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Construction and Application of Personalized Teaching Models in Universities Supported by Artificial Intelligence

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Abstract: The application of artificial intelligence technology in university education and teaching has placed various professional disciplines at a new historical starting point. It holds the promise of innovation, the construction of new educational models and forms, and the realization of modern and high-quality development in higher education. Exploring the construction of personalized teaching models in universities supported by artificial intelligence, enriching relevant teaching content and methods, and achieving the generation of personalized student profiles, customized learning resources, selection of practical activities, and intelligent learning feedback are worthy of in-depth exploration and practice. Given this, this paper explores artificial intelligence technology and personalized teaching concepts, and proposes several feasible and effective teaching strategies to address the prominent issues in current higher education, hoping to provide more references for front-line educators.

Keywords: Artificial intelligence; Universities; Personalized teaching models; Problem analysis; Construction strategies

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1. Introduction

Based on the support of artificial intelligence technology and platforms, how to innovate personalized teaching models is a question that relevant educators and administrators should consider. Currently, there are numerous problems in higher education, and the educational situation is not optimistic. There are still issues such as outdated teaching concepts, single and rigid teaching models, inadequate infrastructure, a lack of teachers' information literacy, and the neglect of students' differences, which have reduced the teaching effectiveness and quality. To create a personalized teaching model, it is necessary to deeply reform teaching. Technical applications should be incorporated from the initial stage of talent cultivation planning, and a new personalized teaching model should be developed from the inside out and from the shallow to the deep, to construct an efficient and high-quality higher-education talent-cultivation system [1].

2. Overview of artificial intelligence technology and personalized teaching concepts

Artificial intelligence (AI), one of the most cutting-edge and popular technologies, is influencing the global economy, society, and culture at an unprecedented speed. By combining machine learning with computer language, it can perform various human-like operations beyond human accuracy and speed, bringing unprecedented changes and opportunities to the development of various industries, including the education sector. Specifically, artificial intelligence supports the construction and application of personalized teaching models in universities. With corresponding basic equipment and facilities, it can directly provide teaching support. Through relevant technology platforms, it can integrate data, analyze teaching and learning situations, and form strong teaching feedback, offering new solutions for the personalized and modern construction of higher education. In the future, the application of this technology will further expand, promoting the construction of personalized teaching models in higher education and the transformation and upgrading of the education field [2].

Personalized teaching adheres to the principles of students' subjectivity and individuality, with the fundamental goal of promoting the optimal development of each student. It implements adaptable and precise education. It breaks through the traditional education model, moving away from the single-centered teaching model focused on teachers or teaching progress, and towards a more diverse, inclusive, and student-centered teaching approach. Therefore, relying on artificial intelligence technology and platforms and paying attention to students' differences in learning styles, interests, hobbies, and ability levels can fundamentally ensure the quality and effectiveness of personalized teaching. On this basis, reasonable stratification of teaching objectives, teaching activities, teaching evaluations, and assignment designs allows students at different levels to have corresponding learning and assignment tasks, making up for their weak knowledge points and improving their practical abilities and comprehensive qualities, which serves multiple purposes [3]. In other words, personalized teaching creates an exclusive learning path for each student, helping to tap into their inner potential and implement personalized and modern higher education.

3. Analysis of prominent problems in current university education and teaching

3.1. Inadequate infrastructure

According to investigations, currently, more than 70% of universities do not have complete intelligent technology and platforms, restricting the implementation, development, and innovation of personalized teaching. Specifically, some schools lack basic hardware facilities. The computers, projectors, headphones, etc., equipped in classrooms are outdated, and the update of laboratory instruments is slow, lacking cutting-edge technology and sophisticated equipment [4]. In addition, although some schools have basic hardware support, they still lack research and application in software. There are no personalized teaching software and resources designed for the teachers and students of their schools, which is also a direct manifestation of inadequate infrastructure. Moreover, there are problems such as poor network signals and insufficient broadband, which do not support "5G" transmission. It is urgent to increase investment and construction in this area to support the implementation and innovative application of personalized teaching models in universities [5]. In the future, it is expected to configure more professional and cutting-edge artificial intelligence equipment to achieve "artificial intelligence + education" and fundamentally improve the quality of educational services.

3.2. Teachers' competence needs to be enhanced

Since the previous section outlined several situations where universities lack artificial intelligence facilities and

equipment, it can be inferred that teachers lack information and intelligent literacy due to a lack of training in this area. Even if some teachers have received such training, they may still lack teaching experience, which is insufficient to influence the overall level of the entire education system. The author believes that this is highly related to factors such as teacher training, teachers' motivation for seeking employment, and the imbalance of teachers' work [6]. Many current university teachers are engaged in research in their positions, focusing on scientific research and teaching of professional content. However, they ignore the integration of their majors with artificial intelligence (AI), falling behind the pace of the times. Many teachers also lack information literacy and do not have sufficient training resources on or off campus, so they are reluctant to make progress and find it difficult to improve their application ability of intelligent technology in a short period. It is even more difficult for them to promote personalized teaching. Of course, some teachers have heavy work pressure and do not have enough time and energy to expand their professional skills, which also affects their own development to varying degrees and needs to be taken seriously and improved [7].

3.3. Ignoring students' individual differences

Universities recruit students from across the country and society. Therefore, students in each school come from different regions and social classes, with completely different learning foundations, interests, hobbies, and comprehensive qualities. However, currently, basic courses in universities are taught in large classes, and small-class teaching only appears when students are divided into specific majors in the later stage. The traditional education model completely ignores students' differences, measuring students' abilities and qualities with a unified standard, and the reference indicators are relatively single and fixed [8]. For students with a weak foundation, the difficulty of course learning is high, and they do not have time for self-reflection and summary, which directly leads to excessive daily learning pressure and a tendency to lose their way. For students with outstanding abilities, the courses are too simple, and the assigned homework and tasks are easy to complete. As a result, they may perfunctorily deal with them, resulting in a weakening of learning interest and an increase in casualness, which is also not conducive to students' healthy growth and professional development. With the support of artificial intelligence technology, personalized teaching practices attach importance to students' differences and hope to make up for them through the application of technology, software, and tools, achieving a multiplier effect in education.

4. Construction strategies for personalized teaching models in universities supported by artificial intelligence

4.1. Generation of personalized student profiles

The recording, sorting, and analysis of students' learning data were initially obtained from software such as the National Smart Education Platform and the Xuexitong APP. By extracting background data, we can understand students' video completion status, assignment situation, etc., and thus know their actual performance in a certain course. These platforms also have rich interactive functions, so the teaching and learning data available are sufficient to support the initial construction of personalized teaching models. Of course, when introducing artificial intelligence to support the construction of personalized teaching models, more detailed and precise operations are required [9]. Artificial intelligence platforms have the above-mentioned functions and also make full use of big data platforms to expand the scope of data analysis. They can compare data performances at the national, local, district, and school levels and provide more reasonable and scientific teaching suggestions.

Regarding the situations of individual classes, after data analysis, teachers can add their own records and summaries and obtain conclusions by querying large-language models, which are then fed back into the personalized teaching process, bringing many benefits. For example, teachers can use DeepSeek to analyze students' data. By inputting information such as the number of students, gender ratio, teaching plans and processes, and students' performances, a complete list of students' in-class learning data can be generated. This can be output as a student profile, and details can be refined to correspond to each student's situation, forming various data [10].

For another example, after understanding the situation of students in their class, teachers can input: "I am a university teacher. I assigned after-class homework and graded it. In the practice of the xx lesson, some students misread or overlooked the questions, some could not distinguish the core knowledge, some could not use the core knowledge to solve problems, and some lacked a scientific foundation." Based on this, a learning situation record can be generated. Accordingly, various practice tasks for specific subjects and the next-step teaching plan can be generated, which is also equivalent to forming positive learning feedback. It can be seen that the generation of personalized student profiles is very specific, effectively saving teachers' time and energy, facilitating the organization of teaching activities, and improving teaching quality. It is a key link in artificial-intelligence-supported higher-education reform [11].

4.2. Personalized customization of learning resources

Developing intelligent learning platforms can support efficient and high-quality teaching with a framework of personalized learning and personalized customized learning resources [12]. The author believes that such platforms must have the following three characteristics: First, they can provide personalized learning resource support for students. That is, based on the analysis of students' data, the platform can generate adaptable learning content and derivative resources for students to practice, review, preview, and learn independently. Second, they can provide various auxiliary tools to help students learn. Through machine-learning algorithms and natural-language processing in artificial intelligence, the platform can interact with students and provide them with timely feedback. This is particularly evident in college English teaching, with the support of corpus, voice assistants, and intelligent recommendations. Therefore, there are the most educational products in this area, and they have a wide range of applications. Third, they can be continuously updated and iterated with technological progress and content innovation to provide students with a better learning experience. Currently, most artificial-intelligence-based educational products on the market meet these requirements, especially those that are recognized by teachers and students and have a good market response. If universities want to develop intelligent learning platforms with school-based characteristics, they can also cooperate with well-known platforms and resource channels to achieve the personalized customization of learning resources and ensure the implementation of personalized teaching. This involves the classification and discrimination of resources, which must be considered when applying teaching resources from the Internet. The implementation of personalized teaching in universities requires better-quality resources as support, so the ability of users to apply and distinguish learning resources is crucial. Resources that are suitable for college students' learning foundations, interests, hobbies, and learning progress, or new teaching resources formed through secondary adaptation, are both feasible and effective [13].

4.3. Personalized selection of practical activities

The personalized selection of practical activities is a form of personalized teaching based on students' autonomy. That is, with the support of artificial-intelligence technology and platforms, students are stratified and grouped

in different subject areas, and then individuals or groups can choose practical activities. Completing the tasks represents the completion of the course. A specific example is that hierarchical tasks are set on the Xuexitong platform, and students can choose some to complete and submit online videos, electronic reports, etc., as evidence, which is equivalent to completing the comprehensive test of this subject [14]. This is also common in traditional course teaching, which is an experimental teaching method based on student stratification and grouping. With the application of artificial intelligence technology, it is believed that this experiment will become a normal mechanism according to students' specific situations, providing students with a freer and inclusive personalized learning space. With the support of artificial intelligence, the personalized selection of practical activities will bring students more novel experiences, promoting the improvement of their practical abilities and professional qualities and laying a solid foundation for their job-hunting, employment, and career development.

4.4. Personalized intelligent learning feedback

For the personalized student profiles, learning resources, and practical activities discussed above, personalized intelligent learning feedback is obtained through long-term observation. Specifically, through a series of teaching and learning activities, the teaching experience summarized by machine-learning algorithms is fully applied to teaching practice. After long-term modification and adaptive design, and then observing the results through students' feedback, half of the success is achieved. For example, when a student finds a way to solve a problem or task through an online chatbot, it forms an experience [15]. Then, by testing the methods and abilities mastered by the student, the key to effectiveness can be found, and larger-scale teaching attempts can be organized. Another example is that when a student discovers their weak knowledge points in a certain subject through an intelligent assignment platform, it also forms an experience. By testing the student's ability to use intelligent tools and their improvement in weak knowledge areas, the application feedback of intelligent learning can be obtained. There are many such cases, and the key lies in how teachers and students apply artificial-intelligence technology. This is also the focus of future research on artificial-intelligence-empowered personalized teaching models in higher education.

5. Conclusion

In summary, the construction and application of personalized teaching models in universities cannot be achieved overnight and require strong infrastructure and resources as support. The application of artificial-intelligence technology and platforms provides some support, making higher education take on a new look. It can also create personalized and intelligent teaching models, presenting a new form of education. Research on the use of artificial-intelligence technology to generate student profiles, customize learning resources, and provide intelligent learning feedback also draws on the experience of previous applications of information technology and big-data technology, aiming to cultivate new-era talents with information literacy and excellent ideological and cultural qualities.

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