

Research on the Application and Practice of ChatGPT in Big Data Course Group Teaching

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Abstract: Aiming at the problems of complex curriculum setting, insufficient teachers and balanced teaching resources in the teaching process of big data course group, GPT-4o was applied to the teaching of big data course group to solve the problems. It was analyzed there were the characteristics, existing problems of the current big data course group, and the feasibility of ChatGPT application in higher education, discusses the application strategy of ChatGPT in big data course group teaching. Then it was discussed that was the application strategy of ChatGPT in big data course group teaching, and tested the actual effect of ChatGPT in teaching through the practice of operating system principle course. The results show that ChatGPT can relieve teachers' work pressure, enrich teaching resources, provide innovative teaching methods and personalized interaction in big data course group teaching. At the same time, it is also should be paid to accumulation the process data of ChatGPT during teaching, so that ChatGPT can show more intelligence and personalization in the field of education, and promote the digitalization of education.

Keywords: Project driven; big data course group; ChatGPT; higher education

1. Introduction

To accelerate the construction of education digitization and education power, the Ministry of Education has issued a series of education informatization plans and related policy documents such as "Teachers 'Digital Literacy'" [1]. At present, China is in a great change not seen in a century. The transformation from an education power to an education power needs higher education to play a leading role, actively explore the path and concept of digital education, and help realize the high-quality development of education.

Big data technology has played an important role in all walks of life, and it is an important tool for processing and analyzing massive data. Therefore, cultivating talents with big data processing ability and analytical thinking has become an important task for higher education. The construction of big data course group, the practice teaching reform of the course group, and the development of a series of big data talent training modes such as discipline competitions are helpful to cultivate big data talents with practical ability that meet the needs of the society [2]. In years of teaching research [3-4], big data technology not only contributes to personalized, intelligent and scientific teaching, but also contributes to teaching management, teaching monitoring and teaching evaluation. However, there are also some difficulties and problems [5-6], such as data security and privacy, teachers' insufficient familiarity with big data technology, lack of high-quality teaching resources, and insufficient teacher incentives. How to effectively carry out the teaching of big data related courses is still a problem that educators need to solve.

In recent years, with the development of artificial intelligence technology, various teaching methods, teaching platforms and teaching tools have also emerged. Among them, ChatGPT, which is released by OpenAI company, is represented by its powerful language understanding and generation ability, which has pushed the generation of artificial intelligence content to a new high. Countries are actively exploring the application research of generative artificial intelligence represented by ChatGPT in the field of education. For example, UNESCO (United Nations Educational, Scientific and Cultural Organization) released "Generative AI and the Future of Education", China released "Interim Measures for the Service Management of Generative Artificial Intelligence", Tsinghua University released tsingAI, and the United States released the report "Artificial Intelligence and the Future of Teaching". Chinese scholars have also actively explored the influence of generative artificial intelligence on education, such as strategies and

mechanisms for empowering teachers' digital literacy [7], innovative development paths for media education empowered by generative artificial intelligence [8], and practical paths for critical information literacy education based on the application of generative artificial intelligence [9].

In summary, using artificial intelligence to help promote the digitalization of education and exploring the application of generative artificial intelligence in education have become urgent problems in the field of education. ChatGPT is not only good at complex dialogue, but also can intelligently generate text and image recognition, which makes it have unique application value in the teaching of big data course group. Based on this, this paper intends to explore the application strategy of ChatGPT in big data course group teaching, and take the course of operating system principle as an example for practical research, in order to provide corresponding guidance for the application and practice of generative artificial intelligence in big data related education in China.

2. Feasibility of ChatGPT in higher education

(1) The feasibility of ChatGPT in higher education research

From the perspective of academic research, generative artificial intelligence represented by ChatGPT provides certain convenience conditions for scholars to scientific research. It can quickly retrieve literature, help scholars gain deeper insights [10], analyze data [11], polish language [12], and provide writing materials [13]. From the perspective of university education, ChatGPT is helpful to improve the assessment system and ensure the evaluation efficiency, etc., and gradually transform higher education to a personalized, intelligent and modern education mode [14]. With the characteristics of powerful natural language understanding and high-quality answers, ChatGPT has opened a new chapter for the reform of educational evaluation [15]. When ChatGPT is introduced into undergraduate teaching, it is helpful to cultivate college students' scientific research ability and stimulate students' research motivation [16]. But there are risks along the way. When scholars use ChatGPT to conduct scientific research, there are potential risks such as emphasizing the fluency of content and ignoring the accuracy of content [17], destroying the trust relationship between teachers and students [18], threatening academic integrity and ethics, and difficult to guarantee data security and privacy [19]. Therefore, scholars should have critical thinking when applying ChatGPT to higher education to ensure the reliability and value of the research.

(2) The feasibility of ChatGPT's application in higher education teaching

Due to its powerful natural language understanding and generation ability, ChatGPT has attracted scholars' attention in the application research of teaching field. This new educational tool can be used to generate teaching resources such as syllabus, lesson plans and courseware through multiple dialogues, so as to help teachers design teaching plans and reduce their heavy workload. In the teaching process, students use ChatGPT to participate in classroom interaction and answer questions. This timely interaction ability provides a learning path for personalized teaching in higher education to a certain extent. However, there will be a series of risks in the application of any tool, the most significant of which is that the generated content may have bias, illusion, false information, and there is also information cocoon. If teachers and students rely too much on ChatGPT, they may lose the ability to think independently, reduce communication with teachers, and then have a negative effect on students' learning, and even bring psychological problems.

3. Analysis of the teaching status of Big Data Course group

3.1 Characteristics of Big Data Course Group

(1) Interdisciplinary integration

Big data course group usually includes the knowledge of computer science and technology, statistics, information resources and management, mathematics and other disciplines. Undergraduates are required to master the knowledge of programming languages, data structures, databases, operating system principles, computer networks, common statistical methods and big data platform construction. Because of its interdisciplinary characteristics, students can learn knowledge in many fields, the content is rich, and they can also deal with relatively complex problems.

(2) Strong practicality

Big data course group requires students to have certain practical ability. In-class experiments, course

design and practical training courses account for more hours in the training program, which requires students to understand and master big data technology through a lot of practice. In addition, college competitions such as "Blue Bridge Cup" also require students to write corresponding code to simulate and solve application problems in real scenarios, in order to improve students' ability to solve practical problems.

(3) Knowledge updates quickly

The rapid development of big data technology requires that the big data course group should constantly integrate new tools, algorithms and platforms. Teachers should strengthen their own learning and keep pace with The Times to ensure the timeliness and practicability of teaching content. Students should choose to learn new technology according to their own characteristics and future development direction, in order to adapt to the change of new technology and the development of The Times.

(4) Focus on teamwork

Project-based teaching methods are mostly used in the teaching process of big data course group, which usually requires students to complete in the form of a team, which requires students to have teamwork, communication skills and software project management skills. Through the implementation of the project, students not only improve their technical ability but also enhance their comprehensive quality.

(5) Comprehensive teaching methods

Big data course group is a multi-disciplinary course group, which requires teachers to have a variety of teaching methods, such as flipped classroom, online and offline hybrid teaching, project-driven, traditional teaching, etc., in order to improve students' interest in learning and teaching effect, increase students' teamwork level and autonomous learning consciousness.

3.2 Teaching characteristics of Big Data course group

(1) Strong practicability

The course setting of big data course group focuses on reality, and the course content usually simulates actual projects. Through the analysis of practical application cases, students can better understand and master the scene of big data technology application. For example, big data analysis of diseases in the medical field and public opinion data analysis in the field of information resources. Students can master the techniques and methods to solve practical problems through the analysis of these typical application cases of big data, and improve their practical ability. In this process, students can also propose their own research topics to cultivate their innovation ability.

(2) Teamwork learning

Big data course group emphasizes teamwork learning. In the practice process, students are required to discuss and solve problems in the form of a team. This learning mode can improve students' project management ability, cultivate team consciousness and enhance communication level.

(3) High flexibility

The practice part of big data course group has a certain flexibility, and students can choose different directions and modules flexibly according to their interests and future development. For example, students can choose data mining, algorithm design, big data platform construction, database, software project management and other different fields.

(4) Abundant teaching resources

Most of the courses in the big data course group have rich supporting teaching resources, such as online textbooks, data resource libraries, experimental environments, development environments, development tools, open courses, etc. Students can learn the latest technologies and methods through online open courses online platform, WeChat public account and so on to promote their own technical improvement.

(5) School-enterprise cooperation

At present, many universities cooperate with enterprises to jointly develop and implement big data-related courses. Through this school-enterprise cooperation mode, it not only improves the practicability and cutting-edge of the course, but also allows students to understand the industry needs and technology

trends.

3.3 Problems in Big Data course group teaching

(1) The curriculum is complex

The courses in the big data course group involve multiple disciplines, and the curriculum setting is relatively complex. Requiring students to learn multi-dimensional knowledge such as computer science and technology, data analysis, and big data platform in a limited time, it is easy to cause problems such as students' heavy learning burden and unclear learning objectives.

(2) Lack of teachers

With the rapid development of big data technology, teachers are required to have multidisciplinary knowledge, and it is better to have some project experience. However, many colleges and universities lack of teachers reserve, which has a certain impact on the guarantee of the actual teaching effect.

(3) Balanced teaching resources

The development of most courses in the big data course group requires high experimental equipment. However, in some areas or universities, teaching resources are relatively scarce, and it is difficult to provide more suitable practice environment and data resources. This imbalance of resources will affect the teaching quality of big data courses.

(4) The foundation of students is uneven

Big data courses require high basic knowledge such as programming, mathematics and statistics, and students have different basic levels. The traditional undergraduate teaching mode is basically that students sit in rows of seats and accept theoretical knowledge taught by teachers. Faced with so many students, it may be difficult for teachers to take into account the needs of students and formulate differentiated teaching programs. Students may also have difficulty accessing timely and effective instruction outside the classroom.

(5) Practical teaching is difficult

Big data courses pay attention to practical operation, while the main equipment required for practice, such as computers, requires high configuration. At present, it is difficult for some schools to configure big data laboratories or artificial intelligence laboratories, which will affect the effect of practical teaching. In addition, the construction of big data architecture also puts forward high requirements for undergraduates.

(6) Technology changes rapidly

The rapid update speed of big data technology requires teachers to continuously expand and update the teaching syllabus. And frequent more potential, is bound to bring some pressure to teaching and student learning. On the premise of ensuring the adaptability of big data technology and students, how to effectively organize the teaching outline and adjust the teaching plan is also a problem that needs to be solved in depth.

In summary, the big data course group usually covers courses on operating systems, machine learning, data visualization, database management, and other aspects with distinct characteristics and features. When students study these courses, they usually need to master a lot of theoretical knowledge and practical skills. However, there are also some problems in the teaching process of big data course group. In order to further improve the teaching effect of big data course group, this paper tries to apply ChatGPT to big data teaching. By providing real-time help and personalized teaching support, it is expected to solve these problems, improve the teaching effect, and cultivate more professionals with big data knowledge for the society.

4. Application Strategy of ChatGPT in Big Data course group teaching

4.1 Formulation of teaching syllabus and teaching plan

The syllabus is the core link of big data course group teaching, which should not only cover the basic content of the course, but also reflect the new technology and social development needs in the field of big data. Firstly, ChatGPT was used to assist teachers to retrieve the latest literature and teaching

materials in the field of big data, so as to ensure the forefront and application of the syllabus. Secondly, ChatGPT was used to obtain the latest technology learning resources and strategies to assist teachers to expand the knowledge points in the syllabus. Finally, ChatGPT was used to design diverse syllabus templates to meet the needs of different basic students. Combining ChatGPT with course objectives and training programs to generate syllabus that meets the needs can help teachers save a lot of time and energy, and can also improve the scientific and targeted nature of the syllabus.

The teaching plan is the specific implementation plan of classroom teaching, which is related to the teaching effect. In the process of making teaching plans, ChatGPT can provide rich teaching resources and personalized teaching cases, and can also design consistent teaching strategies according to different teaching objectives and students' characteristics. For example, in the practical session, ChatGPT provides practical operation guidelines and solutions such as project assignments, case studies, and laboratory courses to help students better complete practical tasks. In addition, ChatGPT can also realize dynamic adjustment of the content of the lesson plan. For example, ChatGPT is used to adjust the lesson plan according to the feedback results of students, making the lesson plan more flexible and effectively improving the adaptability of teaching.

4.2 Rich teaching resources and personalized teaching design

The knowledge update speed of big data course group is fast, the information content is large and the range is wide, which needs a more efficient resource integration mode. Compared with traditional data access based on teachers' personal information, ChatGPT can be used to quickly collect and integrate the latest research results, technical blogs, industry reports, etc. According to the course requirements, it can be used for intelligent resource integration. At the same time, ChatGPT can be used to obtain teaching resources under different teaching objectives and teaching contents. For example, when explaining process management, ChatGPT can be used to recommend relevant articles and codes to help students better understand the knowledge points and improve the richness and diversity of teaching content.

In the process of big data course group teaching, how to realize personalized teaching has been a difficult problem due to the difference of students' foundation and future planning. The introduction of ChatGPT is expected to use its powerful natural language processing capabilities and big data analysis capabilities to provide strong support for personalized teaching. Firstly, according to students' learning records and feedback, ChatGPT was used to analyze each student's learning progress and knowledge mastery, and personalized teaching suggestions were provided for teachers. For example, ChatGPT will teach you about the basics or challenging projects, depending on the student's progress. Second, ChatGPT can be used to provide real-time personalized tutoring after class. For example, ChatGPT can provide real-time answers when a student is confused about a topic. Help students understand and master knowledge points in time. Finally, in the process of practical teaching of big data course group, according to the theoretical teaching content, teaching objectives and students' progress, ChatGPT is used to design appropriate project topics and tasks, and the corresponding teaching resources are provided to make the teaching more targeted and practical, and improve students' participation and initiative.

4.3 Teaching interaction and expansion of teaching content

Teacher-student interaction is an important part of improving the teaching effect of big data course group. In the traditional classroom teaching process, due to time and space constraints, classroom interaction is limited. Using ChatGPT, on the one hand, you can design interactive sessions, such as real-time questions, online discussions, and case studies, which can ensure that students have the opportunity to participate in the classroom. On the other hand, it can improve the immediate answers and explanations according to students' feedback and participation, and enhance students' learning motivation and teaching effect.

The expansion of teaching content is very important in the teaching process of big data course group. Using ChatGPT, teachers can integrate interdisciplinary knowledge in the teaching process, add more practical cases and projects, and students can better understand theoretical knowledge and expand their knowledge horizons through interaction with ChatGPT. For example, when teaching data analysis techniques, ChatGPT can help students understand the fundamentals of statistics. The latest algorithms and tools can also be provided to help students understand the current technology frontier and industry development. It is also possible to design an interdisciplinary project of computer science and management, and use big data to solve the problems in enterprise management and improve the comprehensive ability of students.

4.4 Teaching feedback and evaluation improvement

In the process of big data course group teaching, getting students' feedback information is helpful to adjust and optimize the teaching plan. On the one hand, ChatGPT can be used to design online questionnaires and classroom discussions to collect students' feedback information in real time. On the other hand, ChatGPT is used to analyze student feedback information and generate detailed feedback reports and improvement suggestions.

Student assessment is an important part of instructional feedback. Firstly, ChatGPT is used to design diverse evaluation forms and contents. Such as online testing, case analysis, assignments and examinations, etc., the overall process of evaluating the effect of student learning. Secondly, ChatGPT was used to analyze student learning records and feedback information to generate a personalized evaluation scheme. Finally, ChatGPT was used to analyze the teaching quality in depth to help teachers find the direction of improvement. For example, ChatGPT is used to analyze students' learning performance and feedback information, so that teachers can identify key knowledge points and improve students' learning effect.

5. The Teaching Reform Practice of Big Data Course Group Based on ChatGPT -- Taking the course of "Operating System Principle" as an example

5.1 Use ChatGPT to make syllabus and lesson plans

Operating system principle is an important basic course of big data course group, which involves complex knowledge. Traditional syllabus and lesson plans often rely on teachers' personal experience. ChatGPT is used to realize intelligent syllabus and teaching plan formulation. For example, the relevant instructions of academic frontier analysis examples and ChatGPT's reply are shown in Table 1 in the dialog box.

Table 1: Examples of academic frontier analysis of syllabus formulation

User input	ChatGPT replies (partial)
Finance and economics college, information management and information system major, teaching the course of operating system principle. In order to develop the syllabus and lesson plans, please provide the latest academic developments.	<p>Certainly, here is an updated summary of the latest academic developments in the field of operating systems, specifically tailored for teaching an "Operating System Principles" course in a Finance and Economics college for the Information Management and Information System major.</p> <p>Latest Academic Developments in Operating Systems</p> <p>1. Microservices & Containerization</p> <ul style="list-style-type: none"> • Context: The shift towards microservices architecture and containerized applications has revolutionized the way operating systems are utilized and managed. • Relevant Topics: Virtualization, container orchestration (e.g., Kubernetes), container runtime (e.g., Docker). • Resources: Research papers on microservices, Kubernetes documentation, Docker community resources. <p>2. Cloud Computing and Edge Computing</p> <ul style="list-style-type: none"> • Context: Cloud computing platforms (AWS, Azure, Google Cloud) and edge computing paradigms are redefining resource management and deployment strategies. • Relevant Topics: Resource allocation, virtualization techniques, serverless computing, edge devices. • Resources: IEEE Cloud Computing journal, Amazon AWS whitepapers, edge computing research articles. <p>.....</p>

Based on ChatGPT responses, further instructions can be issued until the syllabus and lesson plan are completed.

5.2 Use ChatGPT to enrich teaching resources

With ChatGPT, teachers have access to diverse teaching resources such as electronic textbooks, lab manuals, online tools, and more. For example, the relevant instructions of the examples with rich teaching resources and part of ChatGPT's reply are shown in Table 2.

Based on the ChatGPT response, the instructor can continue to issue instructions and integrate the course content resources.

Table 2: Examples of teaching resource enrichment

User input	ChatGPT replies (partial)
According to the above training, please give the open source code library and tools of the file system, and let the students practice.	<p>Sure! Here are some open-source code libraries and tools related to file systems that students can use for practice:</p> <p>Open-Source File System Projects</p> <ol style="list-style-type: none"> Ext4 <ul style="list-style-type: none"> • Description: Ext4 is one of the most commonly used file systems in Linux. • GitHub Repository: It's generally found within the Linux kernel source code. • Learning Resources: <ul style="list-style-type: none"> ○ Ext4 File System Overview (Wikipedia) ○ Kernel.org - Ext4 Documentation FAT32 <ul style="list-style-type: none"> • Description: FAT32 is a file system developed by Microsoft and is widely used in many storage devices. • GitHub Repository: You can refer to third-party implementations like FatFs. • Learning Resources: <ul style="list-style-type: none"> ○ File Allocation Table (Wikipedia) ZFS <ul style="list-style-type: none"> • Description: ZFS is an advanced file system with strong data integrity protection features. • GitHub Repository: OpenZFS • Learning Resources: <ul style="list-style-type: none"> ○ ZFS File System Overview (Wikipedia) ○ OpenZFS Documentation <p>.....</p>

5.3 Applying ChatGPT to expand teaching content and teaching interaction

Table 3: Examples of teaching content expansion

User input	ChatGPT replies (partial)
Based on the previous training, design a comprehensive experiment that includes multithreaded programming, memory management, and filesystem access. It is convenient for students to master the key technologies of the operating system in practice.	<p>Certainly! Here's a comprehensive experiment that incorporates multithreaded programming, memory management, and filesystem access, aimed at helping students master key operating system technologies.</p> <p>Experiment Overview</p> <p>The goal of this experiment is to build a simple, multithreaded file server that can read files from disk and serve them to multiple clients simultaneously. The server will also implement efficient memory management techniques such as caching to improve performance.</p> <p>Components of the Experiment</p> <ol style="list-style-type: none"> Multithreaded Programming Memory Management Filesystem Access <p>Prerequisites</p> <ul style="list-style-type: none"> • Basic understanding of C/C++ programming. • Familiarity with POSIX threads (pthreads). • Basic knowledge of socket programming and network communication. • Understanding of basic memory management concepts. <p>Step-by-Step Experiment Instructions</p> <p>Part 1: Setting Up the File Server</p> <ol style="list-style-type: none"> Create a Simple TCP Server <ul style="list-style-type: none"> • Use socket programming to create a TCP server that listens on a specified port. • Accept connections from clients. Implement Multithreading <ul style="list-style-type: none"> • Use pthreads to handle multiple client connections concurrently. • Create a worker thread for each client connection. <p>.....</p>

The technology in the field of operating system updates quickly. Using ChatGPT to keep abreast of cutting-edge technology and the latest cases, you can also design challenging and practical projects and experimental tasks according to the course content and teaching objectives. For example, the relevant instructions of the teaching content expansion example and part of ChatGPT's reply are shown in Table 3.

5.4 Feedback and evaluation of teaching effect

ChatGPT is used to generate online questionnaires, real-time voting and classroom discussion to collect students' feedback information on course content, teaching methods and learning effects in real time, and then the students' feedback information is further analyzed to generate detailed feedback reports. ChatGPT is used to design a variety of evaluation forms, such as project tasks, case studies, and online tests. For example, the sample instructions of the online questionnaire for teaching effect feedback and part of ChatGPT's reply are shown in Table 4.

Table 4: Example of Online Questionnaire for Teaching Effect Feedback

User input	ChatGPT replies (partial)
In the course of "Operating System Principles", ChatGPT will be used to assist teaching. Please design a questionnaire to collect students' feedback on the use of ChatGPT.	<p>Certainly! Here's a suggested questionnaire to collect students' feedback on the use of ChatGPT in the "Operating System Principles" course:</p> <hr/> <p>Operating System Principles Course - ChatGPT Feedback Questionnaire</p> <p>Personal Information</p> <p>1. Student ID: (Optional)</p> <p>2. Major:</p> <p>3. Year of Study:</p> <p>Usage of ChatGPT</p> <p>4. How often did you use ChatGPT for this course?</p> <ul style="list-style-type: none"> • Daily • Several times a week • Weekly • Monthly • Rarely • Never <p>5. What were your primary uses for ChatGPT in this course? (Select all that apply)</p> <ul style="list-style-type: none"> • Understanding course material • Getting help with assignments • Clarifying concepts from lectures • Exam preparation • Debugging code • Researching additional resources • Other (please specify): _____ <p>Effectiveness and Satisfaction</p> <p>6. How effective was ChatGPT in helping you understand the course material?</p> <ul style="list-style-type: none"> • Extremely effective • Very effective • Moderately effective • Slightly effective • Not effective at all <p>.....</p>

6. Conclusion

In the process of big data course group teaching, ChatGPT is used to assist teachers in formulating syllabus and teaching plans, enriching teaching resources and designing personalized teaching, implementing teaching interaction and expanding teaching content, and improving teaching feedback and evaluation. The course of "Operating system principle" is taken as an example to practice in order to achieve efficient, intelligent and personalized teaching management. Through the application of ChatGPT, it can not only improve teachers' work efficiency, but also improve students' learning experience and teaching effect, and promote the improvement of the overall teaching quality of big data course group. However, there are also some problems in the practice process. For example, when using ChatGPT to formulate the teaching outline of a single mode, it is necessary to analyze the historical teaching data and student feedback data, but due to the lack of historical data, it is impossible to ensure that the content of the outline is targeted. Therefore, the experience and teaching process data of ChatGPT applied to teaching should be continuously accumulated in future teaching, so as to create more learning

opportunities and resources for students.

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