Transformation of blockchain and opportunities for education 4.0

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ABSTRACT

There are many ways in which education 4.0 can continue to develop rapidly and coexist with the development of increasingly advanced technology to bond with each other to be balanced, one of which is using blockchain technology that is integrated in the education sector for various purposes. The main direction in developing global integration in education includes the creating a single educational space and optimization of the interaction between education and stakeholder relationships. The blockchain method implemented in education 4.0 was not widely used because initially, blockchain was only known for the financial sector. Blockchain is comprehensive and appropriate for this era, as blockchain offers technology, trust, and transparency by replacing the previous system with a new system. A particular problem is a need for innovative research to provide new insights into blockchain transformation inf education and application opportunities that can be accepted and used optimally. Researchers used the vast mind method and literature study. The goal is to inform the added value of blockchain that is applied in education as needed, the renewal of research and opportunities for implementing blockchain in education 4.0. The blockchain technology that can be used in education, for example, is archiving, learning, certification and other.

1. Introduction

Education is an important pillar that is a source of progress for a nation because, through education, the quality of human resources in a country can improve its government's quality. In this century, advances in technology will significantly affect education, which will follow the latest learning trends to be balanced, one of which is education 4.0, which describes various ways to integrate cyber technology both physically and not into learning and other supporters [1]. The education revolution 4.0 will relate to the industrial revolution 4.0. Blockchain is a database system with identical data characters stored in many places called nodes or miners that are immutable and cannot be edited and cannot be deleted, append-only, one block is cryptographically connected to the previous block and the next one. One of the blockchain applications in education includes blockcert, e-Portfolios, and book copyrights [2].

At the beginning of its appearance, blockchain was considered a threat and was supposed to have an insecure system [3]. Due to the current conditions developed for socio-economic relations, information and communication technology involves the radical modernization of the technological

landscape through integration with digital transformation [4]. Blockchain is currently starting to be widely applied, including in the world of education. However, it is still relatively small; there are already those who use this technology for the education system. The first to implement it is the number one campus in the world Massachusetts Institute of Technology, USA in the issuance of running electronic certificates in the blockchain system in the form of a ledge book. The use of blockchain in education must certainly bring extraordinary innovation [5].

Fig. 1. Educational Revolution depiction from 1.0 - 4.0

Research shows that the integration of blockchain technology growth is an influential the trend in education [6]. The spread of blockchain technology in the education sector is still in its infancy; there are still very few educational institutions that use it (see Fig 1). The volume of blockchain literature applied to education has increased in recent years. However, it is still fragmented, as such reviews are essential to provide up-to-date reviews of the topic and inform evidence-based practice. Thus making an original, timely and efficient contribution to the educational technology literature by investigating how the use of blockchain technology used by education can be excellent service impact on of education [7]. With the relatively high potential of technology capabilities [8] and with one hand the insufficient level of research, the problem of integration together with the lack of blockchain projects implemented in the education sector can determine the relevance of studying the systematic application of blockchain technology in various fields of education to prevent uncertainty and risk [9].

2. Method

During this research, the writer used literature study and mind mapping methods-data and information obtained from the internet in the form of articles, books, and journals. For the mind mapping method, the writer uses data from the author's thoughts to solve the problems in this journal.

2.1 Literature Study

Agus Winarno conducted this research with the title "E-Transcript Design Using Blockchain Technology". This study discusses blockchain technology applied in education in archival storage in the form of transcripts, certifications and diplomas [2]. This research was conducted by Halvdan Haugsbakken Department of Sociology and Political Science, Norwegian University of Science and Technology, Norway with the title "The Blockchain Challenge for Higher Education Institutions". This study discusses blockchain technology whether it can democratize and automate the learning process, reduce expensive bureaucracy and automate the learning process to whether higher education should use blockchain technology as a digital technology [4]. Irini Yakovenko conducted this research, Lyazzat Kulumbetova, Irina Subbotina, Gaukhar Zhanibekova and Kenzhegul Bizhanova with the title "The Blockchain Technology as a Catalyst for Digital Transformation of Education" published in the International Journal of Mechanical Engineering and Technology, 10 (01), 2019, pp. 886–897. This research discusses applying blockchain technology as a blockchain in education to support the need for a transition to a more modern technology with features of blockchain technology that reduce energy and time costs for information processing; the problem of transitioning to digital media for educational institutions; blockchain technology that requires changes in management, management methods, financial management, specific people, development infrastructure [9].

This research was conducted by Boris Starichenko and Liubov Sardak with the title "Transformation of the Digital Transformation Tasks of Education". This study examines existing

educational organizations in Russia to create a universal network communication system for educational purposes and the use of multimedia testing using an approach illustrated from the example of the discipline of "computer mathematics" aimed at comparative digitization [10]. This research was conducted by D. Kirilova, N. Maslov, T. Astakhova with the title "Prospects for the introduction of blockchain technology into a modern system of education". This study discusses the process of issuing certificates that exist in the education of the Russian federation and as an alternative to using modern approaches and blockchain technology for several developments such as confirmation of the authenticity of educational documents, student cards, accreditation, intellectual property and student identification [11].

This research was conducted by Khoula Al Harthy, Fatma Al Shuhaimi, Khalid Khalifa Juma Al Ismaily with the title "The upcoming Blockchain adoption in Higher-education: requirements and process". This study discusses the possibility of adopting blockchain in educational institutions [12]. Muhammad Usman Noor conducted this research with the title "Blockchain Implementation in the World of Archives: Opportunities, Challenges, Solutions, or New Problems?". This research discusses blockchain technology used in the field of archives, including examples of its application, opportunities, and challenges, with qualitative methods sourced from various literatures in the field of archiving [13]. This research was conducted by Sudaryono, Qurotul Aini, Ninda Lutfiani, Firman Hanafi and Untung Rahardja with the title "Application of Blockchain Technology for iLearning Student Assessment". This study discusses the technology used to create cryptocurrencies with blockchain technology in the data security section using mind mapping methods and literature studies [3]. The other study discusses the use of blockchain technology-adjusted to the allocated LTAI schedule to increase the traffic rank of the Alphabet Incubator site and to support the development of Alphabet Incubator [14].

Meyliana conduct this research, Cadelina Cassandra, Surjandy, Henry Antonius Eka Widjaja, Harjanto Prabowo, Erick Fernando and Yakob Utama Chandra with the title "A Blockchain Technology-Based for University Teaching and Learning Processes". This study discusses blockchain technology that is used as an innovative solution in securing diplomas and transcripts from diploma forgery with qualitative methods with discussion of 9 leading universities, and the results show that it is possible to adopt Blockchain Technology into the teaching and learning process to avoid forgery of university transcript documents [15]. This research was conducted by Vetkina Anna, Kudryashova Tatyana, Fikhtner Oxana, Trifonov Vladimir, Zhukova Elena with the title "The Innovative Potential of Digital Transformation of the Russian Higher Education System: Trends of the Competence Approach". This study discusses an integrated model of competently developed personalities adapted in the education-professional public relations system to create a competent and adaptable character using a paradigmatic approach to professional competency training from innovative higher education strategies to determine the movement of subject-based learning. To a synergistic educational [16].

2.2 Mind Mapping

Mind mapping or mind mapping is a method used to maximize the human mind's potential by utilizing the workings of the brain. Mind mapping has benefits, namely, (1) It makes us more careful in seeing the big picture of an idea; (2) Can train yourself to understand important information; Can improve the ability to understand the subject matter; (3) Increase Self Creativity; (5) Increase productivity. And the following is a mind mapping made by researchers in the application of blockchain in various fields. Fig 2 displays of the usefulness of blockchain technology that we will get when using blockchain technology. The advantages and advantages obtained are following which who will use technology. For example, if we use blockchain in education, it will get different advantages and disadvantages.

Fig 3 is a view of a mind mapping that explains the application of blockchain in various fields ranging from the internet of things and can be used in IoT E-business and distributed device management [17], in the field of government identity management [18], proof of existence, notary and law, and public can be used. Administration and e-voting, in integrity verification, it can be used in counterfeit, insurance and intellectual property, in the financial sector, it can be used in the prediction marketplace and cryptocurrencies, in the field of data management, can be used in human resources and data distribution, in the field of business and industry.

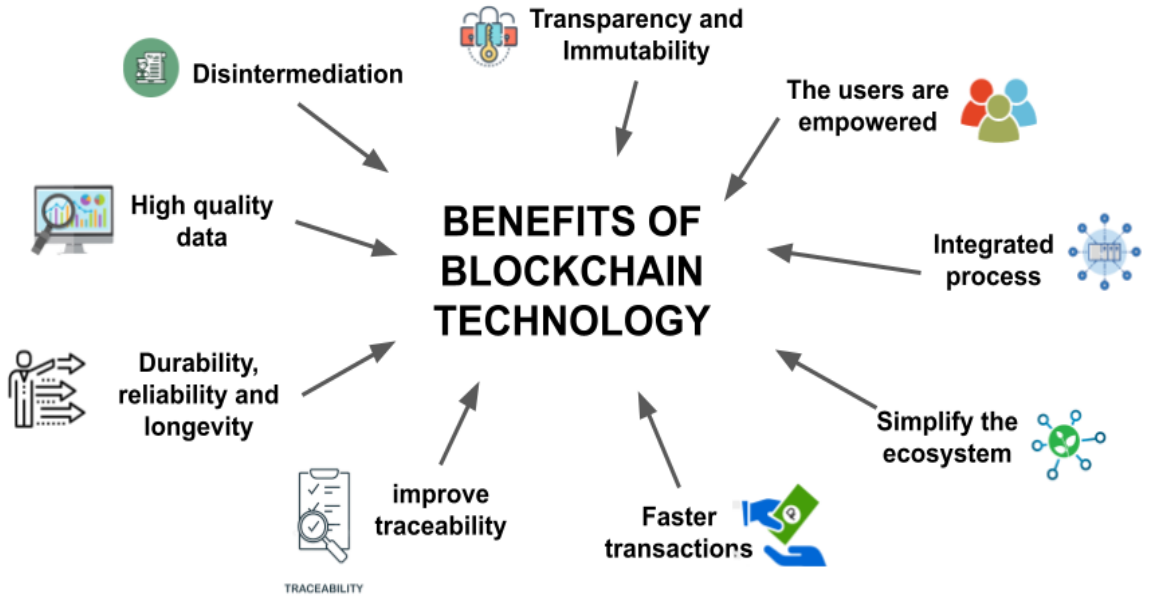

Fig. 2. Advantages of Blockchain Technology

Used in the energy sector and supply chain, in the field of privacy and security, it can be used in secure storage and anonymization; in the health sector it can be used in EHT and in the field of education it can be used in certification managers and reputation.

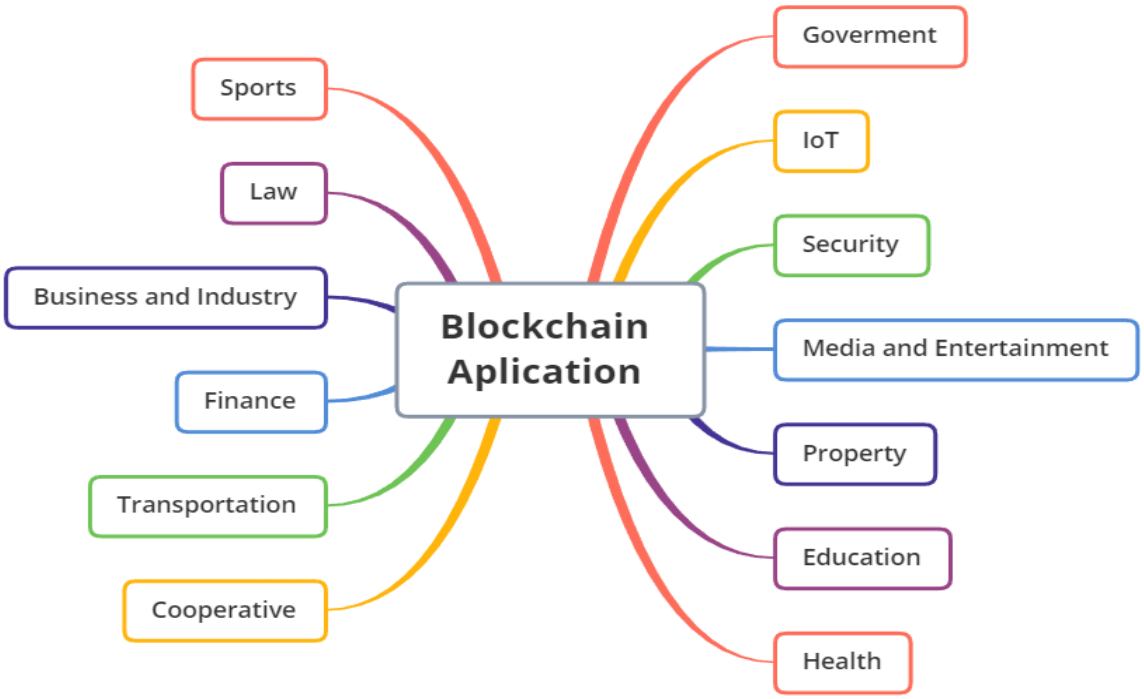

Fig. 3. Depiction of Mind Mapping in Blockchain Applications in Various Fields

Fig 4 is a depiction of blockchain applications that can be used in higher education and schools. In higher education can be in learning, diploma data, transcripts, lecturer certification, registration, achievement scores, issuance of diplomas, and archiving in the school that can be in education, filing, registration and achievement scores.

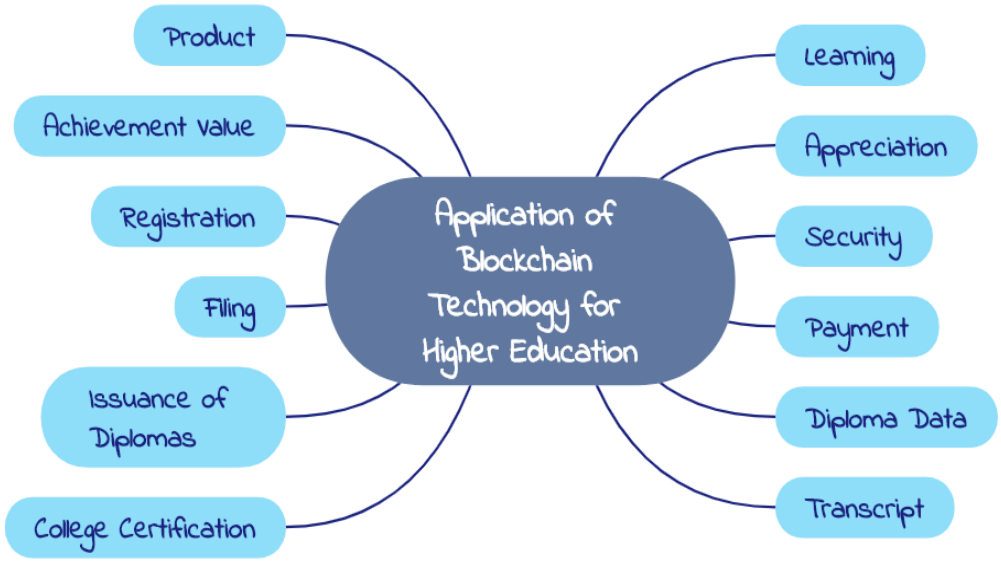

Fig. 4. Application of Blockchain Technology

Fig 5 depicts the advantages or advantages that will be obtained in the use of blockchain technology in education in the field of certification and diplomas, there are 9 (nine). The use of multiple platforms in blockchain that can be applied according to needs makes blockchain more practical but has very high security [19].

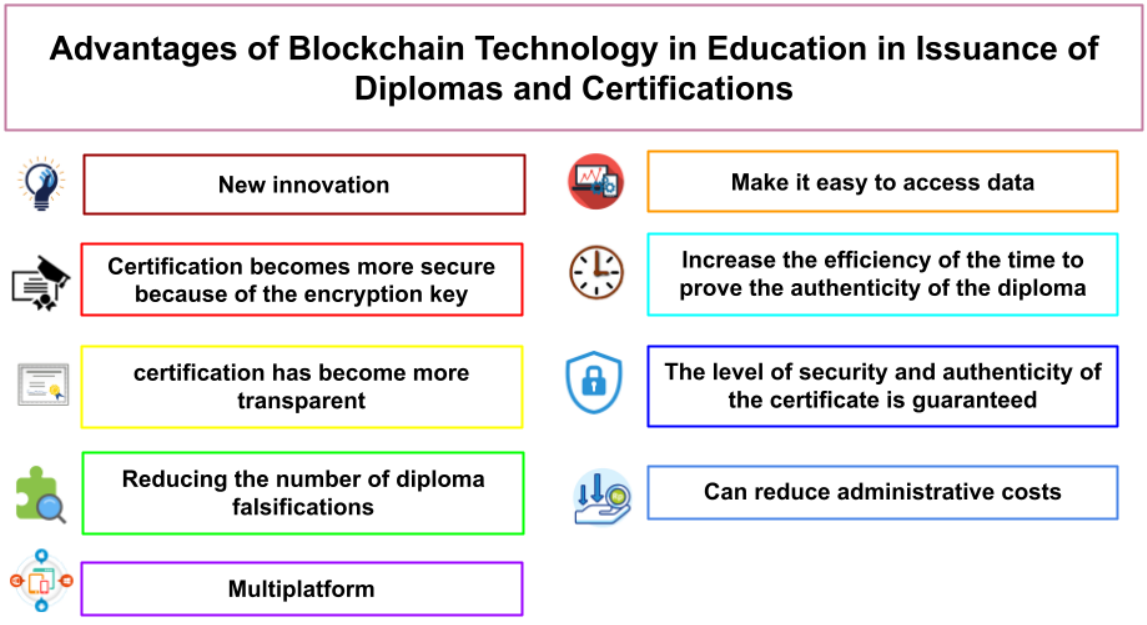

Fig. 5. Advantages of using blockchain technology in Education

3. Results and Discussion

Blockchain can be implemented on a multi-platform basis, which means that it can be used starting from the learning process with e-learning, registration, achievements, values that are well recorded and presented to serve finances, including tuition fees, libraries and other educational needs needed . The distributed implementation of blockchain technology allows many parties involved in it to supervise. So, cases in colleges and schools, one of which is a fake diploma, will be detected

quickly because it is immutable and cannot be replaced[20]. In the paper Guang Chen "Exploring Blockchain Technology and Its Potential Applications for Education" it explains that Nicosia University is the first educational institution to use blockchain technology to manage student certificates received from the MOOC (Sharples and Domingue) platform in 2016. Sony Global Education also uses blockchain technology to create a global scoring platform to provide services and store and manage degree information. The Massachusetts Institute of Technology (MIT) and the Learning Machine company work together to design a digital badge for online learning based on blockchain technology. Students who have attended the MIT Media Lab project and passed the assessment will receive a certification stored on the blockchain network. For implementation in Indonesia, there is still none. It is possible that in public schools, there will be a lot of bureaucracy that is not easy. Therefore, the pilot project can be started from private schools [21] and implemented in Islamic boarding schools. There is a prototyping implementation in the natural environment, which can be developed [22]. As a tool, blockchain is "just" a neutral technology [23]. It allows it to be implemented in various sectors of life [24]. It depends on who the user is and for what purpose. Thus, many try to be enforced in multiple sectors [25] until it finds form, stability, and maturity there [26]. Of course, also from multiple aspects. Fig 6 explain blockchain work system in education, then it can be duplicated to expand coverage so that with the same thing can be applied for the benefit of this education [27][28].

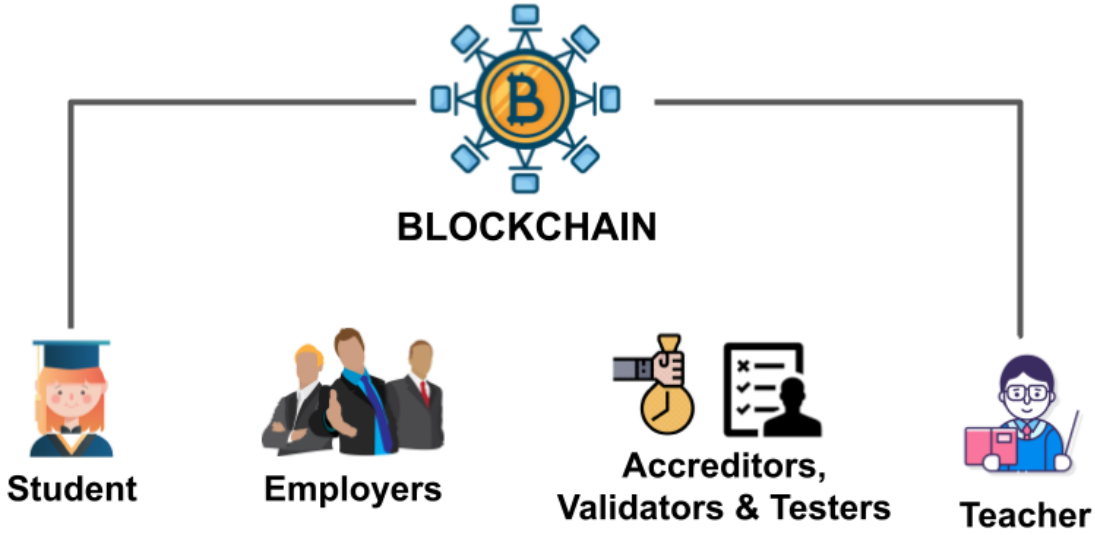

Fig. 6. Blockchain Work System in Education

In the Fig 7, the way blockchain works is permanent and transparent, and easy to search for the required needs accurately and in real-time [29]. With blockchain, cryptology can replace third parties as a bridge of trust to pay attention and ensure overall integrity [30]. Fig 7 explains that with the blockchain technology used in Digital Certificates [31], transcripts and student records cannot be changed but can be evaluated and validated by anyone who has access rights because documents are stored in a shared ledger, certificates can still be validated even if the organization who published it no longer exists and does not need to worry about losing records or files [32]. Copies do not need to be certified. Everything will be validated and consolidated in a blockchain format [33]. In blockchain technology, all certificates and credentials will be stored and can be retrieved at any time [34]. If interested parties need the data, they can quickly check the blockchain and confirm it [35]. Tuition fees: some institutions have started accepting cryptocurrency as a form of payment for course fees. In 2018, MIT teamed up with a blockchain startup, machine learning, to use blockchain bitcoin to issue more than 100 digital diplomas of its graduates [36]. There will be no illegal or fake diplomas or certificates [37]. One form of reward to students can be a form of motivation that can increase their performance [38].

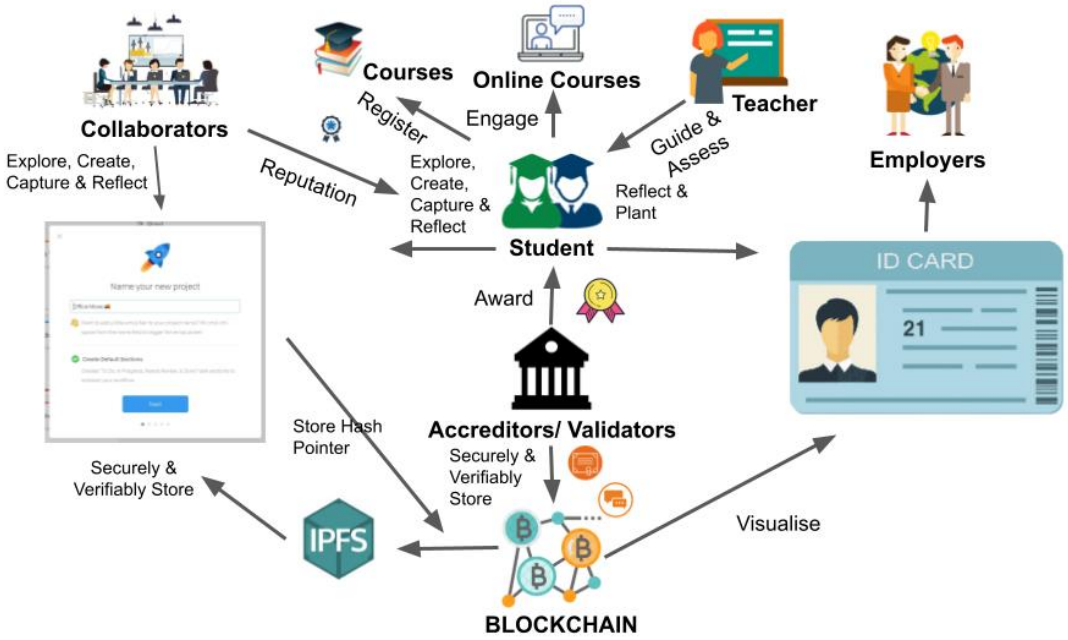

Fig. 7. Blockchain Technology Framework in Education

4. Conclusion

Blockchain technology applied in education is the right decision. We need to know, through the explanation above, it can be concluded that the transformation of blockchain in the world of education and the opportunities for its application will affect the increasingly advanced future of Indonesian education. There is a positive influence on the options for implementing blockchain technology in education, one of which is applying blockchain technology in issuing diplomas which can reduce the percentage of counterfeiting so that the efficiency of time, effort and cost in certificate verification does not require a long time. The performance of blockchain technology that is combined in learning methods becomes more fun and practical with a new, more optimal system. Another opportunity in applying technology in education is data security, such as archiving and document authenticity, meaning the performance of blockchain technology cannot be faked and has a track record. The transparent result allows certificates implementing blockchain to be verified and validated easily. Based on the results of the research that has been done, several managerial implications can be stated. Education is expected to continue to improve the quality of education standards by providing good quality per technological advances that are applied as needed. Education is expected to be able to apply technology policies that can be used evenly. The education sector is expected to optimize the quality of education regulations to minimize the occurrence of cheating that can occur in the world of education.

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Declarations

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Conflict of interest	The authors declare no conflict of interest.

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