Utilization of Big Data in Educational Technology Research

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Abstract

This research aims to exploit the role and contribution of big data in normal-age learning paradigms that require online learning that was initially conducted face-to-face. Educational technology research includes research areas that require changes in learning strategies. This includes the use of technology currently occurring during the COVID-19 virus pandemic to transform face-to-face learning online. Use big data to develop learning strategies (procedures) to solve problems/facilitate learning. The use of big data can contribute to the study of education in general and educational technology in particular. Methodologies used include the analysis and potential implementation of big data in the field of educational technology research by conducting literature survey analyses. The data obtained and used are in the form of local and international journals related to the implementation of big data in the world of educational technology research. The development of technology research applications based on big data makes it easier for researchers to see the possibilities and problems of individual students. Based on this data, researchers can monitor and evaluate students, teachers, materials, and learners. The data can be used to prepare future research efforts.

Keywords: Big Data, Education dan Educational Technology Research,
1. Introduction

Learning begins in the classroom, based on three models: behaviorism, cognitivism, and constructivism[1]. Behaviorist models rely on observable changes in student behavior to assess learning outcomes. Cognitivist models are based on the active involvement of teachers in cognitive-based learning.

Or thinking power. Constructivist models, on the other hand, require students to actively learn from the available knowledge. By providing a large amount of data (big data) that results in good feedback for each student when accessing all materials available on the e-learning portal [2]. The convergence of education and technology has created many opportunities for business entry, but this topic is not the only one. The content on the importance of human behavior in learning (learning about learning) has grown and generated big data.

In the current age of technology, research methods are disrupted by the phenomenon of e-learning, which offers easy access to a wide variety of educational materials and educational media, including infographics, audiovisual media, textbooks, and interactive programs. Easy Access Her Covid-19 case outbreak in Indonesia has affected many aspects of life, from economy and politics to education. Face-to-face learning has turned to online learning. Kindergarten (TK), Elementary School (SD), Middle School (SMP), High School (SMA) to higher education. So from 1930 to 1960, I studied theory, and up until then I was building theory on a face-to-face basis. A rare theory based on network online. Usually enhanced inquiry-based learning [3].

As such, current e-learning does not fully recognize e-learning systems as learning management systems (LMS) [4]. model. All learning resources are not properly managed, and learning materials may be at risk of being lost in the room and remaining class-oriented. Also, e-learning does not focus on student characteristics. The role of e-learning is to assume that all users are equal, and that all users are equal, learning material content Just prioritize the delivery of . Most (traditional) e-learning systems only present materials suitable for homogeneous, well-prepared and motivated students, but problems arise when the system is presented to a wide variety of students. occur. As V.S.L. (Esichaikul; C. Bechter and Thammasat, 2011) pointed out, ```Most e-learning systems offer web-based learning, where students are based on every student's profile, without customization. can access the same online courses over the Internet. and act. E-learning systems are not one-size-fits-all.

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“Students have different learning motivations, knowledge levels, learning styles and abilities, so content learning targeted at one group of students may not be suitable for others. Therefore, the existing e-learning still cannot guarantee the transformation of learning or the smooth implementation of learning itself, and the learning effect is not optimal. The existence
of e-learning systems, which are expected to enhance the intensity of self-directed learning, has not yet shown its important role. This requires a dynamic e-learning system based on student trait models.

Research in the field of pedagogy is increasing. This is facilitated by the proliferation of existing community-based learning environments such as: B. Online learning environments, as evidenced by the presence of forums, online chats, instant messengers, and various learning management systems (LMS). Data from the e-learning industry shows that 78% of companies have implemented a learning management system (LMS). And 100% of these organizations benefit from eLearning (Roth, 2016). The benefits of e-learning have also been recognized by Indonesian education circles, who have endorsed the implementation of his 2013 curriculum, which calls for students to be actively involved in learning at all times. This corresponds to the nature of e-learning, i.e. individual learning and study habits, with students playing the most important role. A major aspect considered in learning design and e-learning development is student behavior (H.D. Surjono, 2011). This method ensures that e-learning provides the maximum learning experience for students, increases student retention, and ensures that all relevant components support achievement of learning goals and accommodate student characteristics.

1.1 Big data

Big data is now becoming a phenomenon of its own. Because everything is data, and everything people do, say, or observe creates more data (Hoy, 2014). The very definition of big data is data that exceeds the processing capabilities of traditional database systems. The data is too big, moving too fast, or doesn't fit into the database architecture. To extract value from data, we must choose a different processing method (Dumbil, 2013).

The three dimensions or "3Vs" of big data are generally accepted to be variety, quantity and velocity. Diversity is the type of data collected and generated. Volume refers to the amount of data produced by the National Library. On the other hand, the speed (velocity) of data growth is determined (Laney, 2001). Big Data is a Growing Phenomenon Big data is so big that it doesn't work with traditional database management systems. According to IDC, big data is a new generation of technology with a data architecture created by extracting valuable data from a large number of data variations efficiently and at scale. Big data is a term that refers to huge data sets with large, diverse, and complex types of structures. Big data consists of large, diverse, and fast data sets of various types that are not easily processed by traditional tools [5]. Various sources of big data are listed below. For example, today's big data is all information collected by governments, private companies, social websites, and many companies around us. There are 2.5 trillion bits of new data every day, and 90% of that data was created in the last two years alone. Big data has various sources
that generate huge amounts of data and sources such as social websites Facebook, Twitter, Google+, etc., and large amounts of data in the form of video, images, text, audio, etc. are generated every day. to generate data for Government websites and private companies also generate large amounts of data (Gondaliya, 2015). Multiple scientific instruments and instruments, media and mobile devices are another reason why so much data is generated. Big data poses not only challenges for organizations and businesses, but also for analyzing, storing and visualizing data processes and end results [6]. A special discussion is needed on how various big data tools can be used to meet this challenge.

Big data is now seen as a “dashboard of human behavior” by Rick Smolan and Jennifer Erwitt, lead authors of the picture book “The Human Face of Big Data”. Big data methods and analytics help us to perceive human behavior and allow us to measure and analyze the constant stream of data collected by sensors, satellites and GPS enabled devices. At this point, big data is also called gold [7]. Today, due to many innovations in technology, the amount of real data is very large. For the first time, a big data implementation was performed in his web search algorithm of Google to show the search behavior of Google users (Rhehalter, 2014). Today, Netflix has transformed the way people select and consume movies and TV through their recommendation engine through the implementation of big data.

1.2 Education and research

Big data is considered as a new opportunity to adapt education to the needs and learning process of participants. Using Big data in education is no longer a fiction and has been practiced in several institutions. With the help of software that analyzes students’ emphasis to find out their learning progress. The software collects information from the device students are using and collects grades, study skills, strong and weak points and hesitancy patterns when using a computer mouse. Big data implementations are able to see the potential of this customized learning also impact teaching, by giving teaching staff more time to support individual students, and being more aware of student needs.

Currently, technological innovation and increased student mobility have allowed education to change massively [8]. Popularity of Massive Open Online Courses (MOOC) Currently, there are 70 institutions in the United States that have offered MOOC courses and have become one of the largest online education platforms. For example Coursera and with more than 470,000 student enrollments[9]. Investments are needed to ensure the development of new pedagogical approaches to take advantage of the scale and possibilities of Big data without forgetting the complexities involved in any creative thinking (Cusumano, 2013). Currently Europe is able to increase its competitiveness through online teaching and using the implementation of Big data technology.
Ethical and moral aspects must be considered, especially when developing robust data anonymization tools. Implementing big data in research presents several challenges, including:

a. Data privacy. Privacy is about controlling the extent, time, and circumstances of what you share (physically, behaviorally, or intellectually) with others [10]. Privacy (also known as privacy) is the ability of an organization or individual to decide what data about themselves can be shared with a computer system.

b. Data Security. This is closely related to the level of security of the data stored and used, and includes standards that can be followed to prevent unauthorized access and to properly access relevant data [11].

c. Security breach. This refers to tracking in the event of theft or other unauthorized access to data containing sensitive personal information, which may compromise the confidentiality of the data.

1.3 Big Data in Research

Big data techniques can be used in various ways in analyzing learning/research such as:

a. Performance Prediction: Student performance can be predicted through the analysis of interactions between students and interactions between students and teachers in their learning environment.

b. Attrition Risk Detection: by analyzing student behavior, the risk of students dropping out in learning can be detected and measured, carried out at the beginning of learning so as to minimize the risk of dropping out.

c. Data Visualization: Reports on educational data will continue to grow in size and become complex. Data can be visualized using visualization techniques to make it easier to identify data trends and relationships between data just by looking at the visualization of the report [12].

d. Intelligent Feedback: The learning system provides intelligent feedback that responds immediately to student input which will improve interaction and performance.

e. Course Recommendation: a new course can be recommended based on student interest, identified by analyzing their activities. This ensures that students will not get lost in choosing their favorite field of knowledge.

f. Student Skill estimation: estimating student skill achievement

g. Behavior Detection: detecting student behavior in their environment based on activities and model robes that help in developing students self.
1.4 Big Data Analytic

Big data analytics can be used to analyze in real time student experiences that may be generated from student activities such as: Course registration, payment, class attendance, online learning and assessment. Uses of big data analytics in education include learning analytics, academic analytics, and process mining [13]. Learning Analytics is designed to analyze learning data in real-time, so it can be used to predict successful and academically at-risk students. Universities can use big data analytics to provide at-risk students with insights to take preventative measures, or provide additional support to increase success and confidence in the learning process before they actually fail. (reduces dropouts and improves results). (Saurab, 2017). Learning analytics has the potential to help students and educators spot warning signs before their learning success is jeopardized. Learning Analytics provides tools, technologies, and platforms that empower educators and open the door to meaningful learning experiences to motivate, inspire, and prepare current and future students for success. (B. Daniel, 2014).

Academic analysis analyzes the performance of academic staff. Academic analytics can perform real-time analysis of data, which is the variable for measuring academic performance, so you know that academic staff are performing better than other academic staff and that academic staff are performing very poorly [14].

The mining process is used to analyze the university’s business processes in real time. The data used can come from student, faculty, and unit log or activity data related to processes and activities occurring in the university, and perform process analysis to find new business process models [15]. However, process analytics is not limited to business process discovery processes, it enables compliance validation, deviation detection, delay prediction, decision support, and process redesign recommendations. I will use it as a reference when developing big data analysis in the future. The proposed designs for learning analytics, academic analytics, and process analytics incorporate ETL technology to acquire data from multiple sources. Data from student information systems, course data sources can be used for learning analytics.

Administration, online education, student assessment, data funding. Data sources for achievement evaluation data, course evaluation data, staff evaluation data, faculty evaluation data, and financial evaluation data can be used for academic analysis processes [16]. On the other hand, data sources from student information system activity log data, course administration, online teaching, student assessment, and financial process activity log data can be used for process analysis. Student assessment and financial data. Data from multiple sources is then aggregated into a data warehouse and analyzed using real-time analytics and predictive technologies such as: for example.
Online analytical processes (OLAP), analytical reporting tools (business intelligence), and data mining/predictive modeling. The results of the analysis and predictions are presented in the form of analytical dashboard presentations designed to help improve decision-making in higher education and improve student and institution performance.

2. Research Method

Includes evaluation and capacity implementation of massive records within the realm of Educational Technology studies via way of means of carrying out a literature evaluate evaluation. The records acquired and used are within the shape of neighborhood and global journals associated with the implementation of massive records within the global of Educational Technology Research.

3. Findings

Educational technology research involves at least multiple stakeholders, including students, educators, and administrators. By introducing big data into research in the field of educational technology, it becomes possible to get a bird’s-eye view of possibilities and challenges. This section describes the role and contribution of big data implementations in improving the quality of educational technology research for students, faculty, and learning providers.

3.1 Learner

Big data implementations enable the extraction of research information, providing insight into student learning performance and a holistic approach to learning. Teachers/Instructors and Learning Administrators can gradually explore and monitor each student to begin a more engaging and in-depth approach to your chosen topic [17]. This will help students to understand the topic better. The implementation of MOOCs also enhances digital reading materials and allows for flexible course plans for students to use. MOOC algorithms can filter a variety of data about how students interact with learning materials (text, audiovisual media, images, etc.). Bigdata algorithms can identify which parts of a lesson are difficult to understand, which parts are unclear, and which parts are easy [18]. Data can be viewed in real-time, allowing you to directly monitor the data and get an overview of the lessons learned. Big data implementations allow for a wider range of monitoring and evaluation of student behavior. B. Time spent reading, sources of electronic resources, and speed at which concepts are learned. key concept. This gives them information about the lessons they are taking so they can change their reading and learning patterns to overcome the challenges they face and improve their learning outcomes. Big data analytics can provide an overview of the quality of student learning and, combined with regular test scores, can help teachers understand what students know and which techniques work best for each student. can be analyzed. A focus on data analysis allows students to learn in more diverse ways.

Currently, research in Indonesia is still face-to-face theory, and MOOC-based implementations have started. Adapting a MOOC-based educational approach to students will certainly take time, so a dedicated approach is needed to support this type of online research. Research results in several countries for MOOC technology studies also show that this system is more effective for some research purposes related to computer and internet use, but not related to information resources. In the field of course teaching technology studies related to the application of courses and new technologies. What is noteworthy is the commitment to learning through e-learning. Good engagement not only influences learning outcomes, but also the research data collected and produced.
3.2 Instructor/Lecturer

The best place to learn is how to provide an output of student learning data. Big data implementations provide educators with a useful toolkit to learn how things work faster and a powerful set of tools to use them for different types of learners and different learning situations. provide an insight into the resources available to teachers. Big data enables teachers to get summary reports on student progress. For example, as students view course materials and tutorials and complete exercises, data is collected and made available to faculty and staff through graphical reports and other interactive visual tools. These tools not only help faculty and staff track their learning progress, but also help them decide how to personalize learning for students who need more help in specific areas.

In this competitive era, research in the field of educational technology has become very important to meet this challenge. One of the natural responses to the above challenges is to adopt new technology to support her MOOC for Big Database. The use of big data in educational technology research will give educators and librarians new perspectives for evaluating educational technology research. This innovation empowers students and teachers to make better decisions and apply the principle of leaving no one behind. Based on the data obtained, faculty and staff will change (adjust) the learning content if learning is difficult, so no student will be left behind. The data is easy for educators to understand and is visualized in color-coded graphs to quickly spot performance gaps and general strengths and weaknesses. Big data dashboards highlight which students need extra help and which students need more difficult assignments, allowing faculty to adjust lesson plans.

3.3 Learning Manager

For Learning Managers, the implementation of massive statistics might be capable of help Learning Managers in making regulations primarily based totally on statistics or statistics pushed regulations. Learning Manager is capable of construct a learner revel in version. This may be completed via way of means of amassing scholar delight questionnaires with mastering, or reading scale statistics. Data series also can be completed via way of means of constructing empirical fashions of college students and coaching personnel thru statistics on attendance of coaching personnel and college students, coaching personnel overall performance, conduct and alternatives in path mastering, and reading mastering systems. For instance via way of means of constructing a learner revel in version, carrying out an internet path evaluation, after which carrying out a path design, a massive statistics version that adjustments the order wherein the path is taught, notably improves the educational overall performance of the learner and the coaching effectiveness of the coaching personnel.

Big statistics is capable of have a look at scholar mastering conduct and coaching consequences via way of means of a massive statistics approximately adjustments in scholar conduct in faculty situations, scholar mastering path final touch status, mastering time spent via way of means of college students at the net device and scholar take a look at rankings Finally, a version of scholar mastering conduct formed. By constructing a massive statistics mastering platform and constructing a learner conduct version, it's far feasible to expect learner failure in mastering failure with a prediction accuracy of greater than 75%. In addition, the mastering supervisor is capable of acquire interactive statistics of college students in a massive statistics on line statistics device, the contents include: the character and quantity of scholar requests for help, the exercise of college students answering questions, the repetition charge of college students who solution errors, an appropriate stage of answering questions and an professional device. thru statistics mining and mastering and evaluation of the learner's know-how version built, statistics records on the unit stage, curriculum stage and know-how factor stage may be analyzed via way of means of guide comments or automated comments to choose an appropriate mode and absolutely bear in mind the learner's time, To offer individuals learner with suitable mastering content, which affords special mastering reviews and mastering comments to freshmen thru special statistics of
every know-how factor from each cellular telecell smartphone thru on line selection making, mastering evaluation and statistics mining.

Learning managers also are capable of make selections via information mining and studying evaluation of instructional huge information, present area understanding is revamped to look at the connection among beginners and studying factors consisting of understanding factors, studying gadgets and courses [19]. By constructing a website understanding model, Collecting and processing applicable learner information, drawing a learner studying curve, after which via information evaluation of this studying curve, can drastically enhance the instructional overall performance of college students and the coaching performance of coaching staff. By accumulating the fundamental studying facts of beginners, the fundamental facts information set, beginners of the identical studying traits are grouped and grouped in line with the studying traits of beginners via information mining, studying evaluation and system studying algorithms, learner documents are established, this could offer a whole lot of sort of learner non-public studying surroundings that may stimulate beginners to examine projects and projects, for example, via information mining era on-line studying platform beginners to examine log evaluation, that may recognize exceptional beginners traits and exceptional styles of studying interactions, after which construct learner documents, completely stimulate studying projects, drastically enhance the studying performance of beginners [20].

4. Conclusion

The most important reason of the usage of huge information in training is to assist educators formulate coaching techniques and examine records amassed from contributors to discover the feature of numerous additives of the studying gadget and to investigate player studying effects and coaching techniques. Extra powerful coaching techniques in training. Through information mining, studying evaluation and linear decision-making structures offer a scientific sensible and dynamic systemic evaluation. Through the analytical studying procedure Research is capable of enhance the performance of coaching / studying. To reap the a success attention of the studying analytic gadget. The implementation of huge information is capable of assist students, coaching team of workers and training and education managers in developing an green studying climate. Big information is capable of optimize training and studies control techniques and notably boom the performance of training and studies sports thru the personalization of adaptive studying structures. Big information is able to converting the manner coaching team of workers educate and studying contributors in addition to studying managers with the aid of using locating approaches to offer answers to troubles for every birthday birthday celebration who has problems withinside the studying procedure in order that contributors fail to attain their ability. However, huge information can offer the important gear for coaching team of workers to higher recognize the wishes of contributors, coaching team of workers and education managers which in flip can deliver events a higher threat of success.

Research withinside the discipline of on-line instructional era is an innovation that has high-quality opportunities. Currently the door has been opened very extensive thru higher net infrastructure, human assets which have started to enhance and the availability of various content. The improvement of huge information-primarily based totally education packages can be capable of make it simpler for training era education managers to look the ability and troubles of every education player. Based in this information, the training and education supervisor can be capable of reveal and examine the education contributors, education teachers, education coaching substances and education implementers. This information may be used as a part of the formula of regulations for the sports of the Education and Training Center withinside the future.
References


