

Design and Implementation of Personalized Learning Paths in the Era of Big Data

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Abstract: The design and implementation of personalized learning paths in the era of big data is a key and urgent task, and its value lies in the fact that through analysis and teaching applications, personalized learning paths can better meet the increasingly diverse learning needs and personalized learning styles of primary school students. By deeply analyzing the necessity of personalized learning in primary education in the era of big data, this paper proposes a complete set of personalized learning path design and implementation framework.

Keywords: Big Data; Personalized Learning; Differentiated Instruction; Primary Education

At present, with the rapid development of information technology and the continuous progress of society, the era of big data has come, which has a far-reaching impact on all walks of life. In the field of education, the personalization of education at the primary school level has become a topic of great concern. However, traditional primary education often adopts a relatively fixed teaching model, which cannot fully meet the unique needs and potential of each student. Therefore, in the face of increasingly diverse learning needs and personalized learning styles, the design and implementation of personalized learning paths for primary education in the era of big data has become an important research topic in the field of education ^[1].

1. The Necessity of Personalized Learning in Primary Education in the Era of Big Data

In the era of big data, in order to better adapt to the increasingly diversified and complex learning needs, provide more accurate and effective education services for each primary school student, and help students establish differentiated learning literacy and basic learning ability, it is necessary to design personalized learning paths for primary school

students. From the perspective of the current development situation, the traditional education model is difficult to meet the individual differences of each student, and the introduction of big data technology has brought unprecedented opportunities to the education field. First of all, big data technology can dig deep into the individual differences of students. By collecting and analysing data on students' subjects, interests, and learning habits, teachers are able to gain a more comprehensive understanding of each student's learning characteristics ^[2]. This helps identify potential strengths and weaknesses for students and supports the design of personalized learning paths. By monitoring student performance in real-time, teachers can adjust instructional strategies more quickly and provide targeted tutoring, making it easier for students to progress in the personalized learning process. Second, big data technology can help build a richer library of learning resources. By analyzing a large amount of learning data, teachers can understand which textbooks and resources are more suitable for different types of students, so that they can build a personalized learning resource library, so that each student can choose the appropriate learning materials according to their interests and subject expertise, and improve their enthusiasm and initiative in learning ^[3]. Finally, personalized learning in primary education in the era of big data is not only related to the development of individual students, but also helps to improve the overall quality of education. Through the analysis of a large amount of learning data, education policymakers can better understand the effectiveness of teaching models, adjust education policies and curriculum in a timely manner, promote the continuous innovation and improvement of primary education, and lay the most basic and fundamental foundation for students' lifelong learning process.

2. Design and Implementation of Personalized Learning Paths in the Era of Big Data

2.1 Comprehensive Data Collection and Analysis

Comprehensive data collection and analysis is a critical step in the design of personalized learning paths. By using big data technology, we can dig deep into the data of students in terms of subjects, interests, learning habits, etc., and form a comprehensive student portrait. This comprehensive data analysis helps teachers better understand each student's individual differences, including potential strengths and weaknesses. In this way, it lays an important teaching foundation for the design of personalized learning paths, provides strong support for teachers, and enables students to better develop and progress in personalized learning.

2.2 Integration of Diversified Learning Resources

In the era of big data, by making full use of big data technology, we can not only collect students' personalized learning data, but also realize the comprehensive integration of diversified learning resources through in-depth analysis of a large number of learning data, and create a learning ecology that is more suitable for students' individual needs. By analyzing large amounts of learning data, teachers can learn which materials and resources are more appropriate for different types of students^[4]. For example, for students with greater subject strengths, more in-depth and extended learning materials can be provided; For students who have shortcomings in some subjects, more targeted and basic teaching materials can be provided. This differentiated integration of resources allows students to choose more suitable learning materials according to their subject level and better meet the needs of personalized learning. In the construction of a diversified learning resource library, we should not only consider the differences in subject levels, but also pay attention to the different learning styles of students. Through in-depth mining of learning data, we can understand each student's learning preferences, including visual, auditory, and hands-on tendencies. Therefore, personalized learning resource libraries need to adapt to different learning styles of teaching materials and resources, so that students can continue to learn in an environment that is more in line with their learning style. Furthermore, the integration of diversified learning resources should also focus on learning materials that meet individual interests. Through the analysis of students' interests, it is possible to understand

the unique hobbies and concerns of each student. Therefore, the resource library can include content that is not related to the subject but can arouse students' interest, and stimulate students' initiative and enthusiasm for learning.

2.3 Real-Time Learning Monitoring and Feedback

The implementation of personalized learning paths requires real-time monitoring of student learning performance and timely adjustment of instructional strategies. Big data technology can support real-time learning monitoring, and by tracking students' data on subject mastery and learning progress, teachers can quickly identify students' learning status, so as to give targeted teaching feedback, help students correct mistakes in time, make up for subject loopholes, and adjust personalized learning paths to better meet students' needs. Teachers can establish a comprehensive subject evaluation model according to the actual situation of students in their own classes, and calculate the students' real-time subject learning scores according to the comprehensive performance of each student's classroom performance, after-class homework results, in-class test results, and various large and small test scores, combined with the designed weight ratio, so as to help teachers grasp the overall learning level of the class more accurately in a quantitative way. When there is a sudden abnormal rise and fall in the comprehensive learning score of students in the class, the teacher can review the changes in the weighting factor, so as to find the crux of the problem and the breakthrough direction of progress.

2.4 Personalized Counseling to Make Up for Shortcomings

With the support of big data technology, teachers can more accurately identify students' subject shortcomings and weaknesses. The design of personalized tutoring can supplement students' deficiencies through customized lesson plans, tutoring materials in specific areas, etc. This kind of individualized tutoring not only helps to improve students' abilities in specific areas, but also fully enhances students' motivation and initiative in learning^[5]. For example, in mathematics teaching, teachers can use big data technology to build students' learning models. By tracking students' real-time participation in math classes, assignment completions, and activity on online learning platforms, teachers can access a wealth of learning data, including students' understanding of different math

concepts, problem solving speed, and more. With this real-time monitoring data, teachers are able to get a more accurate picture of their students' learning status. For example, Student A excels in algebra, while Student B struggles with geometry. This in-depth understanding of the subject helps teachers adjust their teaching strategies in a timely manner, provide more personalized tutoring support for different students, and make up for students' learning shortcomings.

2.5 Build a Dynamic Learning Loop

In the era of big data, the design of personalized learning paths needs to build a dynamic learning closed loop. This closed loop includes comprehensive data collection and analysis, integration of diversified learning resources, real-time learning monitoring and feedback, and personalized tutoring. Through this closed loop, teachers can continuously adjust and optimize personalized learning paths according to students' actual performance and needs, making the learning process more accurate, efficient, and personalized. In the specific implementation, the key link is to establish a sustainable and personalized learning mechanism. If it is simply the teacher who is leading the educational experiment, it is very likely that it will be interrupted by the teacher's natural inertia or the interference of other things, and it will end up in nothing. However, if the teacher completely delegates the individualized learning plan to the students or the class leaders manage it themselves, it is likely that the students will not be able to do the work correctly because the students' methodology is not enough. Therefore, with the support of big data, in order to realize personalized learning in primary education, it is necessary to form a sustainable and dynamic learning closed loop with two-way supervision. On the one hand, teachers should lead the promotion and implementation of the entire personalized learning work, and at the same time, teachers should also delegate part of the personalized teaching objectives and assessment

and evaluation to the class cadres, so that the class cadres can take the lead and drive other students to join the dynamic closed loop of personalized learning.

3 Conclusion

With the support of big data, personalized learning path design is no longer a theoretical concept, but an educational strategy that can be implemented realistically and efficiently. Comprehensive data collection allows us to gain an in-depth understanding of students' individual differences, the integration of diversified learning resources allows students to choose suitable learning materials according to their interests and subject expertise, real-time learning monitoring and feedback help teachers adjust teaching strategies more flexibly, and personalized tutoring helps to provide targeted help for students' subject shortcomings.

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