

IMPLICATIONS OF TECHNOLOGY TRENDS IN EDUCATION: USING BIG DATA FOR LEARNING ANALYTICS

Rahmawati

Universitas Almarisah Madani Makassar, Indonesia
Email: rahmawatilp3imks@gmail.com

Abstract

Big Data technology trends have a significant impact on education. With its ability to collect, store, and analyze large amounts of data, Big Data can provide valuable insights into the learning process and help improve its effectiveness. Big Data has a significant role and contribution in learning analytics. With its ability to collect, store, and analyze large amounts of data, Big Data can provide valuable insights into the learning process and help improve its effectiveness. The use of Big Data technology in education has significant implications in learning analytics. The use of Big Data technology in education has the potential to improve learning effectiveness, personalize learning, data-based decision making, develop relevant curricula, and monitor and evaluate the learning process. Big Data has an important role and contribution in learning analytics. With its ability to collect, store, and analyze large amounts of data, Big Data can provide valuable insights into the learning process and help improve its effectiveness.

Keywords: Implications, technology trends, big data, learning analytics

INTRODUCTION

Huda et al., (2021) stated that the development of technology in the ethical aspect of the world of education has brought significant changes in the way we learn and teach. Technology is everything that makes it easier for humans. Technology is not just science with the knowledge that we think of such as machines, airplanes or other advanced technologies, but also an organizational structure, social structure, and power that crosses. The essence of technology itself is the "hand" that has the power to control a science owned by humans.

The control of science owned by humans if applied with the development and research carried out will produce technology that provides benefits for human life. Technology is also dilactelic which can solve a problem faced by an individual, but these problems will produce new problems and must be solved by other technologies. Science and technology are to make human life easier in various fields of life (Undavia et al., 2017). The existence of

smartphones and gadgets and the applications in them which are assisted by the internet network is one example of the progress of science and technology in Indonesia, where the Indonesian people themselves can communicate, search for information, learn, sell goods, buy goods, and much more. To gain knowledge, humans need education. Education is known as a force that can determine the superiority of productivity in other fields.

In the current era of globalization, competitiveness and competing to outperform all sectors that also affect the education sector require innovation in learning systems based on information technology. The development of information technology that was popular in the late 70s was created to address the obstacles in schooling. In the field of education, developing information technology has begun to provide benefits or positive impacts on the sustainability of learning. In the field of education, information and communication technology is utilized as a learning process tool to increase the effectiveness and efficiency of the implementation of the education process. The emergence of learning methods that utilize technology as a means to facilitate students and teachers during the learning process (Seufert et al.,).

Big data is seen as a new tool for adjusting instruction to participants' needs and learning styles. It is now reality to use big data for educational analysis, as evidenced by the work of numerous institutions. with the aid of software designed to evaluate students' attention in order to determine how well they are learning. This software gathers data from students' devices, including grades, learning skills, and strong and weak aspects.

According to Cope, B., & Kalantzis, M. (2016) the implementation of big data is Being able to recognize the possibilities for personalized learning has an impact on teaching as well, as it allows educators to spend more time supporting students one-on-one and improving their awareness of their needs. These days, there has been a significant shift in education due to increased student mobility and technological innovation. Massive Open Online Courses' (MOOC) popularity As of right now, 70 US universities are listed as providing MOOCs, making them one of the biggest online learning environments. Take Coursera, for instance, which has registered over 470,000 students. Investment is required to guarantee the creation of innovative teaching strategies that capitalize on the scope and potential of big data while keeping in mind the difficulty of every original idea (Cusumano, 2013). Europe can now become more competitive by adopting big data technology and offering online education. The potential of big data both inspires hope for an information-rich future and raises fears about the unfavorable effects of

technology on the formation of the character of today's young generation (Park, 2020). The impact of technological developments is inevitable, so what is needed now is how to educate today's young generation to become good online learners so that they can be wise in using and utilizing technology. Because this era promises teachers and students a new era of personalized learning, responsive formative assessment and collaborative learning. Learning is no longer only bound by time and space, learning can be designed to be accessed anytime and anywhere by utilizing technological media (Chaurasia et al., 018). As big data technology has developed and the important role of big data for the education system in Indonesia. The utilization of big data in Indonesian education is crucial because it facilitates the rapid collection of student data and the provision and management of vast volumes of both structured and unstructured data (Henry, R., & Venkatraman, 2015). But on the other hand, the use of big data in Indonesia is still very minimal, this is due to the lack of supporting technology. In fact, the education sector in Indonesia really needs big data, in addition to collecting information quickly, the education sector in Indonesia can also utilize big data to help new teachers adapt to a school.

According to Li, J., & Jiang, Y. (2021) similar to Similar to other businesses, education makes extensive use of big data, focusing mostly on adaptive learning. The data is used to analyze the environment, performance, and student needs in order to deliver them instruction that is tailored to their needs, motivation, and needs of the students. The primary use of this application is to create customized study routes in an effort to improve student motivation and provide more individualized training. The outcomes of data gathering and analysis give teachers knowledge about their pupils that can enhance their learning and the overall operation of the school. In order to ensure that students receive a high-quality education and achieve a more effective comprehension, big data in education has produced new learning models and ideas. Education institutions are receiving more information about the skills and development of their teachers and students as a result of the increased usage of virtual reality (VR) and other new digital technologies for training. For instance, they can monitor whether or not online course participants are finishing assignments all at once or taking pauses (Zeide, 2017).

RESEARCH METHOD

This study uses a descriptive method by collecting data from various reliable sources, including literature studies and recent publications. A descriptive approach is used to describe the implications of technology trends in education: the use of big data for learning analytics. The first stage in this research method is the collection of literature relevant to the research topic. A literature search is conducted through academic databases, scientific journals, and related publications that discuss the use of big data for learning analytics. The selected literature must be of good quality and relevant to the research objectives. After collecting the literature, an analysis and synthesis of the information found is carried out. Relevant data and information about big data technology trends in education, the potential use of big data in the educational realm, the role and contribution of big data in learning analytics related to the research topic.

RESULT AND DISCUSSION

Big Data Analytics Technology Trends in Education

In today's ever-evolving digital era, technology and data are two elements that are interrelated and play an important role in every aspect of our lives. One aspect that is greatly influenced by technological advances is education. As is known, today's technology has changed the way we learn and the methods of teaching, and now we see big data analysis as the key to making education more efficient and effective (Bamiah et al., 2018).

Hasan et al., (2020) stated huge data sets that are too enormous to handle or analyze with conventional techniques are referred to as big data. In the meanwhile, gathering, arranging, and evaluating large amounts of data in order to identify pertinent trends, patterns, and insights is known as big data analysis. Big data analysis can be utilized in the educational context to comprehend student learning patterns, assess the effectiveness of teaching methods, and identify areas that need improvement. For example, data analysis can help in understanding how well students understand the material, where they are having difficulty, and how their interactions with learning materials can be improved for better results.

Here are some ways in which analytics can also help make education more efficient and effective according to Murumba, J., & Micheni, E. (2017):

1. Personalized Learning

By using Big Data, educators can customize their teaching approaches based on the individual needs and abilities of students. Data analytics can

help identify areas where each student struggles, allowing teachers to tailor their teaching materials and methods to be more relevant and effective for each student.

2. Improving the Quality of Learning

This Analytics can also be used to evaluate how well instructional materials and programs are working methods. By analyzing data such as student grades, attendance rates, and student feedback, educators and educational institutions can make necessary changes to improve the quality of learning.

3. Predicting Student Outcomes

One of the major advantages of Big Data Analytics is its ability to make predictions based on data patterns. In education, this can be used to predict student outcomes, such as test scores or graduation rates. These predictions can help students and teachers focus on areas that need more attention to improve learning outcomes.

Big data analytics offers great opportunities to improve education. By combining data and technology, we can make education more personalized, effective, and efficient (Luan et al., 2020). However, it is important to remember that the adoption of the use of big data in education must be balanced with the privacy and data security of students. Big data analytics has the potential to be a very useful tool for future education if used properly. Making use of big data analytics, we can prepare a new generation of students who are not only ready for the challenges of the future but can also actively contribute to building that future.

Big Data analytics technology trends possess a noteworthy influence in the field of education. Large-scale data collection, storing, and analysis capabilities of big data make it possible to gain insightful knowledge about how learning works and enhance it. Here are a few educational big data analytics technology trends (Hwang et al., 2018):

1. Personalization of learning: Using Big Data analytics, educators can understand the unique requirements and tastes of every learner. This enables teachers to create learning strategies that are tailored to the needs of each student, thereby increasing the effectiveness of learning.
2. Data-driven decision making: Big Data analytics can help educators make smarter decisions. By analyzing learning data, educators can understand patterns and trends in student progress and identify areas for improvement. This allows educators to take appropriate action to improve student learning outcomes.

3. Prediction and forecasting: Big Data analytics can be used to make predictions and forecasts in the educational context. By analyzing historical data, Big Data can help predict future student progress, identify factors that influence learning outcomes, and plan appropriate actions.
4. Relevant curriculum development: Big Data analytics can help in developing a curriculum that is relevant to students' needs. By analyzing data on student preferences, learning outcomes, and educational trends, Big Data can provide valuable insights in designing a curriculum that is in line with current developments and student needs.
5. Monitoring and evaluation: Big Data analytics can be used to monitor and evaluate the learning process. By analyzing data on student participation, classroom interactions, and evaluation results, Big Data can help educators understand the effectiveness of the learning methods used and identify areas for improvement.

Big Data analytics technology trends have great potential in improving learning. With its ability to collect, store, and analyze large amounts of data, Big Data can provide valuable insights for educators in understanding student needs, making data-driven decisions, and developing more effective and relevant learning.

Potential for Utilizing Big Data in Education

The field of education has undergone a tremendous transformation as a result of advances in digital technology. Big data has become a useful tool in modern times to optimize the learning process in educational institutions. The efficiency, efficacy, and quality of educational services can all be improved with the use of big data in education (Lutfiani, N., & Meria, 2022). Through careful examination of data, academic institutions can pinpoint elements that impact student progress, modify pedagogical strategies, and create relevant learning materials. In addition, big data can help manage resources by improving scheduling, financial management, and administrative procedures.

Historically, the term “big data” has been ambiguous; it is believed to be unreliable and nothing more than a concept of size. The subject of how “big” and “small” are tied to time, space, and circumstances; the term “big” is too general. From an evolutionary perspective, big data continues to grow in size. Thus, a very large data set with a complex, varied, and extensive structure is what is meant by big data. Big data consists of several types of data sets that are difficult to handle with conventional tools because their size is not only very large but also very varied and fast (Baig et al., 2020).

Benefits of Big Data and Its Applications are as follows (Berkat et al., 2024):

1. E-learning

The form of utilization application of e-learning in every school is the use of big data in education. E-learning refers to the use of technology in both formal and non-formal learning settings, wherein educators and students use electronic media to carry out the teaching and learning process. Usually this site can be accessed anytime and anywhere by its users. E-learning websites utilize big data technology to help educators record the learning achievements of students who have gone through the programming process. In addition, it can also identify which materials and assignments are not yet understood by students. That way, it will make it easier for educators to evaluate and design further learning strategies.

2. DAPODIK

DAPODIK or Basic Education Data is a systematic national-scale data collection system. In addition, DAPODIK is also a source of data on the current national education system, which is part of the national design program in forming intelligent Indonesian people who can compete nationally and internationally. So, the form of this great data can be a bridge for several aspects so that they can be connected to each other.

Big data helps educators in recording the learning achievements of students who have gone through the programming process and presenting a summary of information on the development of student learning achievements. Education that is increasingly facilitated by technology has been proven to provide convenience for all parties involved in it (Attaran et al., 2018).

Big Data technology offers a lot of potential to improve learning and data-driven decision making in the educational setting. Here are a few possible applications of big data in the field of education (Fischer et al., 2020):

Personalized Learning: By using Big Data analysis, educators can understand the needs and preferences of students individually. This allows educators to develop learning strategies that are tailored to the needs of each student, thereby increasing the effectiveness of learning.

Data-Based Decision Making: Big Data analysis can help educators in making smarter decisions. By analyzing learning data, educators can understand patterns and trends in student progress, and identify areas that need improvement. This allows educators to take appropriate action to improve student learning outcomes.

Prediction and Forecasting: Big Data analysis can be used to make predictions and forecasts in the context of education. By analyzing historical data, Big Data can help predict future student progress, identify factors that influence learning outcomes, and plan appropriate actions.

Relevant Curriculum Development: Big Data analytics can help develop a curriculum that is relevant to students' needs. By analyzing data on student preferences, learning outcomes, and educational trends, Big Data can provide valuable insights into designing a curriculum that is in line with current developments and student needs.

Monitoring and Evaluation: Big Data analytics is a useful tool for tracking and assessing learning. Through the examination of student engagement, classroom dynamics, and assessment outcomes, Big Data can assist teachers in comprehending the effectiveness of the learning methods used and identify areas that need improvement.

By utilizing Big Data technology in education, it is expected to improve learning effectiveness, personalization of learning, data-based decision making, and curriculum development that is relevant to students' needs.

The Role and Contribution of Big Data in Learning Analytics

Ray, S., & Saeed, M. (2018) stated that big data has brought about significant changes in various industries, including the education industry. A collection of high-volume, high-speed, and/or high-diversity data is called big data. In order to improve insights, decision-making, and automation processes, the data is analyzed to find patterns, trends, and relationships connected to human behavior and interactions with the assistance of a digital agency. Conventional data processing algorithms cannot handle the analysis process due to the continuously growing data.

Businesses use big data to boost profitability, enhance customer service, optimize operations, and develop tailored marketing strategies based on the tastes of individual customers. When Big Data is used successfully, businesses may make faster and more data-driven decisions than those who do not, giving them a competitive advantage. Institutions can use the examined data to obtain insights that will help them make improvements to the educational system (Tempelaar et al., 2021).

Big data helps organizations enact a revolution in education so that students can learn efficiently and joyfully. Customizing programs for individual student is made easier by the ability to track every facet of their activities. Every student's demands and talents are taken into account during this

learning process. Big data can be used by digital companies to help educational institutions better meet the demands of their students. This aids in creating new curricula that students require and demand as well as new classes and teaching methods. Additionally, it aids organizations in resource optimization, which enhances their performance (Sedkaoui, S., & Khelfaoui, 2019). A tailored learning approach can be put in place to allow students to study at their own pace and make sure they comprehend the subject. Teachers can identify which areas their pupils thrive in and which ones require assistance by using Big Data. By continuously tracking students' abilities and growth, big data platforms assist teachers in making accurate assessments of their students. To assist students in choosing their careers, a report showcasing their areas of interest can be created.

Big Data has a significant role and contribution in learning analytics. With its ability to collect, store, and analyze large amounts of data, Big Data can provide valuable insights into the learning process and help improve its effectiveness. Here are some of the roles and contributions of Big Data in learning analytics according to Zhang et al., (2021):

1. Identifying patterns and trends: Big Data can analyze learning data from various sources, such as questionnaires, tests, and online activities, to identify patterns and trends in learning. For example, Big Data can help identify patterns of difficulty that students often face in a particular topic, so that teachers can take appropriate actions to help those students.
2. Personalizing learning: By analyzing data about individual preferences, needs, and progress, Big Data can help in personalizing learning. For example, Big Data can provide recommendations for learning materials that are tailored to students' needs and interests, so that students can learn more effectively.
3. Measuring the effectiveness of learning methods: Big Data can help measure the effectiveness of different learning methods. By analyzing data on student learning outcomes, participation rates, and student satisfaction levels, Big Data can provide insights into which learning methods are most effective and can help in decision-making regarding improvements to learning methods.
4. Detecting learning problems: By analyzing learning data in real-time, Big Data can detect learning problems quickly. For example, Big Data can identify students who are having difficulty understanding certain materials or students who need additional help, so that teachers can provide timely interventions.

5. Optimizing resource management: Big Data can help in optimizing resource management in the context of learning. By analyzing data on facility usage, learning time, and student needs, Big Data can help in decision-making regarding resource allocation, such as classroom space, learning time, and additional support.
6. Developing adaptive learning models: Big Data can be used to develop adaptive learning models. By analyzing data on student responses to various types of learning tasks and activities, Big Data can help in identifying the most effective learning strategies for each individual.

In conclusion, Big Data has an important role and contribution in learning analytics. With its ability to collect, store and analyze large amounts of data, Big Data can provide valuable insights into the learning process and help improve its effectiveness (Vaitsis et al., 2016).

CONCLUSION

For learning analytics, the use of big data technology in education has important consequences. Utilizing big data technology in the classroom has the ability to improve learning effectiveness, personalize learning, make data-based decisions, develop relevant curricula, and monitor and evaluate the learning process.

Big data's application in education has significant implications in various aspects. Here are some of the main implications of using big data for learning analytics

1. Personalize Learning
2. Improve Learning Outcomes
3. Better Decision Making
4. More Efficient Monitoring and Evaluation
5. Increased Operational Efficiency
6. Identify and Address Barriers to Learning

While Although there are many advantages to using big data in education, there are also a number of issues and concerns to take into account:

Data Privacy and Security: The collection and storage of student data must comply with strict privacy and security standards to protect personal information.

Data Quality: The caliber of the data gathered has a significant impact on the success of big data analytics. Incomplete or inaccurate data can result in incorrect analysis.

Technological Capacity and Infrastructure: The application of big data requires adequate technological infrastructure and a skilled workforce in data analytics.

Taking these factors into account, the use of big data in learning analysis can have a significant positive impact on improving the quality of education.

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