

# Research on the Innovation of Personalized Education in Colleges and Universities under the Context of Big Data

Ruihong Yu\*

Jilin Engineering Normal University, Changchun 130061, Jilin Provinces, China

**Abstract:** The advent of the big data era has opened up unprecedented quantifiable dimensions for all walks of life, while also presented many opportunities and challenges. The widespread application of big data in the field of education will inevitably promote the innovation and transformation of the higher education in colleges and universities which introduce new opportunities and challenges to personalized education in colleges and universities. How to promote the in-depth integration of big data and higher education to meet the needs of students' personalized development is one of the hot topics in the theoretical field today. In view of this, this article starts with explaining the connotation of personalized education in colleges and universities, analyzes the opportunities and challenges faced by personalized education in colleges and universities under the context of big data, and proposes the ideas of innovating personalized education in colleges and universities under the context of big data.

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**\*Corresponding author:** Ruihong Yu, yrh009@126.com

## 1 Introduction

The innovative development of higher education in the new era is oriented in the direction of providing each student with education that is suitable for his or her personality development according to the law of education. The advent of the era of big data has promoted the in-depth integration of big data and higher education, bringing new opportunities and challenges to personalized education in colleges and universities.

## 2 Connotation of personalized education in the context of big data

### 2.1 Connotation of personalized education

Personalized education is a form of education that respects the unique value of each individual, explores the potential of individual, cultivates the independent personality and unique personality of students, and promotes the free and harmonious development of life<sup>[1]</sup>. Educators should take the personality of the students as an important basis for education, fully respect the differences between students, follow the laws of education, as well as understand the interests, hobbies, and specialties of students, so that each student can find and identify a field that is suitable and accordant to student's personality to explore and develop. This helps cultivate students' autonomous learning ability, explore the potential of each individual, and cultivate the ability to adapt to the needs of the contemporary development, so as to promote the harmonious and holistic development of students' personality.

### 2.2 The ways of thinking for personalized education in the context of big data

Owing of its unique nature, big data can not only provide more intelligent technology and platform support for colleges and universities to carry out personalized education, but also bring new and different ways of thinking for personalized education.

#### 2.2.1 Quantitative thinking and integrated thinking in the context of big data

Quantifiable dimensions can be provided for the educators after exchanging, integrating, and analyzing the massive data generated from students' learning lives.

Relying on a large amount of valuable data generated by big data, the educators can establish quantitative thinking in the teaching and education process after understanding the true status and needs of each student. At the same time, through the efficient and accurate analysis of massive data, discovering, capturing, and analyzing to obtain value, an integrated way of thinking can be established. The establishment of quantitative thinking and integrated thinking mode which facilitates the change of the educator's thinking mode can help the educators to comprehensively evaluate the college students in a personalized manner so that the educators can provide college students with personalized learning resources and learning strategies tailored to the needs and aptitudes of each student.

### **2.2.2 Associative thinking and shared thinking in the context of big data**

Relying on big data, a comprehensive multi-dimensional analysis of all aspects of student learning can be achieved, and the association and relationship between complicated data can be analyzed through associative thinking, and the trends of development in future can also be predicted. It is feasible to say that big data focuses on the relationship between data and events. Therefore, compared to traditional teaching and education methods, big data has brought associative thinking to personalized education. In the process of implementing education, establishing associative thinking does not neglect the causal relationship between events and data. In contrast, the correlation of multiple dimensions can provide intelligent analysis methods for personalized education, making the analysis and evaluation results more scientific and comprehensive. In the context of big data, resource sharing is the development trend of personalized education in colleges and universities. This has broken the closed and isolated state of resources of the past, established shared thinking, allowed communication among each other through the resource sharing of data in various departments and links, and jointly discovered the hidden value of data.

## **3 Opportunities and challenges facing personalized education in colleges and universities in the context of big data**

### **3.1 Opportunities for personalized education in colleges and universities in the context of big data**

#### **3.1.1 Providing comprehensive research information for personalized education in colleges and universities**

With the rapid development of education informatization, the deep and extensive integration of big data and higher education is an inevitable trend. Different individual students have different personalities and demands. Through big data analysis, students can be provided with unique educational solutions to meet the requirements of different individuals<sup>[2]</sup>. It is important to note that social networking, online learning, and daily management of the student can generate a large amount of data. By collecting, researching and analyzing massive amounts of educational data, the seemingly irrelevant information can be related. At the same time, information regarding students' feelings, emotions, and attitudes which cannot be quantified in the past can now be collected and analyzed to evaluate if they are inter-related. After proper analysis and presentation of the data, the information can enable educators to understand the status and needs of students in a timely and accurate manner from the macro and micro levels, and analyzes the student's lifestyle, learning habits, interests, hobbies, motivation, potential, etc., to formulate precise plans and intelligent management method to meet the personalized development requirements of students.

#### **3.1.2 Providing scientific predictions for personalized education in colleges and universities**

The predictive function is an important value of big data. After the learning analysis system processes the collected data, a series of information can be extracted. Predictiveness is one of the salient features of this

kind of information. Using this information can bring strong pertinence to teaching<sup>[3]</sup>. When a certain amount of personal data of each individual is accumulated, it is possible to reveal personal habits, mental states, behavioral rules, personality characteristics and other crucial information through data analysis. The thinking mode and status, knowledge acquisition and learning process, management process, daily life, etc. of each student can be digitalized for presentation after mining student's behavior, consumption, and emotion. Using statistics, data mining and other technologies to analyze these collected data can predict the students' thoughts and behaviors in the approach to provide forward-looking scientific predictions for personalized education. For example, through the mining of educational data and analysis of learning conditions, teachers can fully understand each student, and provide personalized learning solutions and learning materials that are tailored to the needs of different students. The teachers can also timely diagnose possible problems and intervene to achieve favorable effects in personalized learning process. Apart from that, by collecting, analyzing and comparing the data regarding students' borrowing records in the library, online search records, etc., the teachers can understand the students' interests and hobbies, and can effectively monitor their negative emotions. When the data is abnormal or when it approaches a critical point, teachers must promptly guide the students in a timely manner to prevent them from manifesting irrational behaviors to ensure healthy development of physical and mental health.

### **3.1.3 Providing technical support for personalized education**

Educational psychologist Ausubel once pointed out that the single most important factor affecting learning is what the learner knows and thus, teachers should determine this factor and implement teaching accordingly<sup>[4]</sup>. With the integration of big data technology and higher education, continuous and open education modes such as flipped classrooms and micro-lessons are becoming more popular. Taking micro-lessons as an example, students can use the pre-developed pad micro-lesson to study, and then technicians will analyze the data using learning resource analysis, interactive analysis, test analysis, and video learning analysis, extracurricular resource analysis, learning result analysis and other dimensions to capture, collect and store the data generated during the learning process at all levels<sup>[5]</sup>. Big data has

promoted the transformation of traditional education models and provided technical support for personalized education. Through the mining of student learning life data, along with analysis, induction and prediction, the individual needs of students can be present so as to enable educators to pay attention to the individual needs of students to provide personalized teaching, recommend personalized learning content, and help students learn independently. At the same time, colleges and universities can provide targeted student management and behavioral interventions according to the individual needs of students. Big data technology can also be used to record data of students' learning behavior, understand the individual needs of students, understand the teaching behavior of teachers, improve educational evaluation, and promote the development of personalized education.

## **3.2 Challenges Faced by Personalized Education in Colleges and Universities in the Context of Big Data**

### **3.2.1 More complex education environment for personalized education in colleges and universities**

In the era of big data, colleges and universities are facing more complex educational environments as compared to in the past. Information transmission overcomes the limitation of time and space, and the volume of information continues to expand, increasing the difficulty of personalized education. With the rapid development of network information technology, especially the rapid popularization of smart phones in recent years and the rapid expansion of the use of new media technologies, the sources of information are becoming more extensive and the content of information is becoming broader. Personalized education in colleges and universities has faced unprecedented challenges which are attributed to the diverse and active thoughts and strong individual consciousness of the students. In addition, the fact that some students have psychological problems also presents as a challenge.

### **3.2.2 Insufficient big data literacy of college educators**

The application of big data in the field of education is still in the initial exploration stage. There is a problem of insufficient big data literacy in college educators, which is mainly reflected in the two aspects of cognition and ability of using big data. In terms of cognition, the

arrival of the era of big data has challenged the way of thinking of traditional higher education. The way of thinking of the educators in colleges and universities who lack sufficient professional knowledge of big data still remain in a traditional empirical state. Thus, their ways of thinking will take some time to change. In terms of capabilities, the lack of big data capabilities of educational subjects and lack of capabilities in information acquisition, analysis, application, and prediction hinder the effective advancement of personalized education in colleges and universities.

### **3.2.3 The challenge of integrating big data with personalized education**

At present, the application of big data in the field of education is still in its infancy. The fact that the educational data is complex has brought great challenges to personalized education in colleges and universities. First, the construction of college education databases is incomplete, and the application of databases is also not complete. There are many types of statistical data in the university education system. A large amount of data is collected, stored, organized, and analyzed. There is no strict system specification for the connection, conversion, and application of different data, and there are obstacles in information communication and sharing. Second, big data processing requires professional talents. The processing of big data requires big data professionals who are capable of processing data in many aspects such as the source of the data, the accuracy of the data, the uniformity of the data, how to process and analyze a large amount of data, and drawing correct conclusions. At present, universities lack professional personnel in this area. There are also risks to security and privacy. Procedures on data protection, privacy risks management, and security are generally lacking in colleges and universities. Particularly, personalized data and privacy are at risk of being leaked and abused, and there is a possibility of conflicts between big data applications and personal privacy protection.

## **4 Research on innovating personalized education in colleges and universities in the context of big data**

### **4.1 Cultivating big data thinking in educators and innovating educational methods**

Big data provides rich information resources, more technical means for higher education, and more

importantly, changes in the way of thinking. For a long time, college educators have been deeply affected by "fixed mindset", and they tend to consistently adhere to the educational concepts and connotations. With this mindset and concept, they will regard the standards of all students are the same. This method is difficult to cultivate the personality of students and inculcate innovative thinking<sup>[5]</sup>. What's more important is that the traditional educational thinking lacks precise training standards for students. In the era of big data, higher education can be illustrated using data. With the emergence of big data, Internet Plus, cloud storage, and cloud computing, college educators are required to change the ways they think, change the traditional, fixed mindset and ideologies that they have been upholding, cultivate big data thinking, and practice associative thinking, shared thinking, quantitative thinking, integrated thinking, and innovative education methods to integrate higher education and big data technology and achieve precise positioning and layering of students. This is also to cultivate students' independent motivation for independent thinking, and to facilitate the development of targeted, personalized and diverse educational programs and standards to meet the individual development requirements of students in order to ensure healthy development of students.

### **4.2 Constructing a scientific management model and training professional talents**

In order to meet the requirements of the era of data digitalization, college and university management should strengthen data consciousness, emphasize the top-level design of data, build a scientific management model, motivate the main subjects of various departments, and form an efficient operation mechanism that mobilizes easily. In terms of data collection, classification, and storage formation, data application specifications for different subjects should be stipulated to develop standardized data formats. Scientific and rational methods should be applied in data mining and analysis to establish an orderly and hierarchical data resource that can be scientifically and reasonably used in education. In addition, a big data information confidentiality system must be developed with clarification of data use rights, and guarantee of the privacy and security of student personal information. At the same time, it is also necessary to nurture educators' ability to learn data, improve their rational data analysis capabilities, and train high-quality professionals in a targeted manner. Professional teachers who are experts

in data are the important ingredients for realizing personalized education in colleges and universities.

### 4.3 Building a data integration platform and a personalized education evaluation mechanism

The evaluation of education is based on the educational values or goals. Effective evaluation techniques and methods are used in systematic collection and analysis of data and information, and valuable judgments are made on the extent to which educational activities meet the needs of educational subjects<sup>[6]</sup>. Furthermore, it is important to promote the construction of an integrated education service platform, establish a systematic educational data resource library, create personalized digital resources, combine digital resources with personalized teaching resources, and sort out various data to achieve consistent data sources which have compatible format, and support sharing. Based on the integrated data platform, a comprehensive, multi-level, multi-domain, and multi-angle personalized evaluation mechanism is developed. Big data storage and technical concepts have changed the unidirectional style of result-based evaluation. Instead, the new evaluation method evaluates students' holistic quality, establishes process evaluation, growth evaluation, and comprehensive evaluation, and changes the evaluation function. This provides personalized evaluation and guidance to fully unleash the potential of students.

## 5 Conclusion

Therefore, in the context of big data, colleges and universities should establish support systems for

personalized education. Furthermore, these institutes should collect, mine and analyze valuable data about the students, customize quantifiable data evaluation indicators, and provide students with personalized education in order to promote the innovative development of personalized education in colleges and universities.

### About the Author:

Yu Ruihong (May 13, 1969), who is of Han Chinese ancestry, is a native of Jiamusi, Heilongjiang. She is a professor and bachelor whose research field of interest is the ideological and political education research.

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