Exploration and Practice on the Construction of Artificial Intelligence Fundamentals Course for Liberal Arts Majors in Local Universities

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Keywords: Fundamentals of Artificial Intelligence, General Education Courses, Teaching Content, Teaching Methods, Course Evaluation, Liberal Arts Majors

Abstract: With the continuous development of artificial intelligence technology and the deepening of its application fields, it is very necessary to carry out basic education in artificial intelligence among liberal arts students. At present, only a small number of universities in China have offered basic courses in artificial intelligence, and the course content, teaching methods, and evaluation system are all immature. This article takes Foshan University as an example to design, research, and explore the construction of artificial intelligence basic courses for humanities majors from three aspects. Firstly, from the perspective of the course teaching content system, a collection of artificial intelligence basic course teaching content is formed from the concepts and theoretical knowledge related to computer fundamentals, Python programming, artificial intelligence and applications, as well as artificial intelligence application technologies such as text recognition, image recognition, and speech recognition. Secondly, in terms of teaching methods and methods, students' interest in learning can be enhanced by fully utilizing teaching methods such as online resources and open platforms, and constructing an ideal classroom. The third is to focus on daily experiments and construct a curriculum evaluation method suitable for liberal arts students. From the perspective of practical effects, the above methods are generally effective and have received praise from the majority of students. But at the same time, it is also necessary to further improve the design of teaching content and other aspects, so that students can benefit more from this course.

1. Introduction

Foshan University is a local university located in the the Pearl River Delta, with 53 enrollment majors, of which arts majors account for about one-third. The main source of students is Guangdong Province, and students have a relatively good computer foundation. With the continuous development of artificial intelligence and the continuous expansion of application fields, the Ministry of Education issued the "Action Plan for Artificial Intelligence Innovation in Higher Education Institutions" as early as 2018, It is required to incorporate artificial intelligence into the basic computer teaching content of universities, attach importance to the cross integration of artificial intelligence with other disciplines and professional education, and explore the talent cultivation mode of "artificial intelligence+X". Therefore, it is very necessary to carry out artificial intelligence general education in universities. Given the limited total duration of the Computer Fundamentals course, after one year of experimentation in the early stage, our school has chosen "Artificial Intelligence Fundamentals" as an alternative to the "College Computer Fundamentals" course for liberal arts students starting from 2022.

At present, universities in China such as Sanya College[1], Donghua University[2], Hefei University of Technology[3], Shanghai Ocean University[4], Guangdong University of Technology [5], and Beijing University of Aeronautics and Astronautics[6] have offered artificial intelligence general courses for non computer majors, and have gained a lot of experience. However, the vast

  DOI: 10.25236/hecb.2023.016

majority of these courses are aimed at science and engineering majors or school level public elective courses. There are no systematic and complete literature reports on the mandatory artificial intelligence foundation courses that are fully aimed at students majoring in humanities.

From the published textbooks related to artificial intelligence general courses, it can be seen that most of them are appropriately adapted from the professional introductions of artificial intelligence and intelligence science and technology majors, with strong professionalism and theoretical significance. There are significant doubts about their applicability to humanities majors. From the practical aspect, the support environment for artificial intelligence experimental teaching in general education in universities is also relatively lacking.

Overall, due to the short duration and lack of experience in the establishment of AI general courses in domestic universities, there are relatively few related resources, especially for liberal arts majors. Therefore, conducting systematic exploration, research, and practice on the teaching content, teaching methods, and course evaluation methods of artificial intelligence general education courses for liberal arts students has obvious value.

2. Design of Teaching Content for Artificial Intelligence Fundamentals

The total class hours of our university's liberal arts artificial intelligence foundation courses are 48, including 24 classroom teaching and 24 experimental teaching each. When designing content, taking into account the characteristics of liberal arts students, the teaching content focuses on basic concepts and applications, avoiding overly professional knowledge and becoming a professional introduction to artificial intelligence or pure Python programming.

2.1. Design of Classroom Teaching Content

The classroom teaching content consists of four modules, namely: 1) Computer Fundamentals; 2) Python programming; 3) Artificial intelligence application technologies such as text recognition, image recognition, and speech recognition; 4) Concepts and theoretical knowledge related to artificial intelligence and applications.

2.1.1. Computer Fundamentals

The teaching content of this module mainly includes:

(1) Computer composition, such as software, hardware, commonly used peripherals, etc.

(2)The working principles of computers, such as operating systems, networks, etc.

(3) Introduction to common files and software, such as doc, docx, cls, clsx, ppt, pptx, bmp, jpg, pdf, and related software.

The main goal is to review and summarize the information technology knowledge that primary and secondary schools have already learned, and to enhance it on this basis.

2.1.2. Python Programming

The teaching content of the module mainly includes six sections[7].

(1) Introduction to Python. This section includes the development history and characteristics of the Python language, installation and configuration of the Python development environment, variables, operators and expressions in Python, basic input and output, module import and use, etc.

(2) Python basic data types, This section includes the basic types of numbers, basic operations of number types, characteristics of string types, formatting of strings, common methods of strings, etc.

(3) Python selection structures. This section includes single branch selection structures, two branch selection structures, and multi branch selection structures.

(4) Python loop structure. This section includes for statements, while statements, nested loops, and break, continue statements, etc.

(5) Python combines data types. This section includes the concept and characteristics of list types, the creation and operation of list types, the concept and main characteristics of tuple types, the creation and simple operation of tuple types, the concept and main characteristics of set types, and the creation and simple operation of set types.

(6) Python functions, This section includes function definitions, function calls, function parameter passing.

2.1.3. Artificial Intelligence Application Technologies

The teaching content of this module mainly includes three sections[8].

The first section includes the concepts and technical processes of image recognition, video recognition, facial recognition, behavior recognition, and text recognition.

The second section includes speech recognition, speech feature extraction, role evolution of human-machine dialogue systems, voiceprint recognition.

The third section includes the meaning of natural language processing, the definition of knowledge graph, the architecture and application of knowledge graph.

2.1.4. Concepts and Theoretical Knowledge Related to Artificial Intelligence and Applications

The teaching content of this module mainly includes:

(1) The basic concept includes development process, and industrial structure of artificial intelligence.

(2) The basic support of artificial intelligence includes the classification and characteristics of artificial intelligence chips, the core driving forces of artificial intelligence - computing power, algorithms, data, cognitive Internet of Things and AIoT, as well as the concepts and applications of cloud computing and 5G, as well as the collection, annotation, and statistical analysis of artificial intelligence data services.

(3) The industry applications of artificial intelligence mainly include the latest applications of artificial intelligence in various industries, such as smart logistics, smart manufacturing, smart healthcare, smart environmental protection, etc.

2.2. Design of experimental teaching content

A total of 5 experiments were designed for experimental teaching.

Experiment 1(Long Document Layout) includes abstracts, main text, references, and charts arranged according to standard requirements, automatic generation of catalogs, etc.

Experiment 2(Basic data types and operations in Python) includes installing a Python interpreter, running Python programs in both interactive and file formats, writing and running programs according to the experimental instructions, and recording the running results.

Experiment 3(Python Control Structure) includes branch structure and loop structure. Students are required to use the Python integrated development environment and learn to use if…else and if elif else statements to write a dual branch selection structure program according to the experimental guide book. They are also required to use while and for statements to write a loop structure program and record the running results.

Experiment 4(Python functions) requires students to use the Python integrated development environment to define and call functions. The main tasks include understanding the concept of lists and using built-in functions to process lists, understanding the concept of dictionaries and using built-in functions to process dictionaries, using list management to collect information, constructing data structures, using combination data types for text word frequency statistics (using third-party library functions), understanding the usage methods of jieba library and CPCA library, etc.

Experiment 5(Artificial intelligence application) requires students to use Python and Baidu AI platform to develop text recognition, image recognition, and speech recognition applications.

3. Design and Practice of Teaching Methods for Artificial Intelligence Fundamentals

For liberal arts students, too many professional terms related to programming and artificial intelligence can make them feel confused. Using Python for artificial intelligence programming can be both novel and difficult. In the classroom, we use methods such as building and utilizing online teaching resources, selecting teaching cases[9], and showcasing programming processes based on multimedia environments to build an ideal classroom for students to gradually understand the idea

of programming. In the experimental stage, we combine experiential programming with autonomous programming to help students experience the joy of programming and reduce their fear of difficulty.

3.1. Programming Process Presentation Based on Multimedia Environment

We avoid directly presenting complete algorithms and programs to students in the classroom. Instead, we first use the process of "proposing problems--->analyzing problems--->proposing preliminary algorithms--->refining algorithms" to provide problem-solving methods. Then, we fully utilize the advantages of multimedia teaching environment to write programs step by step in a real programming environment, providing students with a real "from scratch, from simple to complex" programming experience, and fully provide students with time and space for reflection.

For beginners, even with a clear algorithm, writing a program is still a difficult task. So, in the actual process of programming, first write the basic and simple ones, and then gradually improve them. For example, the input and output can be written out first, and the intermediate processing can be gradually supplemented, dividing a problem into several levels and solving them layer by layer. This method is actually similar to a top-down, step-by-step refinement method. Although the examples of classroom teaching may seem simple, they are still too complex for beginners and require further refinement.

Let's take the definition of prime judgment functions as an example to describe the method we adopted in class.

Case: By defining and calling functions, one program to print out all prime numbers between 200 and 300 should be written.

Step 1: The first step is to solve the problem of determining whether a number is prime. You can write a program that inputs a number to test whether it is a prime number.

Step 2: Then you can abstract the function of determining whether a number is prime and encapsulate it into a function. This function is called in the program and tested by an input number. Note that students here are often confused and unable to make appropriate abstractions. A considerable number of students consider the range of 200 to 300 as a factor when defining functions, rather than just judging a single number.

Step 3: By calling a custom function, the program output all prime numbers between 200 and 300.

3.2. Case Based Experiential Learning

Cultivating students' innovative and creative abilities requires practical training. The practical teaching process of the artificial intelligence foundation course we designed can be generally divided into three levels: the first level is based on theoretical teaching content, mainly allowing students to complete relevant practical content according to the requirements and steps in the experimental guide book, which is called "drawing gourds according to the model", which is very necessary for beginners; The second level is based on higher theoretical teaching, where students independently complete the programming; The third level is integrated with students' majors, and practical projects are carried out that combine the characteristics of liberal arts majors, such as writing programs to draw the "14th Five Year Plan" and "Report of the 20th National Congress of the Communist Party of China" word clouds. The combination of these three levels can promote students to use computational thinking, solve problems in thinking, verify problems, innovate and test their thinking, and gain insights.

The knowledge system of artificial intelligence is vast, and the implementation process of some common intelligent systems is relatively complex. As a general education course for liberal arts majors, a large amount of technical content cannot provide in-depth explanation of principles and practical teaching and training from scratch. Combining third-party libraries such as Baidu AI open platform, we adopt experiential learning to open up students' thinking and expand artificial intelligence thinking. Through third-party libraries, animal recognition, plant recognition, paper currency recognition, speech recognition, text recognition, etc. can be achieved with a small amount of programming, experiencing the application scenarios and effects of artificial intelligence; In

addition, combined with common application cases, video resources are used to introduce the application background, algorithm ideas, and processing flow, allowing students to experience the powerful capabilities of artificial intelligence systems. At the same time, their shortcomings and areas for improvement are also identified.

4. Design and Practice of Evaluation Methods for Artificial Intelligence Fundamentals

The overall evaluation score of the artificial intelligence foundation course consists of experimental scores and final exam scores, with a ratio of 50% and 50%. The experimental scores are mainly composed of five experimental scores: long document layout, Python basic data types and operations, Python control structure, Python functions, and artificial intelligence basic experiments (including experimental reports). Based on student classroom performance evaluation, each part accounts for 10%, 10%, 20%, 20%, and 40%.

The final exam will be conducted using an online exam platform for closed book exams. The examination system extracts A, B, C, and D sets of test questions from the question bank based on the paper formation plan, and uses different test papers for different sessions. In the paper composition plan, the composition of the test questions is: 45 points for single choice questions; 25 points for multiple choice questions; True or false questions score 20 points; Fill in the blank question for 10 points. The key test is to assess students' mastery of the basic knowledge of Python programming and artificial intelligence applications, as well as their ability to apply the knowledge they have learned to solve problems. The difficulty level of the test questions is moderate, and a certain proportion of the questions are evaluated flexibly using comprehensive and improving knowledge, with knowledge points covering the teaching syllabus.

5. Implementation Effect of Curriculum Construction

To test the effectiveness of course construction and implementation, we conducted a questionnaire survey on students.

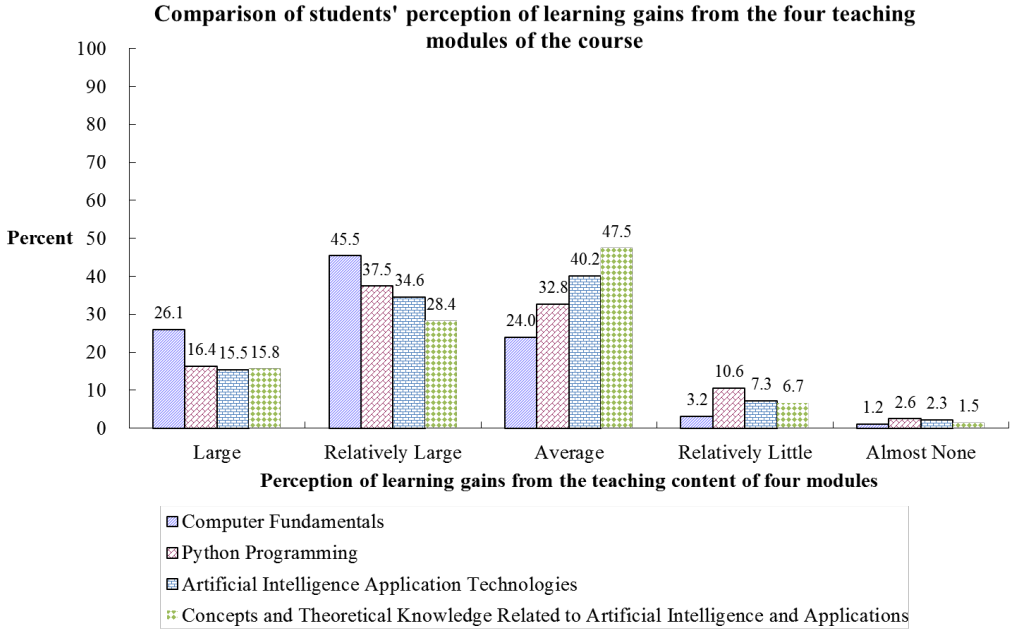

Figure 1 Perception of gains in four teaching modules.

A total of 341 valid questionnaires were collected through online and anonymous means. The questionnaire has multiple questions regarding the evaluation of course learning, and due to space limitations, it is not possible to provide all the results of the questionnaire in this article. Figure 1 shows students' perception of learning gains for the four teaching modules of the course. From the figure, it can be seen that 71.6%, 53.9%, 50.1%, and 44.2% of the four modules of teaching content,

including computer fundamentals, Python programming, text recognition, image recognition, speech recognition (artificial intelligence application technology), and concepts and theoretical knowledge related to artificial intelligence and applications, respectively, believe that they have gained a lot and a relatively large amount, while 4.4%, 13.2%, 9.6%, and 8.2% believe that they have gained little or almost no, respectively. From it, it can be seen that compared to practical content, students gain relatively less from theoretical content.

6. Conclusion

This article has conducted preliminary design, practice, and exploration on the teaching content, teaching methods, and evaluation system of artificial intelligence basic courses for liberal arts majors. The expected results have been achieved, but there is still significant room for improvement. The next step will be to further optimize the teaching content and add content on generative AI, artificial intelligence ethics, and legal aspects. Simultaneously the experimental environment should be improved to make it easier for students to experience and utilize the powerful capabilities of artificial intelligence.

Acknowledgements

This article is one of the phased achievements of the Computer Basic Education Teaching Research Project (No. 2022-AFCEC-254) of the Association of Fundamental Computing Education in Chinese Universities. The work of this article was completed through the unity and collaboration of all teachers in the Department of Artificial Intelligence. We would like to express our gratitude to all teachers.

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