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Role Orientation and Functioning of Artificial Intelligence in the Professional Development of University Teachers

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Abstract: In recent years, under the auspices of technological development, artificial intelligence technology has penetrated into various industries, such as healthcare, industry, energy and even education. For the penetration of the education field, artificial intelligence has changed the teaching mode, teaching management, and brought unprecedented opportunities for the professional development of teachers. This paper explores the role positioning and function play of AI in the professional development of university teachers, with the goal of promoting the modernized university teacher team, after analyzing the role positioning of AI technology in the professional development of university teachers, researching the function play strategy of AI technology in the professional development of university teachers, and mentioning the limitations and challenges of AI in the professional development of teachers, teachers' role changes and It also mentions the limitations and challenges of AI in teachers' professional development, teachers' role transformation and competence requirements, so as to further improve the framework of AI's promotion of teachers' professional development in universitys and universities, and to strengthen the foundation of teachers' development in universitys and universities in China with the help of AI technology, so as to provide a "big country's good teacher" for high-quality higher education and promote the modernization and high-quality transformation of higher education in China.

Keywords: Artificial Intelligence; University Teachers; Professional Development; Role Orientation; Functioning.

1. Introduction

The application of artificial intelligence in today's education industry has gradually manifested more and more profound and far-reaching value, especially for the professional development of the teaching community, has occupied a pivotal position. On the one hand, AI technology provides highly personalized teaching tools for teachers, which can help teachers analyze student data and accurately identify each student's learning progress, interest, and even weaknesses, thus supporting teachers to develop more accurate, personalized, targeted teaching programs and assessment systems, effectively alleviating the problem of teachers' difficulty in realizing the full range of attention to students in traditional teaching. On the other hand, from the perspective of teachers' professional development, AI technology will create a new education model for teachers, providing them with rich and specialized educational materials and management methods, further liberating them and helping them to free themselves from cumbersome administrative affairs and focus their energy on educational research and innovation.

2. Overview of Artificial Intelligence Technology

2.1. Definition of Artificial Intelligence Technology

Artificial Intelligence is a branch of computer science that is based on the creation and study of systems and algorithms that simulate, extend, and expand human intelligence and wisdom. Artificial Intelligence technology usually involves machine learning, natural language processing, computer vision, and other fields, and the core purpose of each technology is to enable computer technology to perform the traditional dimensions of human intelligence to think and deal with tasks, such as reasoning, learning, problem analysis and solving, perception, and the understanding of language, and so on.

2.2. Key Artificial Intelligence Technologies

2.2.1. Machine Learning

Machine learning comes under the umbrella of data-driven algorithms that allow computer systems to achieve continuous improvement in performance on specific tasks. The basic principle of machine learning is to extract patterns and knowledge from a large amount of data, and subsequently apply the various patterns to a whole new population of data. Machine learning algorithms can be divided into three main categories, namely supervised learning, unsupervised learning, and reinforcement learning. Among them, the supervised learning principle is to utilize the labeled data to achieve training, prediction and classification work on brand new data. Unsupervised learning, on the other hand, does not require labeling of the data and its function is mainly used to discover hidden structures within the data.

2.2.2. Natural Language Processing

Natural Language Processing (NLP) is the study of the interaction between computers and human (natural) language. The core principle of natural language processing is to enable computers to understand, parse and synthesize natural language text or speech. Natural language processing technology involves a variety of techniques and methods, including syntactic analysis, semantic analysis, contextual

understanding, generative modeling, etc., which can realize text classification, sentiment analysis, machine translation, question and answer system, speech recognition and other tasks.

2.2.3. Computer Vision

Computer vision is a technology specialized in image processing that can "see" and understand images and video content. The basic principle of computer vision is to use algorithms and models to automatically extract high-value features and information from visual data, so as to realize a series of tasks such as image recognition, object detection, image segmentation, etc. (Yan Zhang, Tao Lv, Shuangru Xue, 2024).

3. The Role Positioning of Artificial Intelligence Technology in the Professional Development of University Teachers

In the field of professional development of university teachers, the role positioning that AI technology can play, including auxiliary role, guiding role, personalized education role, data support role.

3.1. Supporting Role

Under the perspective of auxiliary role, AI technology can support teachers to realize efficient and precise execution and management work in teaching, research and self-improvement through various tools and applications. First, AI-driven intelligent teaching assistants can realize automatic correction of student assignments, course content management, and generation of teaching resources, freeing teachers from heavy and repetitive tasks, so that they can devote more energy to teaching design and teaching innovation. Secondly, the intelligent recommendation system, which can provide teachers with personalized academic resources and teaching case materials, helps teachers to quickly obtain the latest research results and teaching tools for their courses, and realizes the improvement of teachers' own professional knowledge and level.

3.2. Guiding Role

Under the guidance perspective, first, AI technology can help teachers design and develop the teaching content of courses based on computational models, and guide teachers to realize scientific teaching. Secondly, AI technology can guide the change of teachers' educational concepts, and through innovative technologies such as virtual labs, intelligent simulations, and immersive learning environments, AI can change the traditional teaching mode and make teaching more vivid and interactive.

3.3. Personalized Education Role

Under the perspective of personalized education, AI technology can help teachers customize personalized teaching programs by analyzing learning behavior and learning preferences. Under this process, AI algorithms process and analyze a large amount of learning data to identify the strengths and weaknesses, points of interest, and learning habits of each student, and subsequently generate targeted learning plans. The interpretation of this role enables teachers to more accurately design teaching content and tutoring plans to meet the learning needs of different students and achieve personalized education.

3.4. Data Support Role

In terms of data support, AI can provide teachers with in-depth insight and decision-making support through big data analysis, machine learning and other technologies, and conduct in-depth analysis of a series of learning-related data such as students' test scores, classroom performance, and completion of homework, and then generate a detailed and comprehensive analysis report to help teachers understand the effectiveness of teaching, the degree of students' knowledge mastery, and their individual learning ability. Based on the above data, teachers can make targeted teaching adjustments to optimize the curriculum and teaching methods. At the same time, AI technology can also be based on data analysis to identify potential teaching problems and student learning obstacles, and provide teachers with preventive measures to improve teaching efficiency (Zheng Yonghe, Wang Yiyan, Yang Shuhao, 2024).

4. Functioning of Artificial Intelligence Technology in the Professional Development of Teachers in Universitys and Universities

4.1. Application of Intelligent Teaching System in Teachers' Professional Development

At present, the support of intelligent teaching system of universitys and universities based on artificial intelligence for the professional development of university and university teachers mainly focuses on teaching resource management, automated assessment, and intelligent teaching assistant.

4.1.1. Teaching Resource Management

Teaching resource management dimension, the system can use machine learning algorithms to automatically classify and label the teaching resources uploaded by teachers, and combine the teaching style of teachers and student feedback data to provide integration and recommendation of teaching resources. For example, the intelligent teaching system can use collaborative filtering algorithms to identify teaching materials in the database based on teachers' and students' historical use data of teaching resources, saving teachers' time and energy in the process of teaching work. Through NLP technology, the intelligent teaching system can understand and process different types of text and multimedia teaching materials, so as to improve the accuracy and search efficiency of teaching resources retrieval (Lan Guoshuai,Du Shuilian,Xiao Qi,et al,2024).

4.1.2. Automated Assessment

In the dimension of automated assessment, the intelligent teaching system can automatically correct assignments and exams through CNN-Convolutional Neural Network and RNN-Recurrent Neural Network in the field of deep learning, and at the same time analyze the textual content of the students' answers in combination with the exam results to form detailed feedback information and grade reports.

4.1.3. Intelligent Teaching Assistant

Intelligent teaching assistant has been applied to a variety of artificial intelligence technologies, and the most widespread and popular technology is focused on the ChatGPT model, which can play the role of teaching assistant in the virtual classroom with its powerful natural language understanding and generative capabilities, and quickly respond to a variety of teaching scenarios through pre-training

and fine-tuning technology to realize rapid feedback of answers to questions for both teachers and students (Wu Main, Guo Qing, 2024). Guo, Q., 2024).

4.2. Application of Personalized Recommendation and Coaching in Teachers' Professional Development

4.2.1. Principle and Method of Personalized Recommendation and Counseling

In the professional development of teachers in universitys and universities, personalized recommendation language tutoring, aimed at combining a variety of artificial intelligence technologies to help teachers carry out personalized needs of students to accurately locate and tutor, this process mainly involves data mining technology, machine learning algorithms, natural language processing (NLP) technology.

(1) Data Collection

In the data collection phase, the intelligent learning system collects and processes various types of student data, covering class attendance, homework submission, test scores, and online learning behavior. During the data collection period, the system will realize data cleaning and transformation through the ETL (Extract→Transform→Load) process, and load the data into the data warehouse. The information warp in the data warehouse, after preprocessing and feature engineering, provides support for model training and analysis.

(2) Data Mining

On the basis of completing data collection, the system uses data mining technology to implement in-depth analysis of students' learning records and behaviors. This step usually uses cluster analysis, classification models, association rule mining and so on. For example, based on clustering analysis, students are divided into different groups, and each group has similar learning behaviors and knowledge needs. Classification models, which are mainly responsible for predicting students' learning performance, help teachers identify potential students with learning difficulties (Yuxin Song,Ziyi Li,Ning Ding, 2024).

(3) Teaching and tutoring content matching

Under the teaching and tutoring and content matching link, the machine learning model is mainly used as the core. Under this process, the system uses two recommendation algorithms: collaborative filtering and content filtering. Among them, collaborative filtering, the atmosphere is user-based collaborative filtering, item-based collaborative filtering. User-based collaborative filtering aims to recommend resources and revision materials that match their habits by finding groups of students with similar learning habits. Item-based collaborative filtering, on the other hand, will recommend materials that match the students' past learning content based on their past learning records. Content filtering is responsible for analyzing the feature vectors of learning resources and students' needs to achieve matching of teaching and tutoring materials, and recommending teaching and tutoring contents suitable for students.

(4) Intelligent Tutoring and Suggestion

Intelligent tutoring and suggestion session, the system will be based on NPL natural language processing for problem analysis and feedback. In the teaching process, when teachers and students phase the system to input text content, NPL will process the text with segmentation, lexical annotation, named entity recognition, etc., and then input the pre-processed information into the deep learning model to carry out emotion parsing, semantic understanding, and accurately understand the question content and needs, as well as question-based responses and student-oriented tutoring suggestions (Wu Hejiang,Wu Mian, 2024).

4.2.2. Application Cases of Personalized Recommendation and Tutoring in Teachers' Professional Development

The application of personalized recommendation language tutoring in teachers' professional development, taking the university Ethics and the Rule of Law (2023 Edition) as an example, mainly focuses on the four links of data collection, data mining, matching of teaching and tutoring content, and intelligent tutoring and advising.

(1) Data Collection

In the data collection section, the intelligent learning system integrates students' learning data with the school's LMS-Learning Management System, online classroom interaction platform, post-class assignments and test scores, and also collects students' classroom participation, discussion activity, and learning feedback, which is stored in the database based on the data preprocessing of the ETL process, and is used to support the subsequent training of the model.

(2) Data Mining

Under the data mining solution, the intelligent learning system extracts high-value information through in-depth analysis of the collected data, identifying students' mastery and learning patterns on different knowledge points in the learning stage of the Ideology, Ethics and the Rule of Law course. For example, based on the classification algorithm, students are categorized into learning types such as excellent performance, average performance, learning difficulties, etc. Based on the classification results, the system helps teachers to formulate teaching plans in a more targeted manner and promotes the improvement of teaching accuracy. At the same time, based on data mining, the system provides teachers with potential difficulties and problems in the learning of ethics and rule of law classes, warning teachers to intervene in learning in advance.

(3) Teaching and counseling content matching

Based on the results of data mining, the system provides teachers with customized teaching and tutoring for different types of student groups. For example, for students with strong comprehension but poor learning initiative, the system recommends more challenging and attractive teaching cases for teachers. For students with incomplete knowledge, the system provides teachers with more detailed teaching and counseling materials. This kind of content matching, on the basis of improving the learning efficiency of students, can help teachers achieve the best teaching results in the limited classroom time, and this process, the teacher through the interaction with the AI system, can continue to optimize the recommended teaching, tutoring content, and promote the continuous improvement of the teaching content system.

(4) Intelligent Tutoring and Advice

Intelligent Tutoring and Suggestions session, the intelligent learning system will help teachers analyze learning feedback information in real time based on NPL-Natural Language Processing, machine learning technology, and provide intelligent tutoring and suggestions. In the course of "Ethics and the Rule of Law", when a student repeatedly makes mistakes in a certain knowledge point, the system automatically generates targeted counseling materials and suggestions, which help the teacher carry out counseling in the right direction and perspective, and encourage students to

deepen their understanding of knowledge. For teachers, the real-time data analysis and intelligent suggestions provided by the system can not only reduce the burden of repetitive work, but also provide teachers with ideas on the direction of teaching improvement in the face of students' difficulties, which will inspire teachers to make continuous progress and enhance their professionalism in a sustainable manner.

5. Functional Optimization of Artificial Intelligence Technology in the Professional Development of Teachers in Universitys and Universities

5.1. Limitations and Challenges to Address in Technology Application

5.1.1. Inadequacy of Technology Application

Although the current artificial intelligence technology in the professional development of teachers in universitys and universities has achieved remarkable results, comprehensively promoting the reform of teachers' professional development and the implementation of teaching and learning work, data privacy issues, technical dependence on the conflict of peer autonomy, is still the main problem that prevents artificial intelligence technology from promoting the professional development of teachers.

On the one hand, large-scale data collection, processing, and analysis are the basis of intelligent teaching systems, but this mechanism also raises data privacy and ethical issues for students and teachers. Students' learning behaviors, grades, and even personalized tutoring data are all sensitive information that may lead to privacy leakage if not handled properly. In addition, for teachers, their teaching effectiveness and professional development data also face the same problem. If the data cannot be properly protected, once abused or leaked, it may affect the teachers' professional reputation and work motivation. On the other hand, excessive technological dependence is a problem that some university teachers have already demonstrated. Excessive reliance on AI technology will conflict with teachers' professional development autonomy, gradually causing teachers' own teaching ability and scientific research ability to decline, and even though AI technology is able to effectively simulate human thinking and intelligence, bias may still occur in some special cases. At this moment, if teachers lack professional judgment and educational intuition, it will have a serious impact on the teaching effect (Zheng Yonghe, Zhou Danhua, Zhang Yonghe, et al., 2023).

5.1.2. Limitations of Technology Application and Coping Strategies

One of the fundamental causes of the above data privacy problems and technical problems since the transition of teachers is that schools attach great importance to the value of artificial intelligence for the professional development of teachers and the reform of the teaching system, and they have tapped into the advantages of artificial intelligence technology in depth, while ignoring the construction of the school's information security system, which has led to a large amount of data operation based on artificial intelligence, and is unable to guarantee the protection of the factors of teachers and students. Secondly, teachers in the long term with the help of artificial intelligence technology to assist teaching period, gradually ignored their own education intuition, professional judgment ability to protect and cultivate, in the long run may lead to the teacher teaching stage of decision-making mechanization, the teaching process under the initiative, creativity will gradually disappear.

To address the above problems, for one thing, schools should establish a full-dimensional data security system. During the introduction of AI to assist teachers' professional development, universitys and universities should formulate strict data privacy policies and utilize advanced encryption technologies and multi-layer protection mechanisms to protect the security of teachers' and students' data during collection, storage, and analysis. In addition, schools should regularly carry out data security audits and risk assessments to identify and resolve potential loopholes in a timely manner, create a strict data processing authority mechanism, and ensure that data are only used for legitimate and necessary educational research and teacher professional development assistance. Second, schools should strengthen teachers' ideological and political education and psychological counseling in order to avoid their over-reliance on AI technology. In the implementation stage, schools can regularly organize teachers to participate in ideological and political education activities to improve their political awareness and professionalism, and enhance their self-regulatory ability and sense of professional mission. At the same time, psychological counseling and support is provided for some teachers who rely on AI technology to help them maintain a positive mindset in the application of AI technology, avoid anxiety and pressure at the psychological level, and ensure that they continue to engage in self-study and improve their knowledge structure while rationally using AI to assist in their personal professional development (Yu Nanping,Zhang Yiran, 2023).

5.2. Teacher Role Transformation and Competency Requirements

5.2.1. Challenges of Teacher Role Transformation

In the context of AI-assisted professional development, teachers need to change from traditional instructors to knowledge guides and coordinators. This role change requires teachers to frequently research the use of AI technology in addition to upholding conventional teaching methods and competencies. However, many teachers have varying degrees of difficulty in adapting to technology and upgrading their skills, leading to resistance to or dependence on the use of AI technology. To meet this challenge, for one thing, universitys and universities should strengthen teachers' AI technology training and provide systematic AI application training courses so that they can effectively master basic technology operation and application skills. At the same time, the school can set up a professional technical support team to solve all kinds of difficulties and problems in the process of teachers' use of AI in a timely manner, so as to enhance teachers' confidence and proficiency in AI technology. Secondly, teachers need to learn to adjust their psychology and role positioning to better adapt to the new teaching environment and professional development mode. In this regard, schools can regularly organize teachers to participate in psychological counseling, career planning activities, the correct career view of the teacher group, to enhance their adaptive capacity to deal with role changes. In addition, the school should build a cooperation and communication platform for teachers to promote experience sharing and common progress among teachers, so that teachers can realize self-improvement in

mutual learning (Yang Zongkai, Wang Jun, Wu Jian, et al., 2023).

5.2.2. Changes in Teacher Competency Requirements

Under the process of promoting teachers' professional development based on AI, the new professional development model not only puts forward excellent professional competence for teachers, but also puts forward the competence of material integration and digital material judgment together. Material integration ability, that is, teachers need to have the ability to collect and integrate a variety of resources, including textbook resources, online course resources, network teaching resources, etc., to realize the seamless integration of resources, AI curriculum design ability, that is, the ability to use AI to create a reasonable education system in teaching, and to give full play to the advantages of AI technology to promote their own professional development and the continuous improvement of the curriculum system. The ability to judge digital materials, i.e., after AI provides personalized teaching and tutoring materials, teachers need to be able to judge the accuracy, practicability and reliability of the materials to ensure that the digital resources can effectively support the improvement and reform of the teaching mode.

In response to the above changes in competency requirements, in order to ensure that AI technology promotes teachers' professional development with high quality. First, schools should provide teachers with training courses on teaching resource management, which cover resource collection, resource screening, and resource integration, in order to effectively improve the ability to integrate and analyze resources. Second, teachers themselves should continue to improve their own digital literacy, improve their ability to assess and recognize various teaching materials, and if necessary, participate in professional AI education training to ensure that the quality of AI recommended materials is accurately identified in the teaching process (Torrey Hall, Li Siqi, Sun Bo, 2023).

6. Conclusion

To sum up, this paper carries out research on the role and function of artificial intelligence in the professional development of university teachers, pointing out the four major roles of artificial intelligence for the professional development of university teachers, namely, assistance, guidance, personalized education and data support, and then discussing in depth the specific application strategies of the intelligent teaching system, personalized recommendation and counseling in the professional development of university teachers. In the new era, to enhance the core competitiveness of university teachers, the implementation of high-quality professional development, we must make full use of artificial intelligence technology to carry out teaching, and master the various application paths of AI technology in order to improve the efficiency and effectiveness of teaching. However, in universitys and universities, but with the help of AI technology, should also objectively recognize the current shortcomings of artificial intelligence and the new teaching, professional development mode of the role of the teacher, the ability to put forward the requirements, through the effective protection of data, teacher group counseling combined with the teacher's self-improvement of personal qualities, to truly give full play to the value of AI technology in the field of professional development of teachers, so that higher education adapted to the needs of the new era of education.

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