

# Study on the Teaching Model of Artificial Intelligence Principles Course Based on Discipline Integration and Industry-Education Integration

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**Abstract:** Artificial intelligence is one of the most promising and influential fields of science and technology in the current era. How to cultivate high-quality talents with artificial intelligence literacy and ability is an important issue faced by the education sector. This paper designs a teaching model of artificial intelligence principles course based on discipline integration and industry-education integration, and introduces the specific content of this teaching model from two aspects: theoretical teaching and practical teaching. The teaching practice effect is evaluated and feedback is given. The results show that this teaching model helps to improve students' understanding, interest, practice and innovation of artificial intelligence. This paper has certain reference value and enlightenment for promoting the development and reform of artificial intelligence education.

**Keywords:** Artificial intelligence, Teaching model, Discipline integration, Industry-education integration.

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## 1. Introduction

At present, artificial intelligence has become the core force driving the new round of scientific and technological revolution and industrial transformation, and has been widely applied in various fields such as medical, financial, manufacturing, transportation, agriculture, etc., changing the way of human production and life, and improving the efficiency and quality of society. The development status of artificial intelligence in China is also very eye-catching. In July 2017, the State Council issued the "New Generation Artificial Intelligence Development Plan" [1], which proposed a "two-step" strategic goal, that is, by 2020, the overall technology and application of artificial intelligence will be synchronized with the world's advanced level; by 2030, the theory, technology and application of artificial intelligence will reach the world's leading level, and become one of the world's major artificial intelligence innovation centers. China has achieved a number of original achievements in the basic theory and key technologies of artificial intelligence, has significant advantages in the industrialization of artificial intelligence, and also shows an active trend in innovation and entrepreneurship in artificial intelligence. However, China also faces many challenges in the field of artificial intelligence, such as insufficient basic research, core technology being controlled by others, lack of high-end talents, etc.

Cultivating high-quality artificial intelligence talents is the key to achieving China's artificial intelligence development goals. In 2018, the Ministry of Education formulated the "Higher Education Artificial Intelligence Innovation Action Plan" [2], supporting higher education institutions to improve the talent cultivation system in the field of artificial intelligence, and promoting the construction of first-level disciplines in the field of artificial intelligence. As the main battlefield for talent cultivation, universities need to constantly reform and improve the setting and teaching methods of artificial intelligence related courses. As one of the basic courses for cultivating students majoring in artificial intelligence or related majors, "Artificial Intelligence

Principles" course is an important course that introduces the core ideas, basic theories, basic methods and some applications of artificial intelligence. This course needs to integrate with other disciplines and industries to meet the needs of social development and national strategy, but there are some problems such as outdated content, single method, insufficient evaluation, etc. Therefore, this paper aims to construct a teaching model of artificial intelligence principles course based on discipline integration and industry-education integration concepts, in order to improve the quality and effect of the course, and promote students' knowledge mastery, skill application and hands-on practice ability. The proposed teaching model will provide a new idea and reference for universities to offer artificial intelligence related courses to adapt to the development of the times and social needs.

## 2. Current Situation of Course Teaching

Artificial intelligence is a comprehensive and interdisciplinary field that covers multiple disciplines. Artificial intelligence principles course is an important core course that introduces the core ideas, basic theories, basic methods and some applications of artificial intelligence. It is one of the basic courses for cultivating students majoring in artificial intelligence or related majors. However, there are some common problems in the teaching of this course at present:

- (1) The teaching content is outdated. Because artificial intelligence involves various theories and technologies, universities tend to focus on basic theories and common technologies in course setting, neglecting the cross-integration of artificial intelligence with other disciplines, resulting in the disconnection between course content and the needs of the times, and failing to reflect the latest developments and trends of artificial intelligence. In addition, some textbooks are too biased towards theoretical knowledge, lacking the introduction of practical application cases, which makes it difficult to stimulate students' interest and motivation in learning.
- (2) The practical link is weak. Because artificial

intelligence involves various application scenarios and demands, universities often lack cooperation with enterprises or society in the practical link, resulting in the disconnection between practical content and actual problems, which makes it difficult to cultivate students' application ability and professional quality [3]. In addition, some universities lack specialized laboratories or platforms, which makes it difficult to provide students with enough experimental equipment or data resources, limiting their practical level.

(3) The teaching evaluation is insufficient. Because artificial intelligence principles course involves the comprehensive application of various knowledge and skills, a single exam or assignment can hardly evaluate the learning effect of students comprehensively. And unreasonable evaluation standards and methods can also hardly give students timely and effective feedback and guidance.

These problems limit the teaching effect and quality of artificial intelligence principles course, and also affect students' cognition and interest in artificial intelligence field. This paper will construct a teaching model for artificial intelligence principles course from two aspects: discipline integration and industry-education integration. Through reforming the theoretical teaching design, practical teaching design, teaching methods and evaluation mechanisms, this paper aims to cultivate more suitable for social development and national strategic needs of artificial intelligence professionals in China.

### **3. Teaching Model Based on Discipline Integration and Industry-Education Integration**

Discipline integration refers to introducing knowledge from other disciplines related to artificial intelligence in the course, such as mathematics, computer science, cognitive science, neuroscience, etc., in order to broaden students' knowledge horizon, enhance their interdisciplinary thinking and innovation ability; industry-education integration refers to combining industry needs and practical application scenarios in the course, in the form of cases, projects, experiments, etc., to improve students' practical skills and problem-solving ability. Based on theoretical analysis, this paper designs a teaching system of artificial intelligence principles course based on discipline integration and industry-education integration concepts, aiming to provide a new idea and reference for universities to offer artificial intelligence related courses.

#### **3.1. Theoretical Teaching Based on Discipline Integration**

Artificial intelligence principles course is a comprehensive course that involves multiple disciplines. It not only requires mastering the basic knowledge of computer science, mathematics, logic, etc., but also needs to cross-integrate with psychology, linguistics, philosophy and other humanities and social sciences, as well as widely connect with engineering, medicine, manufacturing, transportation and other application fields, showing the diversity and innovation of artificial intelligence. In theoretical teaching, discipline integration needs to be realized from the following aspects:

(1) Discipline integration of course content. When teaching the basic concepts, methods and techniques of artificial intelligence, not only the foundation of mathematics and computer science should be introduced, but also the

application and inspiration of artificial intelligence in other disciplines should be combined, so as to let students understand the diversity and cross-border nature of artificial intelligence, and stimulate their interest and curiosity. Specifically, discipline integration can be carried out in the following aspects of artificial intelligence principles course:

a. In the introduction part, the definition, development history, main branches and application fields of artificial intelligence can be introduced, as well as the relationship and influence of artificial intelligence with other disciplines, such as the mutual inspiration and reference between artificial intelligence and psychology, linguistics, philosophy, etc., and the impact and challenge of artificial intelligence on society, economy, culture and other aspects.

b. About intelligent agents, the concept, classification and characteristics of intelligent agents can be introduced, as well as the connection and comparison between intelligent agents and other disciplines, such as the similarities and differences between intelligent agents and behavioralism, cognitivism and other theories in psychology, and the association between intelligent agents and evolutionary theory, genetic algorithm and other ideas in biology.

c. About search solving, the definition, representation and algorithm of search problems can be introduced, as well as the application and examples of search problems in other disciplines, such as syntactic analysis in linguistics, diagnostic reasoning in medicine, path planning in engineering, etc.

d. About knowledge representation and reasoning, the methods, principles and techniques of knowledge representation can be introduced, as well as the relationship and reference between knowledge representation and other disciplines, such as the connection between knowledge representation and logic, mathematical logic and other fields, and the dialogue between knowledge representation and ontology, epistemology and other thoughts in philosophy.

e. About machine learning, the concept, task and method of machine learning can be introduced, as well as the application and cases of machine learning in other disciplines, such as natural language processing in linguistics, computer vision in image analysis, data mining in social networks, etc.

f. About planning and decision making, the definition, representation and algorithm of planning and decision making problems can be introduced, as well as the application and examples of planning and decision making problems in other disciplines, such as game theory in economics, operations research in management, path planning in transportation, etc.

(2) The formation of a teaching staff with multidisciplinary backgrounds. When organizing the teaching team, not only their professional level and teaching experience in the field of artificial intelligence should be considered, but also their research background and achievements in other related disciplines, such as psychology, linguistics, engineering, etc., should be considered. This can enable teachers to explain and analyze artificial intelligence from multiple angles and levels, and improve the quality and effect of teaching. Specifically, we can take the following measures to achieve multidisciplinary background teaching staff:

a. Build a multidisciplinary background teaching staff through teacher training. Teachers can be regularly organized to participate in various academic conferences, seminars, lectures and other activities related to artificial intelligence, so that they can understand the latest developments and exchanges of artificial intelligence and other disciplines, and

broaden their horizons and knowledge. At the same time, experts or professors from other disciplines can also be invited to conduct special training or lectures, and share their research experience or achievements in the field of artificial intelligence, and enhance teachers' interdisciplinary awareness and ability.

b. Achieve discipline integration through teachers with multidisciplinary background knowledge taking turns to teach. According to the different characteristics and needs of the course content, teachers with different disciplinary backgrounds can be arranged to take turns to teach, so that they can explain and analyze the relevant knowledge and problems of artificial intelligence from different angles and levels. For example, when teaching intelligent agents, teachers with psychological background can introduce cognitive models and behaviorism theory; when teaching knowledge representation, teachers with philosophical background can introduce ontology and epistemology; when teaching machine learning, teachers with linguistic background can introduce natural language processing, etc. This can enable students to understand and master the core ideas and methods of artificial intelligence from multiple perspectives.

(3) The adoption of interactive teaching methods. In teaching, not only the knowledge points and formula derivation should be emphasized, but also interactive teaching methods should be adopted, such as questioning, discussion, group cooperation, etc., to stimulate students' thinking and participation, and promote their communication and interaction. For example, when teaching search algorithms, students can experience the advantages and disadvantages of different algorithms through games or experiments; when teaching knowledge representation, students can compare the applicability of different representation methods through case analysis, etc. Specifically, we can take the following measures to achieve interactive teaching:

a. Use multimedia resources to increase the interest and interactivity of teaching. Make full use of multimedia resources in the teaching process, such as video, audio, animation, etc., to show the application cases and achievements of artificial intelligence in various fields, such as robotics, speech recognition, image analysis, etc. This can let students intuitively feel the practicality and charm of artificial intelligence, and arouse their interest and curiosity. At the same time, we can also use multimedia resources to design some interesting interactive links, such as letting students communicate or test with intelligent systems through voice or image input, increasing the interest and interactivity of teaching.

b. Use online platforms to improve teaching efficiency and quality. We can make full use of online platforms in the teaching process, such as China University MOOC, Zhihuishu, etc., to obtain and share high-quality teaching resources and content, such as video courses, e-books, online tests, etc. This can save us teaching time and cost, and improve teaching efficiency and quality. At the same time, we can also use online platforms to carry out some effective teaching activities, such as online Q&A, online homework, online assessment, etc., improving the convenience and effectiveness of teaching.

### **3.2. Practical Teaching Based on Industry-Education Integration**

Artificial intelligence principles course is a course that

focuses on application practice. It not only requires understanding the principles and methods of artificial intelligence, but also needs to be able to apply them to practical problems, and solve various complex and challenging tasks. Therefore, in practical teaching, we need to take the following measures to achieve industry-education integration:

(1) Incorporate enterprise application examples. When designing practical content, not only the corresponding relationship with theoretical knowledge should be considered, but also the fit with enterprise application needs should be considered. Some representative and cutting-edge enterprise application examples should be selected as practical topics or materials, such as using crawler technology in search engines, using recommendation systems in e-commerce platforms, using image diagnosis in medical fields, etc. This can let students understand the application scenarios and value of artificial intelligence in various industries, and improve their practical significance and motivation.

(2) Incorporate project-driven education. When organizing practical activities, not only the guidance of students to complete specific tasks or operation steps should be emphasized, but also the cultivation of their ability and quality to complete the whole project or product development process should be emphasized, such as demand analysis, design thinking, team cooperation, project management, etc. This can enable students to upgrade from a single task or technical level to a whole project or product level, and cultivate their innovative thinking and problem-solving ability.

(3) Incorporate college student competition activities. When evaluating practical results, not only the code quality or running effect should be checked, but also encouraging and supporting excellent works to participate in various college student competition activities should be emphasized. This can enable excellent works to be more widely displayed and recognized, and motivate more students to participate in competition activities. Specifically, we can take the following measures to integrate college student competition activities with course teaching:

a. Connect course design with competition tasks. We can refer to the task requirements and evaluation criteria of various college student competition activities when designing course practice content, so that students' practice works can meet the specifications and standards of competition, and prepare for participating in competition.

b. Collaborate between course teachers and competition guidance teachers. We can make full use of the existing competition guidance teacher resources when organizing the course teacher team, and let them participate in the course teaching and practice guidance, share their experience and skills in competition, and provide more professional and effective guidance and suggestions for students. At the same time, we can also let course teachers serve as competition guidance teachers or judges, and provide support and service for competition activities.

## **4. Teaching Practice and Effect**

Based on the proposed teaching model of artificial intelligence principles course based on discipline integration and industry-education integration, teaching practice was carried out, and the teaching effect was evaluated and feedback was given through various ways, including: online tests, homework correction, questionnaire survey, practical

project evaluation, classroom observation, etc. Generally speaking, the teaching effect is satisfactory. According to the questionnaire survey results, more than 90% of the students expressed satisfaction or very satisfaction with this course, and believed that this course helped them to improve their understanding and interest in artificial intelligence, as well as their practical ability and innovation ability. According to the online test and homework correction results, more than 80% of the students mastered the basic concepts, methods and techniques of artificial intelligence, and were able to apply them to practical problems. According to the practical project evaluation results, more than 70% of the students completed high-quality project works, some of which participated in artificial intelligence related innovation application competitions and won excellent awards.

## 5. Conclusion

This paper designs a teaching model of artificial intelligence principles course based on discipline integration and industry-education integration concepts. By applying the discipline integration concept to the theoretical teaching process, students' horizons and thinking are broadened; by applying the industry-education integration concept to the practical teaching process, students' practical ability and innovation ability are cultivated. A comprehensive evaluation and feedback of the teaching effect of artificial intelligence principles course was carried out. Data was collected from multiple perspectives such as online tests, homework correction, project evaluation, questionnaire survey, classroom observation, etc., and analyzed the impact of this teaching model on improving students' understanding,

interest, practice and innovation of artificial intelligence. This paper has certain reference value and enlightenment for promoting the development and reform of artificial intelligence education, and also provides some ideas and directions for subsequent research.

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