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## Application of Big data in Higher Education in Vietnam

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### ABSTRACT :

The education system regularly accumulates a vast amount of data, making systematic data processing an issue at the forefront today. Big data in education allows administrators to reconsider approaches, adjust the learning experience, and enhance the effectiveness of the management system.

This article focuses on the role of big data in improving the efficiency of the learning system, thus assisting educational managers in devising better solutions for various student groups.

Keywords: Big data, digital transformation, education, higher education, Vietnamese universities, information technology.

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### Introduction :

Big data has brought and continues to bring numerous benefits to countries worldwide, contributing to the transformation of various industries and sectors such as education and healthcare. It allows analysts to utilize a set of mathematical and statistical tools to form a universal data structure and extract valuable information, applying this information in various fields of operation. In the education sector, the application of big data enables the automation of information systems, streamlining information and minimizing the daily workload of teachers. Additionally, on the basis of large databases, the system's educational status can be analyzed to enhance the quality of the industry, promote improved managerial capabilities, enhance the quality of student education, and support graduates in entering the job market. To better understand the role of big data in higher education, the author focuses on researching its role and benefits for university education as well as educational administrators, specifically in devising better solutions for management and enhancing the quality of education tailored to diverse student populations.

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### Theoretical Basis :

#### *The concept of Big data in Education*

Big data refers to a collection of data with large volume, diverse types, high data value, and rapid data accumulation speed. Through Big data technology, these data can be effectively integrated to analyze the core value of data and prompt corresponding development. Among various types of big data, there are structured and unstructured data. Unstructured data, in contrast to structured data stored as text, has posed significant challenges for various industries. With the rapid development of Internet technology, the types of data are constantly changing, including logs, audio-visual data, graphics, etc., all of which impose many requirements on data processing capabilities. With the growth of big data technology, relying on cloud computing to analyze and organize various types of data, and forming computer systems and distribution, it can be seen that big data technology has the exceptional ability to analyze and process information. Applying big data technology in the field of education can improve the efficiency of education and teaching.

The function of big data in education involves in-depth analysis of the education system. This includes measuring, gathering, analyzing, and presenting structured and unstructured data with massive volumes regarding students and the educational environment. Such profound insights help understand the most suitable features of activities and the development of the learning system.

Types of data used in education: quantitative and qualitative methods are used to extract and study big data to gain a comprehensive picture that enables more informed decision-making. These decisions can significantly impact current business models, teacher effectiveness, as well as student learning outcomes. Additionally, the information obtained can help improve the overall technology infrastructure of educational institutions.

#### *Five types of data are used for the purposes mentioned above:*

Personal information;

- Information about students' interactions with digital learning systems (e-books, online courses, etc.);
- Reports on the effectiveness of learning materials;
- Administrative data (system-wide);
- Predictive input data.
- Based on the analysis of various methods and models, the main areas can be identified as:
- Critical thinking (mainly argumentation and creativity);
- Interaction with other participants in the process (communication and collaboration);
- Self-regulation, self-organization, and reflection.
- The most valuable results of big data analysis in education come when they reveal abnormal states and boundaries within the system. This allows managers to develop regulatory measures to respond to negative conditions, thus enhancing the development of the learning system.

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### **The Role of Big data in Education :**

- Big data provides academic institutions with opportunities to integrate integral platforms and applications commonly used to manage various aspects of their work. This enables them to improve efficiency and ultimately significantly reduce costs.
- Technology itself is changing the way we analyze information and make decisions in areas such as learning outcomes, technology effectiveness, faculty management, and organizational interactions. This helps students build their individual learning programs in a new way and choose appropriate learning methods.
- Firstly, academic performance: Educators use big data to research student achievements and identify potential opportunities for closer engagement in processes. For example, they can analyze dropout rates, total student enrollment, and student achievement rates to optimize teaching programs.
- Secondly, teaching effectiveness: Teachers can use the information received to create a more efficient learning environment and assess the most effective outcomes and quality of lessons. Analytics can provide detailed information in the real world about test errors, students' incorrect answers, and time spent on completing assignments. This allows teachers to adjust their instructions as needed and ensure optimal results for students in a short period.
- Thirdly, process organization: With the help of CRM, educators can track the activities of potential students on social networks and mobile devices. When a potential new student accesses the university's website, cookies can be used to target advertisements to them on other websites. This can help increase the number of actual students and, consequently, increase profits.
- Fourthly, internal progress: Technology also contributes to the efficiency and productivity of financial and business operations within the campus. For example, network log analysis helps significantly reduce response time to support requests. This encourages better student learning, thereby positively impacting the educational institution's image.
- Fifthly, planning: as analytics and data collection tools improve, administrators will have more information to make predictions and informed decisions about student recruitment. This can help drive growth in a targeted manner and plan resource usage at the scale of specific educational programs rather than the entire organization.
- Sixthly, expansion opportunities: This technology enables the creation of personalized training programs using various online resources. Automation allows for the creation of assignments using learning management systems (LMS), giving teachers more time to focus on direct classroom work.
- Integrating artificial intelligence, the Internet of Things (IoT), virtual reality, and augmented reality into teaching programs will promote personalized learning and improve student outcomes. They will also further drive the development of big data. Technologies like 5G networks and blockchain will provide academic institutions with a framework to handle increasing access demands, enhance rapid transfer capabilities, and ensure the complete security of any student records.

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### **Benefits of Big data in Higher Education :**

#### ***Through Big data research, departments can:***

- Identify areas where students are successful or need additional support. Identified patterns help simplify understanding specific needs and develop optimized personalized educational strategies. This also helps students save time when choosing the right majors.
- Monitor students' activities, such as how much time they spend, what resources they use for preparation, which topics are skipped, etc. Big data can also be used to track students' careers after graduation. It will also provide invaluable service in selecting the right university and courses.
- Create unique programs for each student. Even with hundreds of students in a college or university, different programs can be created for each of them using what is called blended learning methods (simultaneous online and offline learning).
- Receive predictions about future performance. It also helps quickly analyze course outlines before they are introduced into the curriculum.
- Evaluate dropout rates. By identifying the top reasons why students leave university, instructors can develop programs and strategies to better retain students.
- Predict candidates more accurately, as well as analyze factors influencing enrollment. Such knowledge allows organizations to adjust recruitment strategies and allocate resources. This data stream will also help prospective students analyze information about universities and

colleges not only in their own country but also worldwide.

- Understand more clearly the strengths and weaknesses of students in school. Teachers have the opportunity to analyze the entire block of information and draw clear conclusions, then recognize problems and take action to prevent more complex issues. After careful analysis, the program will be easier to adjust and more personalized. Thus, it improves the performance and achievements of students.
- Reduce dropout rates due to lack of understanding of the complexity of the technical parameters that students have chosen. Deep analysis helps assess students' abilities and talents and determine the best technical learning characteristics for students.
- Adjust current learning strategies. Educators may realize that a specific plan is not working well for a specific group of students and timely adjustments can help students progress and keep up with the program.
- Increase productivity. Data collection helps educators in continuously monitoring trends. After in-depth analysis, they can understand the strengths and weaknesses of each student more clearly.
- In the coming years, big data could revolutionize learning. Several attributes of the collected database have been developed, enhancing their effectiveness in education:
  - First, partial independence: Local data management can be used for each segment of the database. At the same time, each segment is a component of the entire database but can be considered as a separate small database with its own procedures and established rules.
  - Second, continuous access and transparency: All participants in the educational process have the opportunity to receive data from any segment of the database, even if they have been used for other tasks. If granted access, analysts should not consider parameters about the actual location of the information. Data distribution is automatically done through integrated tools.
  - Third, data multiplication: The simplified data transmission process from one database to another facilitates the integration of different systems. Thanks to advanced technology, complex structures with easy and reliable access can be created.
  - Fourth, technology stack freedom: any software and hardware solution can play a role as a data processing tool. Big data helps process the experiences of thousands of teachers and students, based on personalized experience analysis, to obtain effective methods and select learning modes.
- With expanded information space, students will be guided in more detail on various topics. Programs have learned to predict the success of a course even before training begins. Students will have the opportunity to choose their course programs, complete homework, and receive more detailed suggestion.
- There will be fewer dropouts in university groups, as technology will allow the early identification of at-risk students. At the same time, teachers will be able to better assist struggling students, as the program will pinpoint specific knowledge gaps in which areas.
- This system will also aid adolescents in choosing universities. AI can select the best places for future students to study without the need for applications. Each graduate of the organization will have a digital investment portfolio to help students accurately navigate the job market and help employers in selecting experts.
- Learning will become adaptive and student-centered. Big data-driven educational analytics are changing the idea of the format of educational programs. Texts used in education can not only be digitized but also translated into digital data.
- The results of such analyses will lead to changes in content that users can navigate more easily. Innovative methods will become an essential part of educational analytics: the combination of known data will allow predictions of the unknown, network analysis, and identification of structures and clusters.
- Changing the approach to monitoring and evaluating both the educational process and educational outcomes will allow teaching programs and teachers to effectively allocate resources.

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## Conclusion :

Big data opens up new horizons in modern education. With its assistance, educators can identify better or poorer performing students and predict which students need additional support and assistance in their learning process. Additionally, analyzing data on the quality of education helps students in choosing the most suitable career path based on their interests and personal qualities. In the future, big data analysis will facilitate the implementation of mechanisms that enable effective real-time interaction between teachers and students. Through big data analysis, educational institutions can deploy in-depth and comprehensive research on learning models and optimize them based on newly acquired knowledge.

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