Research on Individualized Learning of Psychology Course Combining Artificial Intelligence and Data Analysis

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Abstract: With the continuous innovation in the field of education, in order to improve the teaching quality of psychology courses and meet students' individualized learning needs, this article has carried out a research on individualized learning of psychology courses integrating AI (artificial intelligence) and data analysis. By analyzing the application principle of AI and data analysis technology in educational scenes, this article constructs a fusion mode covering data collection and preprocessing, intelligent analysis and model construction, and individualized learning scheme generation and implementation. In the process of research, it is clear that practical strategies include changing teachers' roles, strengthening technical infrastructure, building a multi-evaluation system, etc. At the same time, challenges such as data privacy security, technical cost and system compatibility are identified, and corresponding countermeasures are given. This integration model has the potential to improve the learning effect of psychology courses, but in practice, all parties need to cooperate and effectively deal with many challenges in order to promote the individualized learning of psychology courses.

1. Introduction

Driven by the current wave of educational reform, the study of psychology courses has an important impetus to strengthen students' comprehensive quality [1]. The traditional teaching mode of psychology course is often difficult to meet the diverse learning needs of students, so it is very important to implement personalized learning [2]. The purpose of personalized learning is to provide customized learning paths based on students' individual differences and help students master knowledge and skills more efficiently [3]. Driven by the development of science and technology, AI and data analysis technology have brought new opportunities for personalized learning of psychology courses. With its powerful algorithm and model, AI can simulate human intelligent behavior to a great extent and realize intelligent learning support [4]. Data analysis can mine valuable information from massive learning data and gain insight into students' learning situation and [5]. The integration of the two is expected to build a new model of personalized learning of psychology courses and improve the learning effect.

At present, the research on the application of AI and data analysis in the field of education is constantly emerging, but the systematic research on individualized learning of psychology courses is still relatively scarce [6]. Some studies only focus on the application of single technology, and fail to give full play to the synergistic advantages of the integration of the two; There are still some studies that lack in-depth theoretical discussion and practical verification, resulting in unsatisfactory application results [7]. This study is devoted to exploring the effective integration mode of AI and data analysis in individualized learning of psychology courses. Theoretically, this study will enrich and improve the teaching theory of psychology courses, and provide a new perspective and basis for the development of individualized learning theory in specific disciplines. Practically speaking, this research is helpful to develop a learning plan of psychology course that is more suitable for students' needs, improve teaching efficiency and students' learning experience, and provide educators with practical teaching strategies and methods.

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2. Analysis of AI and data analysis technology

AI covers many key technologies and has a far-reaching impact on the study of psychology courses. As the core of AI, machine learning can carry out model training according to students' learning data to predict students' learning performance and needs [8]. Natural language processing technology can realize intelligent interaction between human and computer. In the study of psychology courses, students can have a natural language dialogue with the intelligent counseling system, and the system provides accurate answers and learning suggestions according to students' questions, thus enhancing the interactivity and autonomy of learning.

Data analysis technology is also indispensable in the study and research of psychology courses. Data mining method can extract potential patterns and relationships from a large number of learning records, such as finding the relationship between students' learning behavior and grades, and helping teachers adjust teaching strategies [9]. Descriptive statistical analysis can sort out and summarize students' learning data, so that teachers can intuitively understand students' overall learning situation, including the average score and the distribution of learning time. Correlation analysis can clarify the relationship between different learning factors, such as exploring the correlation between learning investment time and learning effect, and providing basis for individualized learning intervention.

3. Construction of fusion mode

The construction of individualized learning mode of psychology course integrating AI and data analysis aims to give full play to their advantages, meet students' diverse learning needs and improve the learning effect of psychology course. This model can be divided into three key links: data collection and preprocessing, intelligent analysis and model construction, and individualized learning scheme generation and implementation.

Table 1 Individualized learning schemes corresponding to different learning situations

Student Learning Conditions	Learning Style Characteristics	Mastery Degree of Knowledge Points	Individualized Learning Plan	Expected Outcomes	Tracking and Adjustment Points
Having difficulty understanding the "Psychological Measurement" knowledge point with a high error rate in assignments	Leaning towards theoretical understanding and slow in accepting abstract concepts	Weak; confused about key concepts and measurement methods	Push detailed micro-lectures on "Psychological Measurement", provide 10 basic and 10 advanced exercise questions on the same knowledge point, and arrange one one-on-one tutoring session for Q&A	Students can clearly understand the key concepts of "Psychological Measurement" and reduce the assignment error rate to below 10%	Regularly check the assignment error rate and adjust subsequent tutoring content based on Q&A situations
Having a learning style inclined towards theoretical research and a strong interest in the "History of Psychology"	Preferring theoretical exploration and enjoying in-depth study of historical contexts	Good; having a solid grasp of basic knowledge	Recommend 3 extended reading books on the "History of Psychology", invite participation in relevant academic lectures, and assign the task of writing a short paper in this field	Students have an in-depth understanding of the "History of Psychology" and can demonstrate unique insights in the short paper	Guide the writing direction of the short paper based on reading feedback and lecture participation
Having an overall fast learning pace and solid basic knowledge	Having strong self-learning ability and pursuing knowledge expansion	Excellent; being proficient in conventional knowledge	Provide cutting-edge psychology research topics, encourage participation in research projects, and organize seminars for exchanges	Students have some exposure to cutting-edge research fields and possess preliminary	Pay attention to the progress of research topics and adjust research guidance

			with experts	research abilities	strategies based on expert feedback
Having low participation and few contributions in group discussions on "Social Psychology"	Being introverted and passive in team collaboration and expression	Medium; having insufficient understanding of some group psychological phenomena	Assign specific group discussion tasks requiring them to lead the discussion; provide relevant case analysis materials to aid understanding	Students increase their frequency of active contributions in group discussions and have a deeper understanding of group psychology	Observe changes in group discussion participation and provide encouragement and guidance in a timely manner
Lacking confidence in practical operations of "Cognitive Psychology" and having low-quality experimental reports	Having practical abilities that need improvement and having a fear of experimental operations	Medium-low; having weak practical skills	Increase the viewing of experimental demonstration videos on cognitive psychology, arrange one-on-one guidance from an experimental tutor for experimental operations, and provide experimental report templates and examples	Students can independently complete experimental operations and achieve a good level of experimental report quality	Adjust the intensity of guidance based on experimental report scores and operational proficiency

Data collection and preprocessing, widely collecting multi-source data. Students' behavior data in psychology course learning, such as online course click frequency, video viewing duration, forum participation, etc., reflect their learning interest and concentration. Learning achievement data, such as homework scores and test scores, show their knowledge mastery. There are also students' basic information, such as age and professional background, because students with different backgrounds have different needs for psychological knowledge. These data have diverse sources and different formats, so it is necessary to preprocess, unify the format, and clean up the missing and abnormal values, so as to lay the foundation for subsequent analysis. In the intelligent analysis and model construction, AI algorithm and data analysis method are used to deeply analyze the preprocessed data. With the help of machine learning algorithms, such as decision tree and neural network, the potential relationship between students' learning behavior and achievements is explored. This link can also be combined with psychological theories, such as cognitive development theory, so that the analysis results are more in line with students' learning rules. Individualized learning plan generation and implementation, according to the results of intelligent analysis for each student to customize the exclusive learning plan. Individualized learning schemes corresponding to different learning situations are shown in Table 1.

Teachers guide students to carry out learning according to the generated individualized learning plan, and keep track of students' learning progress, evaluate the learning effect in real time by using data analysis, and adjust the learning plan in time to ensure that the plan always meets students' learning needs.

4. Practical strategies and challenges

In the process of putting the individualized learning mode of psychology course integrating AI and data analysis into practice, a series of practical strategies are needed, and at the same time, many challenges will be faced. It is very important to clarify these strategies and challenges and actively seek countermeasures to promote individualized learning of psychology courses. In terms of practical strategies, the first thing is the change of teachers' role. Teachers are no longer just imparting knowledge, but also need to be guides and promoters of students' learning. Teachers should provide students with targeted guidance and feedback according to individualized learning programs.

Through multi-dimensional evaluation, students' learning situation is comprehensively and accurately reflected, which provides a richer basis for the adjustment of individualized learning programs. When collecting and using students' learning data, we must strictly abide by relevant laws and regulations to ensure that students' personal information is not leaked. Once the data is leaked, it will not only harm the rights and interests of students, but also trigger a crisis of confidence. Technology cost is also a challenge that cannot be ignored. The introduction of AI and data analysis technology requires a lot of money for hardware equipment purchase, software system development and maintenance, which may be unbearable for some schools and institutions with relatively scarce educational resources. Compatibility problems between different technical systems may also lead to difficulties in data transmission and integration, and affect the implementation effect of individualized learning mode. Table 2 below shows these challenges and corresponding solutions in detail:

Table 2 Practical challenges and countermeasures

Practical Challenges	Specific Manifestations	Countermeasures	Responsible Entities	Expected Outcomes
Data Privacy and Security Issues	Risk of information leakage in data collection, storage, and usage	Develop strict data management policies, clarify permission processes; use encryption technology for protection; conduct regular security audits	Schools, Educational Institutions	Student data is properly protected with no leakage incidents
High Technological Costs	Significant capital requirements for hardware procurement, software development, and maintenance	Seek government educational funding support, establish special funds; collaborate with enterprises to reduce costs; reasonably plan the scope of application	Schools, Educational Institutions, Government	Maintain technological system operation at an affordable cost
Compatibility Issues of Technological Systems	Poor data interaction between different technological systems, affecting analysis and application	Consider compatibility during selection; establish unified data standards and interface specifications; strengthen technical team building	Technical Departments, Schools, Educational Institutions	Smooth data interaction between systems, stable operation of individualized learning models
Teacher Adaptation Challenges	Teachers' inadequate mastery of new roles and technologies	Conduct targeted training, share successful cases; establish incentive mechanisms to encourage application	Schools, Educational Institutions	Teachers can proficiently use technology for individualized teaching
Student Acceptance Differences	Some students are not used to individualized learning models	Strengthen publicity and guidance to explain model advantages; provide individualized psychological counseling	Teachers, School Psychological Departments	Students actively accept and adapt to individualized learning models

Faced with these practical strategies and challenges, schools, educational institutions, teachers and relevant technical departments need to work together to explore effective solutions. In order to promote the smooth implementation of the individualized learning mode in psychology courses integrating AI and data analysis, relevant teaching resources, technical support, and assessment mechanisms should be systematically developed and optimized.

5. Conclusions

This study focuses on the individualized learning of psychology course which integrates AI and data analysis, and has achieved a series of results through various explorations. This article studies and constructs a systematic fusion mode. Starting from data collection and preprocessing, with the

help of intelligent analysis and model construction, it realizes the generation and implementation of individualized learning scheme, which provides a clear framework for individualized learning of psychology courses. Moreover, the practical strategies are expounded, which promotes the transformation of teachers' roles and improves the construction of technical facilities. These strategies provide guidance for the practical application of the model to some extent. The research also reveals the challenges that can not be ignored in the practice process. Data privacy and security issues threaten students' rights and interests and educational trust; The burden of technology cost hinders educational institutions with limited resources. In view of these challenges, the study puts forward corresponding countermeasures and tries to eliminate practical obstacles.

Although the personalized learning prospect of psychology course integrating AI and data analysis is broad, it needs the joint efforts of educational institutions and teachers to achieve a wide range of applications. All parties should attach importance to data security, rationally plan technology costs, improve technology compatibility, and ensure that this innovative learning model really takes root and meets students' individualized learning needs.

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