Exploration of the Precise Teaching Path of Theory Courses in Colleges and Universities Empowered by Big Data

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Abstract: With the development of big data technology, the teaching mode of theoretical courses in colleges and universities needs to be changed urgently. This study first systematically explains the relevant concepts of big data and precision teaching, and clarifies the basic framework and value of data analysis and application in the field of education. Subsequently, through an in-depth analysis of the teaching status quo of the existing theory courses in universities, it points out the problems that exist in the current teaching process, including the uneven distribution of teaching resources and the unrefined assessment of learning effects. Based on the above findings, this paper proposes a diversified strategy for big data-enabled accurate teaching of theory courses in colleges and universities, focusing on the collection and analysis methods of learning behaviour data and learning effect assessment to optimize the teaching process from a data-driven perspective. Through case studies, specific strategies and effects in practical application are demonstrated, emphasising how the precise setting of teaching objectives and rational allocation of teaching resources can enhance the quality of courses and students' learning experience. Practical suggestions for improvement are made to address the challenges encountered in the implementation process, such as user privacy and data security, and insufficient teacher skill requirements. The study shows that through the systematic application of big data, university theory courses can achieve more precise teaching objectives and personalised learning experiences, thus promoting educational equity and teaching quality.

Keywords: Big Data; Precision Teaching; Theoretical Courses in Higher Education; Learning Behaviour Analysis; Personalised Learning; Educational Resource Allocation

1. Preface

1.1 Conceptualisation of Big Data and Precision Teaching and Learning

In the context of the current rapid development of the educational environment, big data and precision teaching are receiving widespread attention as an important part of educational reform. The definition of big data is not only limited to the huge amount of data, but also emphasises the characteristics of data such as diversity, rapidity, authenticity and value. Big data in the field of education covers information such as students' learning behaviours, academic performance, interests and hobbies, which can provide support and basis for educational decision-making and enable educators to make precise analysis and intervention for individual students' differences. According to the theoretical framework of educational technology, precision teaching not only emphasises the appropriateness of teaching content, but also the selection of teaching timing and the optimal allocation of learning resources, so as to improve the efficiency and effectiveness of teaching.

1.2 Background and Significance of the Study

At present, college education faces many challenges, including the diversification of students' learning styles, the uneven distribution of teaching resources and the lagging teaching methods of teachers, etc. In this context, the promotion of education informatisation is particularly important. In this context, the promotion of education informatisation is particularly important, in which the rapid rise of "big data technology" provides effective support for the teaching

reform and innovation of colleges and universities. Through the collection, processing and analysis of massive educational data, colleges and universities can achieve accurate reform and enhancement in multiple dimensions, such as teaching content, teaching methods and evaluation of teaching effects [1]. Specifically, the application of big data technology in education is mainly reflected in three aspects: first, the construction of data-driven personalised learning paths, second, the teaching feedback mechanism based on data analysis, and third, the dynamic monitoring and evaluation of learning effects. This approach not only improves students' learning efficiency, but also enhances their learning autonomy and interest.

2. Second, the Strategy of Accurate Teaching of Theory Courses in Colleges and Universities Empowered by Big Data

2.1 Data Collection and Analysis Methods Analysis of Learning Behaviour Data

In the modern education system, the collection and analysis of learning behaviour data is an important foundation for the realization of accurate teaching, especially in the context of big data, the effective use of various types of information technology resources enables educators to provide in-depth insight into the learning characteristics of students [2]. Through the systematic collection and scientific analysis of learning behaviour data, teachers can obtain a comprehensive view of students' learning habits, participation and knowledge mastery, which in turn provides a basis for the development of personalized teaching strategies.

From a data collection perspective, learning behaviour data are mainly sourced from diversified channels, including online learning platforms, learning management systems (LMS), and mobile learning applications. The methodology for analysing the data relies mainly on a behavioural analytics model. This model covers not only descriptive analyses, but also diagnostic and predictive analyses, aiming to provide a perspective on all dimensions of the learning process. Cluster analysis of each student's learning interaction data allows teachers to identify the characteristics of different types of learners and also inspires educators to pay more attention to the presentation of personalised content when designing courses.

2.2 Assessment of Learning Outcomes

Under the current big data environment, it is particularly important to assess the learning effectiveness of theoretical courses in colleges and universities, especially in the development of accurate teaching strategies, how to effectively assess the learning effectiveness through data collection and analysis is of great practical significance and research value. The adoption of the "Effectiveness Assessment Framework" can provide systematic support for this process, making data-driven decision-making more scientific and rational. The core of learning effectiveness assessment lies in the selection of effective assessment indicators. According to educational assessment theory, learning effectiveness is divided into cognitive, affective and behavioural domains, which form the basis of comprehensive assessment.

3. Discussion of the Results of the Construction of the Precise Teaching Path

3.1 Precise Setting of Teaching Objectives

In the teaching process of higher education theory courses, learning needs analysis is particularly important, and its function is to formulate practical teaching objectives through in-depth analysis of students' learning characteristics and needs. This process not only provides the basis for the selection of course content, but also determines the implementation of teaching strategies to a certain extent. Therefore, the use of the Needs Analysis Model (NAM) to provide guidance for the precise setting of teaching objectives has become a hot research topic in the field of education today.

Based on the results of data analysis, teachers are able to generate visual reports on learning needs, thus presenting a more intuitive picture of students' learning interests, knowledge levels and skill mastery. This information helps teachers to more accurately match the gap between course requirements and students' actual abilities in teaching goal setting, so as to optimise the teaching programme [3]. For example, in the theory course of a university, through the demand analysis, it was found that most students had a high demand in critical

thinking (Critical Thinking, CT), which prompted teachers to increase the teaching content of this field in the course and design a corresponding assessment mechanism to better meet students' learning needs.

In the context of big data empowerment, the precise teaching path of theory courses in colleges and universities must be guided by clear teaching objectives [4]. For this reason, the precise setting of teaching objectives is not only the starting point of teaching activities, but also the benchmark for the evaluation of teaching effects. Therefore, the formulation of precise teaching objectives requires hierarchical goal decomposition and implementation from macro to micro. Through this scientific goal decomposition, the concreteness and operability of teaching goals are achieved, which helps teachers and students to clarify their respective responsibilities and expectations in practice.

Specifically, the setting of teaching objectives should follow the "SMART" principle, ensuring the specificity, measurability, achievability, relevance and time limitation of the objectives. Based on big data, the accurate setting and implementation of teaching objectives not only injects new vitality into the theoretical courses of colleges and universities, but also provides a scientific basis for the realisation of personalised learning. In the future exploration, the continuous optimisation of goal setting and feedback mechanism will be the key to promote the deepening and development of precise teaching of theory courses in colleges and universities.

3.2 Rational Allocation of Teaching Resources

In the construction of precise teaching paths for theory courses in colleges and universities, data-driven resource allocation has become a key link to improve teaching efficiency and effectiveness [5]. Through careful analysis and mining of big data, educators are able to reasonably allocate teaching resources according to the learning characteristics and needs of different students in order to achieve personalised and precise teaching goals.

Data analysis provides evidence for the rational allocation of teaching resources. By constructing a "data analysis and decision support model", educators are able to comprehensively analyse multi-dimensional data such as students' learning behaviour, performance distribution and course understanding. For example, after analysing the learning data of students in a history course, a university found that most of the students' test scores in one chapter were much lower than those in other chapters. At this point, an in-depth analysis of the causes may confirm that the material in that chapter is too difficult and not practical enough.Table 1 On the basis of this information, the institution can adjust the corresponding teaching resources in time, such as increasing the time of teachers' lectures, providing richer supplementary materials or designing targeted tutorials, so as to achieve the precise allocation of resources.

Table 1. Core Elements of Big Data-Enabled Exploration of Accurate Teaching Paths in Theory Courses in Higher Education

Core elements	Precision Teaching and Learning Implementation			challenge
analysed		valuation		
Learning needs analysis	Resource allocation	Effectiveness evaluation		
Personalised Learning Objectives	data-driven		Combining quantitative and qualitative	
Key indicators	Optimal allocation of resources	Student Feedback	User Privacy and Data Security	
machine learning	Classroom Interaction	Sentiment analysis	Teachers' skills requirements upgraded	

When exploring the path of precision teaching in theory courses in higher education empowered by big data, it is important to analyse the core elements involved in this new teaching mode from multiple dimensions [6]. Defining the core elements of precision teaching must include "learning needs analysis", i.e., the necessity of establishing personalised learning objectives through in-depth research on individual student differences. In this process, key indicators such as academic performance data and learning behaviour data will provide data support,

complemented by machine learning technology to dynamically assess students' learning progress, so as to adjust teaching strategies in real time and improve learning efficiency and effectiveness.

In the rational allocation of teaching resources, the "data-driven" resource allocation strategy should be emphasised [7]. The use of big data analysis technology can effectively identify which teaching resources can best meet the needs of students, so as to promote the optimal allocation of resources. For example, by analysing the correlation between students' assessment results and teaching content, teachers can optimise the teaching syllabus and enhance classroom interaction to improve students' participation in learning.

The construction of precise teaching path not only needs to rely on the innovation of big data technology, but also needs the continuous updating of educational concepts [8]. In this context, through reasonable data collection and analysis methods, effective teaching resource allocation, and comprehensive effect evaluation, we expect to be able to provide a guarantee for the improvement of the teaching quality of theory courses in colleges and universities.

4. Conclusions and Outlook

With the rapid development of big data technology and the updating of educational concepts, the precise teaching path of theoretical courses in colleges and universities is undergoing profound changes. Through the application of big data, educators are able to analyse students' learning habits, attitudes and behaviours more deeply, so as to achieve personalised learning path construction. This not only improves the efficiency of students' learning, but also enhances their learning autonomy [9]. At the same time, the concept of precision teaching provides college education with flexible and diverse teaching strategies, which makes the teaching content, methods and assessment methods tend to be more scientific and effective. In terms of the rational allocation of teaching resources, the data-driven approach enables educators to make timely adjustments according to the actual needs of students and achieve the optimal use of teaching resources. This dynamic allocation of resources not only improves the quality of classroom teaching, but also lays the foundation for ensuring that each student is supported in personalised learning [10]. The quantitative assessment of learning effects has also become more and more important, and through scientific assessment indicators and data analysis methods, colleges and universities can grasp the teaching effect in a timely manner and adjust the teaching strategy, so as to continuously improve the learning outcomes of students. It is foreseeable that with the help of big data, the theoretical courses in colleges and universities will show unprecedented vitality and innovation, and promote the whole education system towards the direction of intelligence, precision and personalisation.

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