The Exploration of Artificial Intelligence (AI) Empowering Food Chemistry Curriculum Design and Teaching

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Abstract: The rapid development of artificial intelligence（AI） technology has brought innovative opportunities to the field of education. The technical advantages of AI in data processing, pattern recognition, virtual simulation and other aspects provide new ideas for food chemistry curriculum design and teaching practice to break through the shackles of traditional teaching mode. Food chemistry course is an important professional basic course for food science and engineering, food safety and quality. Exploring the design and teaching of the food chemistry course enabled by AI is not only the inevitable trend of digital transformation of education, but also the internal demand of discipline development. It can greatly improve the efficiency of knowledge transfer and optimize the experimental teaching conditions, so as to cultivate more professionals with interdisciplinary vision for the intelligent transformation of food industry. This paper focuses on the deep integration of AI technology and food chemistry teaching, and constructs an intelligent food chemistry course design framework by adapting the four key technologies of natural language processing, machine learning, computer vision and knowledge graph.

Keywords: artificial intelligence, food chemistry course, teaching design

Introduction

The Outline of the Plan for Building a Powerful Country in Education (2024-2035) clearly states that it is necessary to " promote AI to help education reform, " " face the digital economy and future industrial development, strengthen the reform of the curriculum system, and optimize the setting of disciplines and specialties. It points out a new direction and provides a new scheme for the teaching reform of food chemistry course under the background of the new era. Food chemistry is a compulsory core course for food science and engineering, food safety and quality. The teaching content covers multidisciplinary knowledge such as chemistry, biology and engineering. In the teaching of food chemistry course under the traditional teaching mode, students often find it difficult to quickly establish systematic cognition due to problems such as insufficient visualization of molecular structure and limited experimental equipment conditions. In addition, with the rapid iteration of modern food industry technology, the contradiction between the lag of textbook update and the disconnection of industrial demand is increasingly highlighted in the design and teaching of food chemistry course[1]. The AI-enabled food chemistry curriculum design and teaching practice can break through the original standardized teaching restrictions in the process of intelligent algorithm analysis of learning behavior and construction of dynamic knowledge network, and realize personalized knowledge push and precise learning support in food chemistry courses. At the same time, it can also make up for the lack of practical resources in teaching with the help of virtual

experimental environment, and strive to cultivate students ' interdisciplinary thinking ability to solve complex engineering problems.

1. Adaptability analysis of AI technology in food chemistry curriculum design

1.1 Natural Language Processing (NLP)

In the theoretical teaching design of food chemistry course, NLP mainly relies on the intelligent question answering system supported by NLP to realize the real-time processing of professional questions raised by students. Whether it is the complex concept of food composition analysis principle or the principle involved in chemical reaction mechanism, the intelligent question answering system supported by NLP can accurately identify the core of the problem through semantic analysis, and extract matching answers from the structured knowledge base on this basis[2]. The instant interactive experience brought by natural language processing (NLP) to the teaching of food chemistry course will greatly reduce the workload of teachers ' repeated answering questions, and students can find the answers to the difficult problems encountered in learning at any time.

1.2 Machine learning (ML)

ML adopts the continuity of learners ' interactive data, test performance and knowledge mastery trajectory, and constructs the learner 's feature portrait based on this, which can realize the accurate prediction of students ' weak links in the study of food chemistry course driven by data, so as to intelligently screen the learning materials with the highest matching degree in the food chemistry course resource library, quickly establish a dynamic evolution of personalized learning path, help students to check and fill in the gaps, improve the learning effect, and truly realize the " teaching students according to their aptitude " under the empowerment of artificial intelligence.

1.3 Computer Vision (CV)

The main advantage of CV technology in the course design and teaching of food chemistry is its non-contact image analysis ability, which will provide more intuitive technical support for food composition analysis, process monitoring and quality evaluation. Whether it is visual analysis of food microstructure or dynamic monitoring of processing process, it will greatly reduce the experimental operation threshold of undergraduates and enhance the interpretability of the results. At the same time, it will also transform the traditional detection method relying on chemical reagents into a visual analysis process.

2.The teaching design framework of AI-enabled food chemistry course

2.1 Theoretical teaching module

Based on ML, the course content is dynamically updated, and the NLP technology is used to generate the ideological and political case library.

Based on the systematic analysis of the technological development of the food industry, the academic research progress and the trend of students ' knowledge mastery, the ML model will be able to automatically identify the ' lagging ' content in the current food chemistry course teaching, and dynamically update the new achievements such as the research of new food additives and the iteration of food safety detection technology in the industry to the food chemistry course resource library, without teachers and students actively recommending relevant literature[4]. The ideological and political construction of food chemistry course is an important practice to realize the integration of value shaping, knowledge

imparting and ability training in food science and engineering specialty. NLP technology will be able to extract appropriate ethical issues from the latest food industry news, policies and regulations and enterprise practice, and combine it with food chemistry professional knowledge to automatically generate teaching cases, guide students to learn professional knowledge, and also build a value judgment framework for technology application in their minds.
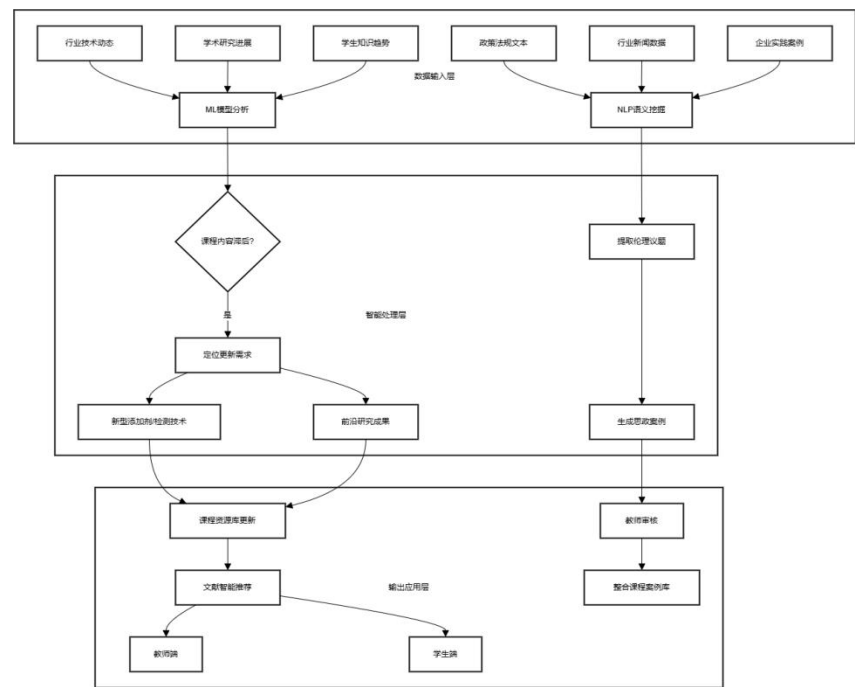

Fig 2.1 Flow chart of AI-enabled food chemistry course dynamic update and ideological and   political case generation system

NLP supports real-time question answering and learning difficulty diagnosis, and builds an adaptive learning platform.

The construction of intelligent teaching system supported by NLP can realize the analysis of the text data generated by students in the discussion area, homework feedback and online test on the online platform, so as to accurately identify the blind area of group knowledge and individual cognitive impairment, and promote supplementary teaching resources for students in need[5]. At the level of personalized support, the intelligent question answering engine can answer all kinds of problems encountered by students in the learning process in real time, and guide students to think deeply through questioning dialogue, which will greatly improve students ' learning effect and autonomous learning ability. The adaptive learning platform constructed on this basis will form the core framework of data layer, algorithm layer and application layer, that is, the data layer integrates authoritative textbooks, scientific research papers and industry standards in the field of food chemistry. The algorithm layer uses deep neural network to optimize the semantic matching model to achieve accurate mapping of knowledge points and problems. The application layer provides personalized learning path recommendation through the interactive interface.

2.2 Using CV and VR technology to simulate food processing and composition analysis experiments.

Based on the image recognition and component analysis system of CV technology, the microstructure changes of food components during the experiment can be captured and observed by students, especially in various lipid oxidation or protein denaturation experiments, which has higher application value. In the aspect of food processing simulation in the course of food chemistry, based on the integration of three-dimensional modeling and physical engine technology based on VR platform, the influence of different processing parameters such as temperature, pressure and pH value on food texture will be presented in a more intuitive form in front of teachers and students. The intelligent detection module driven by CV in the course of food chemistry will be able to directly replace the traditional chemical titration method and greatly

improve the efficiency and safety of students ' operation experiments. In addition, the use of CV and VR technology to simulate food processing and component analysis experiments will also provide students with more opportunities and platforms to participate in high-risk experiments such as high-temperature and high-pressure sterilization and the use of toxic reagents, and provide a new development direction for the intelligent and green transformation of food chemistry experiment teaching.

2.3 AI algorithm tracks learning behavior and realizes personalized learning path planning

The learning behavior analysis system of food chemistry course driven by AI will realize the systematic integration of interactive logs, experimental operation records, test scores, resource access duration and other data on the online learning platform, and build a learning behavior portrait for students. Through the integration analysis of ML algorithm, it can accurately evaluate the cognitive style and ability development stage of each student in the course. Based on this, the online learning platform will automatically generate a personalized learning roadmap for students, that is, for some students with weak spatial imagination ability, the system will give priority to strengthening the learning weight of molecular structure visualization resources. For those who have difficulties in analyzing experimental data, we will focus on pushing the data processing method guidance module to realize ' teaching students in accordance with their aptitude ' under AI empowerment, which will also effectively promote the teaching quality and effect of food chemistry course.

Conclusion

Under the background of the deep penetration of artificial intelligence technology into the field of education, the teaching reform of food chemistry course empowered by artificial intelligence (AI) needs to realize the support of data-driven precision teaching on the basis of retaining the core of food science and engineering courses, and further explore the teaching mechanism of human-computer cooperation. On the premise of ensuring the reliability of AI technology, the cultivation of students ' critical application ability of intelligent tools should be carried out in all aspects of course teaching, so as to finally realize the organic unity of technology empowerment and educational essence.

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