Optimization Strategies for the Group Cooperative Learning Model in the Undergraduate Artificial Intelligence Course

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Abstract. In view of the problems in the group cooperative learning mode of undergraduate artificial intelligence courses, such as one-way teaching, formalization of group cooperation, poor timeliness of teaching content and imperfect teaching evaluation feedback mechanism, etc. This paper takes the undergraduate artificial intelligence course as the research object, and deeply discusses the group cooperative learning mode. Based on the analysis of various problems in group cooperative learning in the current curriculum and the theoretical basis of educational psychology and multiple intelligence theory, this paper puts forward a series of targeted and operable optimization strategies. It aims to effectively improve the teaching effectiveness of artificial intelligence courses and enhance students' professional quality and comprehensive ability in this field. It provides an effective improvement example and theoretical support for the teaching of undergraduate artificial intelligence courses, and has great significance for promoting the teaching reform of related courses.

Keywords: Undergraduate; Artificial intelligence course; Group cooperative learning; Optimization strategy

1 Introduction

In today's era of rapid development of science and technology, artificial intelligence, as a strategic technology leading a new round of scientific and technological revolution and industrial transformation, is reshaping the development pattern of various fields at an unprecedented speed[1]. From convenient services in daily life to the innovation of autonomous driving in the field of transportation; From the accurate identification of diseases by artificial intelligence technology in medical image diagnosis to the intelligent prediction of risks in the field of financial risk control, the application scenarios of artificial intelligence have widely penetrated into all aspects of society and profoundly changed people's production and lifestyle. In this context, colleges and universities undertake the important mission of training high-quality professionals

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to meet the needs of the era of artificial intelligence for the society, and the undergraduate artificial intelligence course has therefore become a key component of the curriculum system of many colleges and universities[2].

Group cooperative learning mode, as a teaching method that emphasizes interaction and cooperation among students, has been widely used in the field of education[3]. It is believed that through the communication and cooperation with peers, students can build a richer and deeper knowledge system in the process of mutual inspiration and mutual questioning. At the same time, it can effectively cultivate students' comprehensive qualities such as teamwork ability, communication ability and critical thinking[4]. In the teaching practice of many disciplines, the group cooperative learning model has shown unique advantages[5], such as promoting students to jointly complete complex project design in engineering disciplines and stimulating students to discuss social issues from multiple perspectives in humanities and social sciences disciplines.

At home and abroad, the research and application of group cooperative learning mode in the field of education have rich achievements and practical experience[6]. Foreign educational researchers began to pay attention to the group cooperative learning model earlier, and carried out in-depth theoretical research and practical exploration. American educationalists widely implement the group cooperative learning model in the curriculum teaching of primary and secondary schools and colleges, verify its effectiveness through a large number of empirical studies, and constantly summarize and improve the implementation strategy. They focus on cultivating students' independent learning ability and teamwork spirit, and emphasize students' self-management and self-supervision in the process of cooperation. Some European countries combine group cooperative learning mode with project-based learning, taking interdisciplinary project tasks as the carrier, so that students can comprehensively apply multidisciplinary knowledge to solve practical problems in group cooperation, and cultivate students' comprehensive literacy and innovation ability. In China, with the continuous advancement of education reform, group cooperative learning mode has been gradually valued and widely used[7].Many primary and secondary schools and colleges are trying to integrate it into the curriculum teaching, especially in some practical subjects, such as computer science, engineering technology and so on. However, although the group cooperative learning model has been widely used at home and abroad, it still faces many problems and challenges in its implementation.

Based on the undergraduate artificial intelligence course, this paper deeply discusses the group cooperative learning mode in the undergraduate artificial intelligence course, and proposes a series of targeted and operable optimization strategies through a detailed analysis of various existing problems in the group cooperative learning of the current course, combined with the theoretical basis of group cooperative learning theory and multiple intelligence theory.

2 Relevant Theoretical Basis

2.1 Multiple Intelligence Theory

Gardner's multiple intelligence theory holds that individuals have multiple intelligences, such as logic-mathematical intelligence, linguistic intelligence, interpersonal intelligence and so on. In group cooperative learning, different intelligence advantages of group members can be brought into full play to achieve complementary advantages. In the practice of artificial intelligence course projects, students with advantages in logic-mathematical intelligence can be responsible for algorithm design and optimization, while students with strong interpersonal intelligence can better coordinate group relations and promote communication and cooperation among members[8].

2.2 Cooperative Learning Theory

Cooperative learning theory originated in the United States in the 1970s, and its core idea is based on the social constructivism theory. This theory, proposed by Vygotsky, emphasizes that the construction of individual knowledge is achieved through interpersonal cooperation and communication in the context of social culture. Cooperative learning includes key elements such as positive interdependence, face-to-face facilitating interaction, personal responsibility, social skills, and cooperative group self-assessment. Positive interdependence means that group members depend on each other to work together towards a common goal. Face-to-face facilitating interaction promotes effective communication, discussion and mutual support among members; Personal responsibility Ensuring that each member is aware of their tasks and is accountable for the group's results; Social skills help members build good relationships in cooperation; Group self-evaluation is conducive to continuous reflection and improvement of the group. Numerous educational research results show that group cooperative learning has significant advantages in improving students' learning enthusiasm, promoting knowledge internalization, and cultivating social and teamwork abilities[9].

By analyzing the two theories, we can know that they are closely related and complement each other. Group cooperative learning provides practical scenes and social soil for the development of multiple intelligences. In the group, the different strengths of the members are highlighted and complement each other. Therefore, it is of great significance to introduce the group cooperative learning mode in the teaching process. Therefore, at this stage, we also introduce such teaching methods in undergraduate artificial intelligence courses, so as to improve teaching quality and cultivate compound talents who are fully developed and adapt to the needs of the field of artificial intelligence.

3 Analysis of Existing Problems in Undergraduate Artificial Intelligence Courses

3.1 Status Investigation Design

In order to deeply and comprehensively analyze the existing problems of group cooperative learning mode in undergraduate artificial intelligence courses. This research adopts multi-dimensional survey methods including multi-party questionnaire survey, achievement evaluation and communication. In terms of questionnaire survey, undergraduate students of three grades who have received or are receiving artificial intelligence courses in our school were surveyed by questionnaire. The questions in the questionnaire cover students' overall cognition and attitude towards group cooperative learning, whether there is a group cooperative learning mode in the course, and the rationality and cooperation experience of groups in the process of group construction. At the same time, the content of the questionnaire also involves the setting of the course content and the application of the knowledge points in practice.

In terms of achievement evaluation and communication, teachers understand the current status of undergraduate artificial intelligence courses through experiments, classroom tests, questions and other ways. At the same time, through teacher guidance, intervention in group assignment and discussion, to observe the change of curriculum and students. In addition, the communication between students and teachers was also conducted, so as to understand the current situation of students' integration of group cooperative learning mode in the classroom.

3.2 Current Problems in Undergraduate Artificial Intelligence Courses

Through the analysis of the survey results, it is found that there are still some problems in the implementation of the current undergraduate artificial intelligence course, and the problems are summarized into the following aspects.

3.2.1 One-way Teaching Method.

The current undergraduate class is dominated by one-way teaching by teachers, in which teachers are the main body and students are mostly in a state of passive acceptance of knowledge. In this teaching mode, students lack active thinking and active participation in the classroom interaction, which is easy to lead to students' mind wandering in the classroom or cramming teaching. For example, for the complex algorithms taught in the artificial intelligence courses for undergraduates, teachers mostly deduce the process through blackboard writing or PPT presentation, which makes it difficult for students to truly understand the thinking logic and application scenarios behind the algorithms. The methods of asking questions in class adopted by most teachers can not effectively stimulate students' curiosity and desire to explore.

3.2.2 Formalization of Group Cooperation.

Group cooperative learning mode has been adopted in some courses, but there are some formalization problems. In addition, the allocation of team members is relatively arbitrary, which makes the group division not fully consider the differences in students' abilities, interests and personalities, resulting in unclear division of labor and poor cooperation among team members, resulting in the phenomenon of "free rider". This indirectly reflects the unreasonable formalization of the current group cooperative learning model. In the undergraduate artificial intelligence course, the group cooperative learning mode is mostly used in the seminar course. Students are asked to conduct research and discussion in groups and finally select one student from the group to make a summary report. In this process, individual students with strong ability undertake most of the work. In the long run, it will be found that the students in each report are relatively fixed, while other members have low participation, which makes the group cooperation fail to achieve the expected effect of cultivating team cooperation and comprehensive ability. This leads to serious formalization problems even when the group cooperative learning mode is used in the classroom.

3.2.3 Lack of Individualized Culture.

Above, we have analyzed the formalization of the group cooperative learning mode adopted in the classroom at this stage. Through the analysis, it can be seen that the training mode of students with different abilities is the same, resulting in the lack of individualized training. At the same time, most undergraduate teachers of artificial intelligence courses use one-way teaching methods and focus on class preparation, so the teaching progress, teaching content and teaching methods are unified, and the individual differences of students cannot be fully paid attention to, and it is difficult to meet the needs of students with different learning levels and interests. Students with a good foundation and strong learning ability may find the course content too simple and lack of challenge; Students with a weak foundation may not be able to keep up with the pace of teaching and gradually lose interest in learning, leading to serious polarization.

3.2.4 Theory is Disconnected from Application.

Technology iteration in the field of artificial intelligence is rapid, but the course content update cycle is long, and it cannot timely reflect the latest development trends and cutting-edge technology applications of the industry. At the same time, the teaching content focuses on the explanation of theoretical knowledge, and students learn more theoretical knowledge in class. Due to the current situation of the classroom setting, practical teaching links are relatively weak and the combination with theoretical teaching is not close enough, so that students lack enough practical projects to consolidate and apply the knowledge they have learned, resulting in the understanding of theory remaining on the surface and unable to convert it into practical operational skills. For example, when learning machine learning algorithms, students only understand the principle of algorithms through simple example codes in class, but when facing actual large data sets and complex application scenarios, they do not know how

to carry out practical operations such as data preprocessing, model selection and optimization.

3.2.5 Single Evaluation Method.

If the course evaluation mainly relies on the final exam results, the evaluation of students is not comprehensive and objective. This single evaluation method cannot accurately measure the performance of students' comprehensive quality improvement, teamwork ability, innovative thinking ability, practical operation ability and other aspects in the learning process, which is easy to cause students to study for exams and neglect the cultivation of their comprehensive ability. For example, in a group cooperation project, although the group as a whole completed the project task, the actual performance and ability level of each student in the project could not be accurately distinguished due to the lack of evaluation of the individual contribution and collaborative process of the members in the group.

3.2.6 The Feedback Mechanism is not Perfect.

The feedback channels between teachers and students are not smooth enough, teachers' feedback on students' learning is not timely and specific, and students' problems encountered in the learning process cannot be timely and effective guidance and solution. At the same time, students' opinions and suggestions on teaching content and teaching methods are also difficult to be fed back to teachers, resulting in problems in the teaching process that cannot be adjusted and improved in time, which affects the improvement of teaching quality.

Then, the analysis of the current problems of undergraduate artificial intelligence courses is mainly analyzed from the two aspects of classroom implementation and after-class, and is summarized into the above six contents. Among them, the first four points analyze the status quo problems in the course of curriculum implementation, and the problems after class are also sorted out in this paper mainly summarized into the latter two points.

4 Optimization Strategy based on Group Cooperative Learning Mode

4.1 Scientific Construction of Cooperative Groups

At the beginning of the scientific construction of cooperative groups, the grouping factors should be considered comprehensively, and multidimensional assessment tools can be used to conduct a comprehensive assessment of students. Based on undergraduate artificial intelligence courses, students' basic knowledge of artificial intelligence, programming ability, logical thinking and reasoning ability, and algorithm design ability are evaluated respectively. Then the analytic hierarchy process is used to determine the weight of each part. According to the evaluation results, cluster analysis algorithm is used to divide students into different levels, and then group them

to ensure that each group has both students with solid theoretical knowledge and students with strong practical ability, active thinking and good communication and cooperation, so as to form a group with complementary advantages and scientific structure.

It should be noted that the ability level of students in the learning process is constantly changing. Therefore, the group structure cannot remain unchanged, and a dynamic adjustment plan should be formulated according to the teaching process and project task requirements of the artificial intelligence course.

4.2 Reasonable Design of Cooperation Content

The whole content of undergraduate artificial intelligence courses is sorted out and divided according to knowledge modules, such as machine learning foundation, deep learning framework, natural language processing application and other modules. At the same time, each module is divided into three levels: foundation, improvement and innovation. Taking the basic module of machine learning as an example, the basic task is to implement linear regression algorithm using simple data sets and analyze its performance, so as to enable students to master the basic algorithm implementation process and evaluation method; The improvement task is based on the basic task, after the data set is preprocessed, a variety of machine learning algorithms such as decision tree and support vector machine are applied for comparative analysis, so as to cultivate students' ability to comprehensively apply knowledge and solve practical problems. The expansion task requires students to independently design and improve machine learning algorithms according to specific practical application scenarios, so as to stimulate students' innovative thinking and exploration interest and ability. At the same time, in order to enable students to deeply understand the application value of artificial intelligence in various fields, and to improve students' ability to solve practical problems, students should be divided into analysis and processing in combination with the application of actual projects or real scenes and data in actual industries. Realize the contextualization and realizability of tasks in class.

4.3 Define the Role of Teachers

In the classroom that implements the group cooperative learning mode, the teacher acts as the organizer of the class, and makes a detailed cooperative learning plan before the start of the class, clarifying the tasks, time nodes and achievement requirements of each stage. At the same time, the teacher is also the leader of the class. When the group discussion is in trouble, the teacher inspires the students to think by asking questions, providing relevant cases or literature, etc., so that the students can think about how to apply these technologies to solve the current problems. Teachers should also act as facilitators. Teachers should actively create a good atmosphere of cooperation, encourage students to actively participate in discussion and sharing, and coordinate internal conflicts in a timely manner. For example, when members in a group have disputes over the division of tasks, teachers guide students to re-examine

their respective strengths and needs, and reassign tasks through negotiation to promote the harmonious development of the group.

At the same time, it is also necessary for teachers to conduct regular and effective supervision over group activities. Through the establishment of a regular inspection system, teachers can inspect the participation, task progress, discussion quality and other learning situations in group cooperation on a weekly or regular basis to understand the overall situation of group cooperation and the specific situation of each student.

4.4 Establish a Multiple Evaluation System

In the group cooperative learning mode of undergraduate artificial intelligence course, it is very important to establish multiple evaluation system. The system can cover multidimensional evaluation indicators to measure students' performance comprehensively. For students' knowledge mastery dimension, in addition to the traditional theory examination, the project application examination is added. For example, in setting a specific artificial intelligence scenario, students are required to use their knowledge to build models and solve problems, and evaluate their understanding and application ability of knowledge based on the accuracy, completeness and innovation of the model. The team cooperation dimension is comprehensively considered through group self-evaluation, mutual evaluation and teacher evaluation. Group self-evaluation can reflect on internal cooperation and coordination, mutual evaluation can promote communication and learning between groups, and teacher evaluation can assess the level of team cooperation from a macro perspective by observing the interaction of members and the rationality of task division, such as whether they actively listen, effectively communicate, and rationally assign tasks. In terms of innovation ability, students are encouraged to put forward unique ideas and methods in the project, evaluate its novelty and feasibility, and set up a demonstration of innovation results, which is evaluated jointly by teachers and students to stimulate innovation awareness. The task completion dimension focuses on task quality, schedule and resource utilization efficiency. Quality inspection whether the results meet the expected function and performance standards, progress assessment is promoted on time, resource utilization depends on whether the reasonable planning of computing resources, data resources, etc.

At the same time, the process evaluation and the final evaluation are organically combined. Process evaluation runs through the whole learning process, group reports are carried out regularly, and timely feedback of phased results and problems is convenient to adjust learning strategies. The final evaluation is carried out at the end of the course, and the final exam and the final evaluation of the project results are scheduled to comprehensively evaluate the overall learning effectiveness. The multiple evaluation system can comprehensively, objectively and accurately reflect the comprehensive performance of students in group cooperative learning, and provide strong support for teaching improvement and student growth.

The above optimization measures are put forward based on the current problems, and also hope to provide effective reference for the subsequent research on curriculum teaching mode.

5 Conclusions

This study focuses on the group cooperative learning mode in undergraduate artificial intelligence courses, and deeply analyzes its current situation and problems. At present, it is faced with many difficulties, such as one-way teaching makes students passively accept knowledge, and their learning enthusiasm is frustrated; Group cooperation is formalized, it is difficult to form effective cooperation among members, and the advantages of the team cannot be brought into play. To solve these problems, a series of optimization strategies are carefully formulated according to group cooperative learning theory and multiple intelligence theory. This includes a shift from teaching methods to stimulating student initiative through interactive teaching; To the optimization of group cooperation, scientific grouping and clear division of labor rules; And the establishment of multiple evaluation system, comprehensive multi-dimensional comprehensive evaluation of students. At the same time, it is expected to effectively solve existing problems, effectively improve teaching effectiveness, comprehensively enhance students' professional quality and comprehensive ability in the field of artificial intelligence, provide solid and exemplary theoretical and practical support for the teaching reform of undergraduate artificial intelligence courses, and help the significant improvement and sustainable development of the teaching quality of related courses.

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