied undergraduate colleges need to keep an eye on and adjust their curriculum to keep pace with reality, adding complexity to the management and operation of applied undergraduate colleges. How to further improve the quality and effect of running schools, meet the

needs of regional economic development, train high-quality talents with application ability, innovation and entrepreneurship ability, ability to adapt to and lead the future, and promote the sustainable development of private colleges and universities is an urgent problem to be solved [4,5].

2. Problems in the teaching of artificial intelligence courses

Artificial intelligence (AI) is a branch of computer science. It mainly studies and develops a complex interdisciplinary technical system that simulates, extends, and expands human intelligence. It includes machine learning, computer vision, expert systems, natural speech processing, semantic web, and game theory [6]. Artificial intelligence has become the hottest word in the current science and technology industry, and the demand for talent in the market is large. In 2019, China's first batch of 35 universities added new undergraduate qualifications for artificial intelligence, and many universities have followed the hot spots to offer artificial intelligence majors and artificial intelligence courses. Artificial intelligence involves a huge knowledge system. The pre-course courses mainly include basic computer knowledge such as signal processing, linear algebra, calculus, and mathematical statistics [7,8]. Due to the high requirements on students' knowledge structure and practical skills, artificial intelligence courses are offered in the computer major as a professional elective course in the early stage of a master's degree.

With the rise of new engineering industries with artificial intelligence as the core, such as big data, cloud computing, and intelligent science, which give birth to the educational transformation of "new engineering majors and new requirements of engineering" in colleges and universities, in order to cultivate new engineering talents, transform and upgrade traditional engineering education, and train talents in future strategic fields, more and more college computer and related majors are set up to meet the requirements of the times. The artificial intelligence course operation major can be a compulsory course or a professional elective course [9,10]. However, students in application-oriented undergraduate colleges often face problems such as insufficient basic knowledge, weak theoretical foundations, and a lack of practical skills. The rapid development of the field of artificial intelligence, the diversification of teaching materials and curriculum settings, and the lack of unified teaching standards resulted in uneven teaching content and quality. The class hours of artificial intelligence courses are limited, with the total class hours of theory and experiment generally ranging from 16 to 48 hours, and students often can only understand the concepts and principles of artificial intelligence at the theoretical level, lacking opportunities for practical operation and application. In addition, the experimental hardware facilities are outdated, the teaching team is not from the subject class, the teaching level is low, and there is a lack of comprehensive curriculum settings. Therefore, as the artificial intelligence curriculum is limited by the characteristics of the course, teaching content, class hours, teachers, experimental facilities, and other hardware and software, the study and teaching of artificial intelligence courses in private independent application-oriented undergraduate colleges are challenging. The course teaching of artificial intelligence is a systematic project, which needs to be deeply explored and continuously reformed to meet the needs of social development for the training of artificial intelligence talents [11,12].

3. The countermeasures of artificial intelligence course teaching in application-oriented undergraduate colleges

Combined with the educational purpose and professional talent training objectives of application-oriented undergraduate colleges, all-round and multi-level training of applied innovative talents with strong engineering practice skills is required. Starting from the actual situation of students, we will explore the construction of

artificial intelligence courses under the background of new engineering in order to improve the teaching quality of artificial intelligence courses from the following aspects: establishing course training goals in line with students' development, reforming traditional course teaching methods, constantly optimizing course teaching contents, strengthening teacher team building, attaching importance to promoting learning through competition, combining learning with competition and improving course assessment methods, enhancing the professional quality of students, and cultivating high-quality application innovative talents who meet the needs of new technology development and have market competitiveness [13].

3.1. Establishing curriculum and teaching objectives in line with students' development

Learning AI courses requires a solid mathematical foundation, programming language algorithm accumulation, etc. It contains complex knowledge system structures such as knowledge representation, search strategy, machine learning and deep learning, genetic algorithms, natural language processing, etc. It has the characteristics of multi-disciplinary crossing, integration, penetration, and strong support, making the learning and teaching of AI courses challenging. As students majoring in computer science and related fields in applied undergraduate colleges, they should understand the general situation, characteristics, main research fields, future development direction, and related ethics of artificial intelligence; master the basic principles, methods, and development trends of artificial intelligence; be familiar with the frontier knowledge and research hotspots of artificial intelligence technology; and be able to carry out practical and effective theoretical and application research closely with the frontier technologies in artificial intelligence. Through experiments, students are guided to exert their learning initiative, inspire their learning interest in artificial intelligence, stimulate their in-depth research in the application field of artificial intelligence, discuss the operation and implementation process of artificial intelligence systems, and be able to skillfully use artificial intelligence methods to solve given problems. They can put forward their own opinions and actively explore and verify their own ideas, so as to better master knowledge and cultivate their ability of knowledge and technological innovation [14].

3.2. Reforming traditional teaching methods

Traditional artificial intelligence course teaching is mainly theoretical teaching, artificial intelligence course is a highly practical course, and teaching should be student-centered, project-guided, carefully conceived, designed, realized, and carried out. Through the real project traction, the knowledge module of the course is deduced. Guided by real projects, the teaching design can not only provide students with hands-on practice opportunities, but also make students more intuitive about how to use knowledge to solve problems, stimulate students' learning interest, and cultivate students' innovative thinking and innovation ability. For example, in the section on deep learning, students need to master the relevant knowledge of convolutional neural networks, which involve image processing and data reading. Age recognition projects about faces can be designed to trigger students to think about how to automatically identify the age of faces.

3.3. Optimizing the course teaching content

Full consideration should be given to the characteristics of students in application-oriented undergraduate colleges, especially the degree of mastery of basic knowledge of pre-requisite courses and the limitation of class hours. According to the development law and the actual situation of students in application-oriented undergraduate colleges, curriculum teaching content suitable for students' study and development should be formulated, so that students learn AI-related knowledge in a relaxed learning atmosphere and stimulate their enthusiasm for learning. Students carry out further study and research on artificial intelligence to prepare in advance and understand the cutting-edge theories, research hotspots, and applications of artificial intelligence,

and take solving the core technical problems in the field of artificial intelligence as its own mission. Through project experiments, questions are set, giving full play to students' learning initiative; students study and discuss the operation and implementation process of artificial intelligence systems, so as to better master knowledge and cultivate their application and innovation ability [15].

3.4. Scientific research promotes teaching and cultivates application-oriented innovative talents

We need to integrate scientific research with talent training and establish a platform for teachers and students to co-create artificial intelligence research projects and results. For students who are interested in AI learning and research, we will actively and correctly guide students and encourage them to participate in teachers' scientific research projects. Teachers guide, supervise, and encourage students to truly participate in scientific research projects and write codes so that students can directly experience the process of completing a program or project, which can not only gain satisfaction and a sense of achievement but also stimulate students' enthusiasm for learning and scientific research. By participating in scientific research projects, students expand the original curriculum system and form an artificial intelligence course that attaches equal importance to application ability, engineering ability, and research ability.

3.5. Strengthening the construction of teachers' teams

Artificial intelligence is a developing discipline, and there is no reference and unified standard in teaching materials and curriculum settings, nor has a unified basic theoretical system been formed. At present, the field of artificial intelligence has not trained professional teachers in its own field, but more researchers, which is very different from the essence of teaching knowledge. The most important thing for course construction is to have a team of professional teachers, which is lacking in the applied undergraduate artificial intelligence courses at present. Strengthening the construction of a professional teacher team is the focus of the course, and the construction of a teacher team is integrated with the training goal of students. It is necessary to cooperate with leading enterprises, introduce enterprise research and development experts, form high-level teacher cooperation between schools and enterprises, and improve teacher project practical skills and innovation ability.

3.6. Promoting learning through competition, promoting competition through learning, and improving students' comprehensive practical skills

Students' practical skills are an important criterion for assessing college students' comprehensive skills. Students' participation in various professional skills competitions is the most direct way to improve their practical skills. We need to encourage and guide students to participate in the Challenge Cup, Blue Bridge Cup, National University Computer Ability Challenge Competition, Baidu Star Program Design Competition, etc. By participating in the competition, students can quickly locate their strengths and weaknesses, discover their shortcomings, and strive to improve. When students participate in the competition, they will actively prepare for better results, and when they encounter difficulties, they will actively seek solutions, thus enhancing their learning initiative. In the competition, students get the chance to know some like-minded friends, help each other, compete with each other, broaden their vision, and enhance the sense of unity and cooperation.

3.7. Promoting interdisciplinary integration of artificial intelligence

Teachers and students are encouraged to carry out interdisciplinary AI research projects and promote exchanges and cooperation in different subject areas. For example, cross-disciplinary seminars, research teams, and project cooperation will be organized to promote the application and development of AI in multiple subject areas. In

the teaching process, interdisciplinary AI education courses are designed so that students can comprehensively apply knowledge from different subject areas to solve practical problems. These disciplines include the basic theories of artificial intelligence, computer science, mathematics, statistics, psychology, economics, etc. Through academic conferences, forums, research centers, or online community interdisciplinary exchange platforms, exchanges and cooperation between experts, scholars, and students in different subject fields will be facilitated to promote the interdisciplinary integration of AI and other disciplines and improve the quality of AI research and education.

3.8. Improving curriculum assessment methods

The assessment of traditional artificial intelligence courses is often a combination of final written tests and regular attendance, while the artificial intelligence course is a course that cultivates students' practical skills and comprehensive ability and broadens students' vision. Focusing on written examination makes it difficult to fundamentally stimulate students' interest in learning and fails to achieve the expected training goals. We need to formulate a set of scientific course assessment methods, transfer the focus of assessment to the learning process, and penetrate each teaching link, such as attendance, discussion, experiment, experiment report, homework, and class performance. Students will apply for and participate in various projects and competitions in related fields, or solve practical problems in the field of artificial intelligence, comprehensively consider the performance of students in the process, according to the participation time, importance, and contribution of the appropriate score, as a part of the final grade. In the whole learning process, it is imperative to follow the concept of student-centered and continuous improvement of the assessment process, respect and refer to the feedback of corporate mentors and students.

4. Summary

The artificial intelligence course is a developing course. In the whole teaching process, according to the characteristics and teaching objectives of the course, continuous exploration, research, and improvement have been made to find out the teachers, teaching methods, teaching contents, and course assessment methods suitable for the development of students in our school under the background of new engineering. With the artificial intelligence curriculum as the internal thrust, we aim to cultivate high-quality applied and innovative artificial intelligence talents who meet the development requirements of new technologies, have the practical skills and innovation ability, and are competitive in the market.

Disclosure statement

The authors declare no conflict of interest.

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