Innovative Research on the Curriculum Teaching Mode of Artificial Intelligence Practice Classes Based on the New Engineering Background

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Abstract: New engineering is a strategic action to cope with industrial change and technological revolution, and it is the new direction of engineering education reform in the new era. Aiming at the status quo of the teaching system construction of artificial intelligence practice courses in software engineering majors, we analyze the problems existing in the current teaching process of practice courses, put forward the reform plan for the teaching of artificial intelligence practice courses, and explore the feasible ways to improve the teaching quality of practice courses under the background of new engineering disciplines. This program proposes a series of effective measures to improve the engineering practice ability and innovation ability of college students, and lay a good foundation for students to go to work.

Keywords: Artificial Intelligence, Practice Classes, Curriculum Teaching, New engineering, teaching system

1. Introduction

Against the background of the rapid development of new technologies, new business forms, new industries, new modes and other new economies, China's engineering education is in urgent need of cultivating diversified and innovative scientific and technological talents, and the study of new engineering disciplines is increasingly becoming the mainstream of engineering education innovation and reform. In his speech at the National Conference on Ideological and Political Work in Colleges and Universities, general secretary pointed out, "our demand for higher education is more urgent than ever, and our desire for scientific knowledge and outstanding talents is stronger than ever." In June 2016, China joined the Washington Accord, an international accreditation organization for engineering education. In 2017, the Ministry of Education called for new engineering research and practice, from the "Fudan Consensus" to the "Investec Initiative", the "Beijing Guidelines", and the "New Engineering research and practice". Beijing Guide", new engineering construction, the rise and fall of the people of Zhejiang is in a good situation, to determine the direction, principles and priorities of the new engineering construction. In the same year, the Ministry of Education issued the "Ministry of Education, Ministry of Higher Education, on the development of new engineering research and practice", the cultivation of engineering ability talents put forward higher requirements [1-3].

Since 2017, the Ministry of Education has been actively promoting the construction of new engineering disciplines, actively exploring China's engineering education model and experience, and promoting the construction of a strong higher education country. The connotation of the new engineering discipline is to cultivate excellent engineering talents under the leadership of moral education, and the core is to improve the ability to cultivate talents. artificial intelligence is a new technological science, research and development of theories, methods, technologies and application systems to simulate, extend and expand human intelligence, in the context of the new engineering discipline, the new standard of talent training for the construction of the new engineering discipline puts forward higher requirements. In 2019, the Ministry of Education, the Ministry of Higher Education organized the construction of the knowledge system and resources of the core curriculum in the field of artificial intelligence. At present,

the construction of the artificial intelligence talent training system and the construction of high-quality theoretical and experimental course resources for the direction of artificial intelligence have become an urgent need for the training of artificial intelligence talents [4-7]. In 2018, Changchun University of Science and Technology established the first artificial intelligence college of Jilin Province. This will set a good standard for students to follow in the workplace. This will provide a good foundation for students to go to the workplace.

2. The current situation of the teaching system of the artificial intelligence practice classroom course

The construction of the teaching system of artificial intelligence practice courses in China's colleges and universities is still in the primary stage, featuring a short open time, weak systematization, imperfect construction of practice platforms, poor combination of theory and practice, and poor connection between the teaching content and the industry's needs. In addition, in terms of the teaching mode of practical courses, the traditional combination of teacher classroom lectures and designed experimental assignments are still used to complete the training of basic skills, such as the core idea and the main technology related to AI participation in the course by setting up the corresponding experimental assignments. This kind of curriculum system and teaching mode is difficult to adapt to the current new engineering and artificial intelligence era of enterprise employers on the demand for artificial intelligence professionals.

Artificial Intelligence, as a key specialty in the construction of "New Engineering" in colleges and universities, plays an important and fundamental role in cultivating innovative talents with high scientific literacy and strong innovation and entrepreneurial ability. As the main basic course for information and computing science majors and applied mathematics majors in colleges and universities and the public course for some science and engineering majors, AI course mainly describes how to use computers to simulate the human brain to engage in human intelligence activities such as perception, reasoning, learning, thinking, planning, and so on, to solve the problems that need to be solved by human intelligence, in order to extend the people's intelligence, which is of wide practical application value, and reflects the relationship between mathematical principles and practical problems, as well as the importance of the human brain and the human brain. For example, the drone has not yet solved the problem of intelligent autonomous control, the most important distribution development exists dynamic multi-objective optimization problem, so the drone's next industrialization, the whole region development and application, must rely on the progress of artificial intelligence technology. The purpose of the establishment of the artificial intelligence course is to systematically and comprehensively teach the knowledge points and knowledge structure of the entire artificial intelligence discipline, which is characterized by multidisciplinary crossover. Whether it is the social development of artificial intelligence talents, or the "new engineering" construction of the focus on the field of artificial intelligence, are prompting the university education of artificial intelligence to think about how to play an effective role. In view of the artificial intelligence courses can cultivate suitable talents for the development of modern industry, many schools have set up artificial intelligence practice courses, formulated artificial intelligence personnel training program, adhere to the principle of education first, guided by the demand, cultivate new era of artificial intelligence talents, and many colleges and universities have cultivated special talents to meet the needs of modernized talents in education.

3. Issues in the Teaching Model of Artificial Intelligence Practice Classes

3.1 Practical classroom assignments are not innovative

At present, the teaching mode of AI practical courses is mainly designed and taught by the lecturers themselves for the knowledge points of the courses, and the practical assignments are aimed at the core ideas and main technologies to cultivate students' practical ability. This teaching mode and teaching content are relatively traditional and simple, often deviating from the actual needs of enterprises and organizations, and lacking in real application scenarios, resulting in students being unable to understand how to apply what they have learned to solve complex engineering problems in the real world.

3.2 Holistic approach to guidance and evaluation

The existing teaching of AI practice courses is mainly under the guidance of campus teachers, and

students submit the codes and files of their assignments and the results of their argumentation at the end of the course, which leads to a certain extent to a disconnect between students' practical ability and the needs of enterprises, and it is difficult for students to integrate into enterprises to carry out their work after graduation, so it is difficult to effectively realize the the purpose of practical teaching. Therefore, if the guidance and evaluation methods are too simple in the whole process, it is difficult to realize the purpose of practical teaching effectively.

3.3 Outdated experimental methods and hardware and software environments

Most AI practical courses have outdated lab methods, each with different hardware and software environments, leading to problems such as the inability to standardize evaluation criteria. In addition, practical assignments related to AI involve big data and technologies related to deep learning, as well as hardware and software configuration requirements (e.g., memory capacity, hard disk capacity, graphics card level, etc.). Because the actual environment is relatively high, and the lagging hardware and software environment will directly lead to the failure of finalizing the assignment.

4. Teaching Reform Program for Artificial Intelligence Practice Classes

4.1 Incorporate cutting-edge programs and explore new ways to mutually promote teaching and scientific research

Through research, it is found that the current artificial intelligence practice courses of famous foreign computer technology and software engineering universities (such as Cambridge University, University of California at Berkeley, Massachusetts Institute of Technology, Stanford University, UIUC, etc.). The traditional design-oriented experimental work-oriented teaching organization is basically abandoned in favor of a cutting-edge project-oriented one. The specific teaching process is shown in Figure 1, where the lecturer provides some cutting-edge hot projects of academic and industry concerns after the course completes the teaching of the basics, and the students spontaneously choose the theme of the team to participate in a specific project, and each team cooperates to complete the work of status quo research, problem formalization, development of the technical route, project design, and implementation of the project, etc., and at the end of the course for the project's defense results are shown.
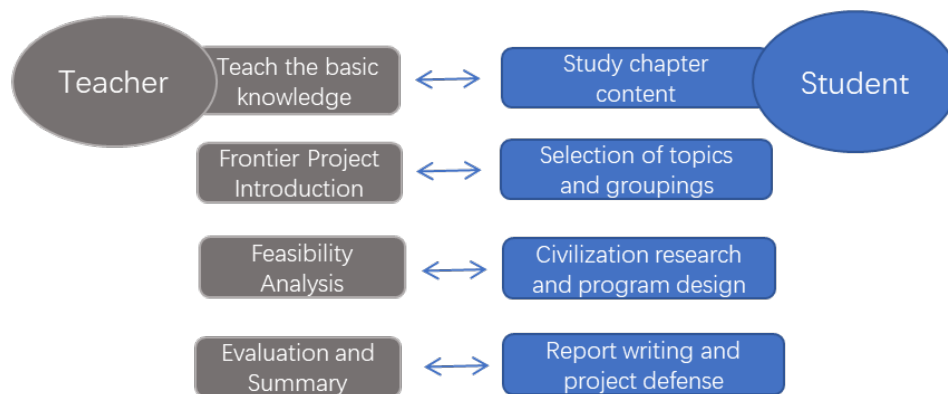

Figure 1: Specific teaching and learning process

If students are able to complete such cutting-edge projects in their entirety, they can often be further summarized and upgraded into scientific research papers as well. Through this kind of training and simulated real-world development that focuses on the standardized project development process in enterprises, students' comprehensive practical skills, innovation and teamwork can be practically improved. In addition, teachers can explain their own research fields and ongoing research projects to students in class and guide interested students to participate in them, thus helping teachers to promote their own research projects as well as the landing and application of research results, thus truly realizing the mutual promotion of teaching and research.

4.2 Optimize case teaching and explore the joint construction mechanism of school and enterprise combined courses

If the practical courses are designed around only one specialized theoretical course, it is difficult to

form a coherent integration between different courses, theoretical courses and practical courses. In view of this, 2~3 professional theory courses per semester, no longer individually designed experiments, by the lecturing faculty and enterprise engineers to set up a course team, the theoretical faculty to jointly discuss to determine the core knowledge of each course, enterprise engineers to design different types of themes and project cases for this knowledge, the formation of a number of professional courses and the theoretical lectures synchronized through the entire semester of the integrated practice courses, to realize the "Learning to Use". This course is synchronized with theory lectures of several professional courses throughout the semester to achieve "learning is useful". For example, the School of Software at Beijing Jiaotong University, based on its cooperation with Baidu in talent cultivation and curriculum construction, invites AI experts to form a diversified university-company cooperative course team to meet the needs of different practical courses.

The case design of the practical courses is oriented to practical application scenarios, including thematic cases that strengthen professional knowledge points and comprehensive project cases that cross-fertilize knowledge points of multiple courses. Case content according to the development of the industry and the actual needs of dynamic updating and continuous improvement, always maintain the practicality and advanced case, to achieve "do learning, do learning".

4.3 Highlight the practical nature of engineering and create a high-performance teaching and research practice environment

Students use personal laptops to complete practical assignments, often due to different hardware and software environments, resulting in more time and effort spent on building practical environments, especially after the introduction of cutting-edge projects, some of which will involve technologies such as big data, deep learning, etc., which require more hardware and software environments, and it is usually difficult for personal laptops to meet these needs, so it is very important to build a high-performance,. Therefore, building a high-performance teaching practice platform is essential to ensure the efficient operation of the practice program. The practice courses can build a basic practice platform based on the commonality of different courses, such as Java server Python server, etc., and personalize the configuration of high-performance servers according to the practice content and requirements of the courses themselves. For example, for the data storage and computation needs of the practical courses, you can use distributed architectures such as Hadoop, HDFS, etc., to configure the high-performance server clusters required for teaching experiments; for the data analysis and mining needs of the practical courses, you can set up experimental environments such as MATLAB, SPSS, R and so on.

It is worth noting that, in addition to the above basic practice environment and data storage and analysis practice requirements, most AI practice classes have high requirements for deep learning-related technology practices, in addition to AI storage and analysis practice requirements. Under the current wave of localization, Baidu Flying Paddle, as China's first open-source and open, technologically leading, full-featured, industrial-grade deep learning platform, integrates deep learning core training and inference frameworks, basic model libraries, end-to-end development toolkits, and a rich set of tools and components, which can adequately satisfy the needs of AI practice classes, and therefore we will use Baidu Flying Paddle as the main practice for AI practice classes Support Platform. Therefore, we will use Baidu Flying Paddle as the main practice support platform for the AI practice course to help students fulfill the practice requirements of the course.

In addition, the hands-on teaching platform provides a supportive high-performance server manual, as well as a project development and deployment guidebook to support students in carrying out relevant projects in practice.

4.4 Updating the concept of practical teaching

The construction of new engineering disciplines focuses on the cross-fertilization of disciplines, and at the same time puts forward new requirements for engineering education and students' comprehensive quality and ability, which requires teachers to strengthen self-study, constantly enrich the comprehensive quality, study new ideas, actively establish professional practice teaching system in the context of new engineering disciplines, and change the traditional assessment mode.

Taking the introductory course of artificial intelligence as an example, through the study of this course, students should master the basic concepts and methods of artificial intelligence, understand the cutting-edge technologies and problems in the field of artificial intelligence, and master how to use computers to realize system modeling, reasoning, big data mining and analysis, and machine learning. , with a

certain degree of ability to program and use artificial intelligence algorithms, and master the social application and development direction of artificial intelligence technology, so the practical teaching concept of this course should focus on ability training and strengthening practice, constantly stimulate students' interest in learning artificial intelligence, and be able to apply this knowledge to the process of engineering problem analysis, modeling and technology development. Therefore, the practical teaching concept of this course should focus on ability training and strengthening practice, constantly stimulate college students' interest in learning artificial intelligence, applying this knowledge in engineering problem analysis, modeling and technology development process, and cultivate students' ability of knowledge innovation, technology innovation and theory transformation and application.

4.5 Improvement of practical teaching methods

In order to cultivate applied talents in engineering majors, the core link is experimental teaching, and artificial intelligence experimental teaching cannot be separated from the modern and efficient laboratory. Teaching methods play a very important role in the teaching process in the new engineering background, the cultivation of applied undergraduate talents, and it is necessary to solve the pain points in the traditional experimental practice teaching mode, to explore the practice of establishing new methods and new approaches, and to actively take advantage of new methods such as virtual simulation experiments and cloud experimental teaching. The implementation of new teaching methods and approaches needs to be based on the professional competence of professional teachers, so we also need to seriously explore new strategies to improve the professional competence of professional teachers to cope with the new context. Teachers should explore new modes of experimental and practical teaching, which is an important guarantee to realize new goals under the vision of "Artificial Intelligence + New Engineering". In addition, teachers should pay more attention to the market, understand the new needs of the market for the quality of college graduates, understand the new requirements and new forms of AI laboratory teaching, update and adjust the previous teaching mode and teaching methods, and formulate practical countermeasures. At the same time, teachers should summarize the content and effect of experimental teaching, improve feasible experimental teaching strategies and teaching modes, and effectively improve the level and quality of experimental teaching. Teachers can combine theoretical teaching with practical teaching and teach some theoretical knowledge points through examples. Rich teaching methods are used in practical teaching, such as teachers use case-driven, group discussion, reverse classroom and so on. to explain their theoretical and practical knowledge for students.

5. Conclusion

The new project is a direction of engineering education reform proposed in accordance with the new requirements of higher education institutions to cultivate human character and the new needs of national strategic development, and is an exploration and attempt to reform higher education in the new era. In order to make the university's AI program special and of high quality, it needs to be customized according to the characteristics of its own program, student foundation, faculty strength and teaching resources. It is believed that under the guidance of the current new engineering concepts, the teaching reform of AI practice courses can better achieve the goals of professional training and cultivate professional research and technical talents in this subject area.

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