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Exploring the impact of AI-driven digital and intelligent courses on the reform of teaching models for postgraduate students

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Abstract: With the rapid advancement of information technology, the application scope of artificial intelligence (AI) technology in the field of education has been continuously expanding, particularly demonstrating immense potential and significant value in promoting personalized teaching for postgraduate students. This paper actively explores innovative measures for smart teaching and delves into the influence of AI technology on the implementation methods of personalized teaching for postgraduate students. These implementation methods not only cater to the diverse learning needs of postgraduate students but also drive the innovation of teaching media and methods, significantly enhancing learning efficiency and teaching quality. This lays a solid foundation and provides valuable experience for the widespread application of AI technology in the field of postgraduate education.

1. Introduction

With the continuous iteration of digital technology, the education supply system is undergoing profound reconstruction. Among them, cutting-edge technologies such as AI have opened up new paths for the realization of personalized learning[1]. In the field of smart education, the way to accurately match learners with suitable learning resources to promote their personalized learning process has become a key issue that needs to be addressed urgently.

Personalized education, as the direction of educational development in the era of knowledge economy, is not only a key driving force for promoting educational reform and innovation, but also an important part of implementing quality education. It is also a concrete practice of implementing the people-oriented scientific development concept in education. In the wave of big data, various activities in the educational process can be transformed into valuable educational big data. These data have the characteristics of process generation, which can capture the personalized performance of each student in detail, fully demonstrating the characteristics of high personalization. Compared with

traditional data, educational big data perfectly meets the needs of personalized and humanized learning with its massive scale, high-speed generation, and diverse forms.

Currently, the rapid development of information technology, especially the ever-evolving AI and knowledge graph technologies, has brought unprecedented transformation opportunities to the field of education. Postgraduate education, as the core position for cultivating top-notch innovative talents, is facing severe challenges in its traditional teaching mode, which is difficult to meet the increasingly personalized and efficient learning needs of students[2]. AI technology, with its powerful data analysis capabilities[3], can accurately interpret learning data and provide strong support for personalized teaching, while knowledge graph technology promotes the occurrence of deep learning by constructing a systematic knowledge system. Combining the advantages of both technologies, promoting the digital and intelligent direction of postgraduate teaching mode has become a key measure to improve teaching quality and cultivate innovative talents.

Furthermore, with the continuous increase in the demand for high-level talents and the deepening of postgraduate education reform, the reform and innovation of postgraduate teaching mode have become an irreversible trend. This paper aims to explore the application of cutting-edge AI technologies such as knowledge graph adaptive learning, AI virtual teachers, and intelligent assessment in postgraduate teaching. By leveraging new technologies to empower intelligent teaching reform, we aim to construct a personalized teaching mode tailored for postgraduate courses, thereby opening a new chapter of educational innovation.

2. The Driving Forces & Strategies of AI in Promoting Personalized Postgrad Teaching

In the context of the digital era, traditional education models appear inadequate in meeting the learning needs of postgraduate students. "Tangible technologies" such as big data, cloud computing, and AI, as well as the "intangible technology" of "human-machine collaboration" technological thinking, are injecting new vitality into the field of postgraduate education, providing new elements, spaces, and technologies, aiming to reshape the personalized learning model of postgraduate education and promote its high-quality development.

2.1 AI's drive for personalized postgrad teaching

The original intention of teaching reform lies in optimizing teaching processes and enhancing teaching quality, with clarifying the needs of teachers and students being the first step of reform. Postgraduate teaching faces numerous challenges, such as insufficient learning support services, delayed learning feedback, and the contradiction between homogenization of learning services and learners' personalized needs. These issues urgently require profound changes in postgraduate teaching. Therefore, for the learning of postgraduate education, how to balance student groups and personalized learning needs has become the key to improving the quality of postgraduate course teaching. Traditional strengthening of teacher team construction and teaching arrangements have been difficult to meet the needs of high-quality teaching, while using AI to empower open teaching is an effective way to solve this contradiction.

2.2 AI strategies for personalized postgrad teaching

(1) Build online smart teaching system

To address challenges, we should integrate the strengths of industry, academia, and research institutions, simultaneously advancing theoretical exploration and teaching practice. To achieve this, we should establish an integrated smart teaching system encompassing various aspects such as teacher development, teaching resource construction, teaching data management, smart teaching models, and

intelligent academic assessment. This system aims to optimize the allocation of teaching resources and intelligently manage teaching processes through digital means.

(2) Create a personalized intelligent postgrad learning env.

The core of personalized education lies in recognizing and respecting learners' individuality and providing them with a personalized educational environment. In response to the diverse needs of learners, we have constructed a comprehensive smart teaching system that integrates AI virtual teacher intelligent Q&A, AI virtual teacher course resources, and an adaptive learning system based on subject knowledge graphs. This system comprehensively demonstrates the personalized postgraduate course learning model empowered by digitalization.

(3) Organize diverse activities for effective teaching

The foundation is crucial for intelligent teaching, but achieving effective teaching outcomes also hinges on the effective application of AI technology by both teachers and students. Hence, while constructing an intelligent teaching system, emphasis should also be placed on organizing diversified teaching activities, such as online discussions, virtual experiments, personalized tutoring, etc., to stimulate learners' interest and enthusiasm for learning, thereby enhancing teaching quality and learning outcomes.

3. AI Strategies for Personalized Teaching Envs.

In the field of education in the era of intelligence, teaching is not merely a continuation of traditional historical methods, but also a pursuit of innovation. To cater to society's demand for diversified and personalized talent cultivation, it is imperative to utilize advanced technologies such as big data and AI to implement personalized teaching, thereby deepening and enhancing the principle of "teaching students according to their aptitude".

3.1 Adaptive learning: personalized path

Taking the "Tribology" course as an example, a new digital course based on knowledge graphs has been developed through the use of AI learning tools, supplemented by rich digital resources such as AI virtual human courseware and intelligent question-and-answer systems. This adaptive learning platform breaks down the course content into multiple knowledge points and designs corresponding adaptive diagnostic exercises. Using visual learning data, the system can accurately draw a learning portrait of students, including learning time, intensity, progress, and effectiveness. Students can obtain their own learning paths based on their abilities and learning situations. At the same time, the system will assess students' mastery of knowledge points in real time, intelligently recommend suitable test questions and learning resources, and truly realize the personalized learning mode of "one case for one person". Teachers can understand the learning progress and mastery of each student in real time through back-end data analysis, effectively improving teaching efficiency and assisting students in personalized learning.

3.2 AI virtual teacher: innovate teaching resources

To meet the demand for resource recommendation in adaptive systems, the teaching team has successfully created vivid and engaging lecture scenarios by leveraging AI virtual human technology, incorporating cutting-edge technologies such as speech synthesis, facial modeling, lip prediction, and image processing. This innovation not only enhances the efficiency of digital course production and lowers the technical threshold, but also enables teachers to focus more on the design and optimization of teaching content. Furthermore, this new model shortens the resource construction cycle, saves costs, and enriches the forms of teaching resources. Students report that these vivid learning resources

greatly stimulate their interest in learning and help them quickly grasp new knowledge by utilizing fragmented time. At the same time, the team has also established an intelligent Q&A resource library based on large language model technology, enabling various interaction methods between students and AI virtual teachers, further enhancing the learning experience.

3.3 Intelligent assessment: new individualized teaching

In the process of promoting teaching reform, to better ensure the comprehensive learning effectiveness of students, we integrate intelligent learning methods into teaching and assessment. By applying knowledge graph technology, the system can accurately identify students' learning blind spots, difficulties, and omissions, thereby customizing personalized learning paths for students. At the same time, with the help of AI virtual teacher technology, intelligent Q&A for AI course production and teaching guidance is realized. In the evaluation process, the system achieves multi-dimensional evaluation through human-computer interaction and provides instant machine feedback, significantly reducing the workload of teachers and improving teaching quality. This intelligent teaching mode adopts human-computer interaction and real-time feedback, effectively improving students' language skills and receiving wide acclaim from both teachers and students. This mode not only focuses on the common development of students but also meets their personalized needs, achieving a win-win situation of high efficiency in large-scale teaching and high quality in personalized teaching, becoming a new paradigm of data-driven "individualized teaching" in the era of intelligence.

4. AI-Empowered Personalized Postgrad Teaching

Learning evaluation should avoid being simplistic and one-sided, and instead focus on the diversification of evaluation content and the variety of evaluation methods. AI technology-enabled personalized teaching poses new requirements for teachers' digital literacy, while also presenting challenges. To address this, we have seized the opportunity presented by smart teaching reform and implemented multiple measures to enhance the digital literacy of postgraduate course instructors within the system. Through both online and offline formats, we have organized a series of smart teaching lectures, workshops to improve teachers' digital literacy, expert series lectures on smart teaching design for postgraduate course instructors, and case selection activities. These lectures and activities not only allow teachers to understand the latest hotspots and trends in smart teaching, master digital teaching tools and methods, but also expose them to a wider range of teaching models and concepts. To a certain extent, these activities have prompted teachers to transform their teaching concepts, broaden their teaching horizons, enhance their smart teaching design capabilities and scientific research literacy, and cultivate their innovative thinking.

In the existing teaching and management system platform, we have successfully integrated various modern AI technologies, achieving seamless integration of new technological innovations with the existing teaching functions. This measure not only meets the demand for intelligent teaching but also ensures secure data transmission across platforms. Through the application of digital technology, we have constructed diversified teaching application scenarios, which are based on the existing teaching foundation and fully reflect the local teaching needs.

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5. AI Enlightenment in Personalized Teaching Reform

5.1 AI-driven collaborative innovation deepening

AI technology serves as the core driving force for promoting high-quality and innovative development in open education, particularly playing a crucial role in integrated collaboration. Although current technology platforms have initially achieved “one-stop" functionality, they still face issues such as mismatched teacher resources, limited cross-regional course selection, and insufficient intelligence in educational administration processes. To address these challenges, we need to accelerate the construction of cloud-based infrastructure to meet the demands of digital teaching scenarios and establish a standardized data foundation to provide solid data support for integrated collaboration.

5.2 AI optimizes high-quality teaching resources

The application of digital technology has significantly facilitated the circulation and sharing of high-quality resources in postgraduate education. Through technological empowerment, we can achieve batch processing, customization, and efficient development of educational resources. The resource production model is also gradually shifting from being primarily human-driven to being co-created by humans and machines. To meet learners' diverse and personalized learning needs, we should deepen the application of digital intelligence in the reform of learning resource construction. We should integrate intelligent technology with education and teaching, strengthen the construction of resources such as virtual simulation and knowledge graphs, and promote the diversified development of generative, interactive, contextualized, and personalized resources. At the same time, we should enhance the intelligent push and retrieval functions of resources to support intelligent learning. By leveraging AI technology, we can further improve the supply efficiency of high-quality teaching resources, maximize the utilization of educational resources, effectively enhance students' digital core literacy, and promote their all-round development.

5.3 AI reshapes teachers' roles & abilities

In the context of digital transformation in education, teachers, as implementers and core forces, play a particularly important role in enhancing their digital literacy. The application of AI technology has promoted the reshaping of teachers' roles, transforming them from knowledge transmitters to educators who adapt to new technologies, teaching methods, and learners' needs. With the support of AI technology, a new, more equal and open relationship has been established between teachers and students, making the classroom a practical place for in-depth knowledge exploration and interaction between teachers and students. At the same time, AI technology provides teachers with more personalized teaching methods, enabling them to more accurately understand each student's learning characteristics, interests, and needs, so as to develop personalized teaching plans. In addition, AI technology also provides various possibilities for teaching innovation, requiring teachers to possess

excellent collaboration skills and the ability to solve complex problems, in order to maintain their competitiveness in the digital age and their leading role in imparting knowledge and educating people.

5.4 AI leads the innovation of educational evaluation system

Digital technology is empowering education evaluation across all educational stages and throughout the entire process, transforming evaluation methods from a singular to a diverse approach and shifting the focus from outcomes to processes. The application of AI technology has prompted educators to continuously explore new evaluation methods and models, driving innovative development in education. Through data analysis and pattern recognition, AI technology can provide deep insights into students' learning processes, offering instant and personalized feedback, thereby establishing a more scientific, precise, and efficient evaluation system. This system not only aids in optimizing the allocation of educational resources but also fosters innovation in teaching methods, ultimately enhancing the overall quality of education. Therefore, we should leverage AI technology to establish a diversified evaluation system encompassing process-based evaluation, value-added evaluation, and summative evaluation, and construct an adaptive evaluation and feedback mechanism. Simultaneously, we should scientifically set standards for formative and summative assessments, innovate the methods and content of formative assessments, and emphasize an evaluation orientation that prioritizes "ability". Lastly, we should forge a new paradigm of human-machine collaborative education evaluation, utilizing AI technology to assist in educational evaluation work, thereby enhancing the precision and efficiency of evaluation.

6. Conclusion

This paper is continuously advancing in the exploration and practice of the digital transformation of education, aiming to enhance the quality of education, accelerate efficiency, and promote the process of educational modernization through cutting-edge technological means. The innovative practice of personalized postgraduate course teaching relying on AI technology has begun to show its potential, significantly improving teaching efficiency and quality.

The advancement of digital transformation in education is not merely an innovation at the technological level, but also a profound transformation in educational concepts and methods. The traditional teacher-led teaching model, which emphasizes knowledge impartation, is gradually being replaced by a student-centered personalized teaching model that emphasizes ability enhancement. Technology-driven personalized teaching is a comprehensive systematic project involving teachers, teaching processes, management systems, educational resources, and evaluation mechanisms. It requires concerted efforts from multiple dimensions, including top-level design, infrastructure construction, and teacher training.

Through this series of comprehensive and profound measures, we confidently stride towards the grand blueprint of educational modernization, ensuring that every learner can find the most suitable path for their personal growth, truly realizing the ideal vision of individualized teaching and promoting personalized development. This not only deeply embodies the essence of education, but also makes a positive contribution to and promotes the development of future society.

References

[1] Malik, A.R., et al. (2023) Exploring artificial intelligence in academic essay: higher education student's perspective. International Journal of Educational Research Open, 5: p. 100296.

[2] Gu, C. (2023) Exploration of the Teaching Mode Reform for Postgraduate Students—Taking the Course of Tribology as an Example. Advances in Educational Technology and Psychology, 7(12): p. 102-106.

[3] George, A.S. (2023) Preparing students for an AI-driven world: Rethinking curriculum and pedagogy in the age of artificial intelligence. Partners Universal Innovative Research Publication, 1(2): p. 112-136.