REVIEW OF BLOCKCHAIN TECHNOLOGY AND ITS IMPLEMENTATION IN EDUCATION SECTOR

Dr. Ritu Sharma[*]

ABSTRACT

New technologies always attract education professionals and education planners at various levels to take full advantage of overcoming obstacles and improve the learning and teaching skills of teachers and students alike. Some of the improvements are: greater use of Big Data, Data Analytics and Artificial Intelligence. Another new area of interest in the education sector is the use of Blockchain Technology. Recently, blockchain technology has received a lot of attention in the field of education. This is mainly due to its distinctive features that include segmentation, security, reliability, and data integrity. Despite this growing interest, little is known about the current state of knowledge and practice regarding the use of blockchain technology in education. The current paper focuses on research investigating blockchain-based education programs. Educational apps built on blockchain technology, the benefits that blockchain technology can bring to education, and the challenges of embracing blockchain technology in education. This review also provides insight into other areas of education that could benefit from blockchain technology.
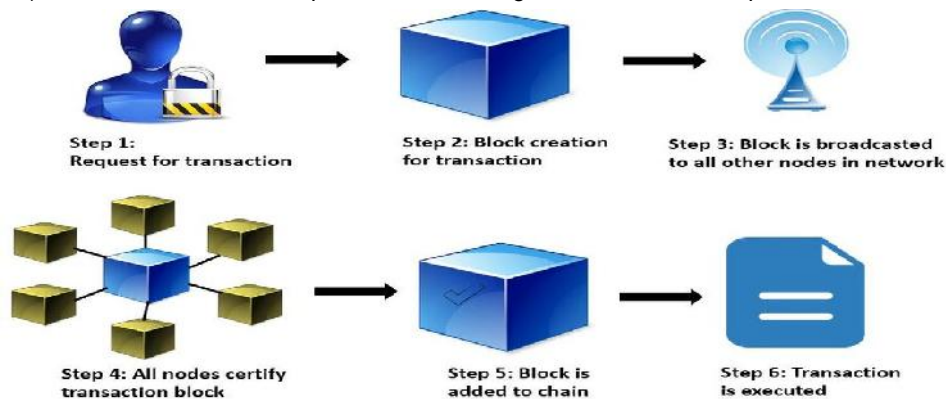
Keywords: *Blockchain, Blockchain in Education, Blockchain Application, Educational Technology.*

_____

Introduction

Blockchain is becoming a popular name today. Many people use Bitcoin at a time when making online payments. Blockchain is a distributed platform for anything that makes Bitcoin and other cryptos work. There is no doubt that the most effective technology in cryptocurrency. Given the security and integrity of blockchain technology, it is finding its way into the education industry. Blockchain has been widely discussed as the basic technology behind cryptocurrensets, as shown in the study of Yuan and Wang (2018), and more recently as an opportunity for data storage that could have a significant, beneficial impact on previously untested industries such as manufacturing (Angrish, et al., 2018), health care (Agbo, et al., 2019), and education (Bartolomé, et al., 2017). The aim of this study is to explore the potential, challenges, and overall impacts of blockchain implementation in the education sector. In doing so, the paper will explore two key questions. First, how can blockchain technology improve the performance of their educational and learning institutions? This question will explore three different areas that could benefit from blockchain solutions: 1) educational institutions (e.g., universities, start-ups, NGOs) may seek ways to improve student efficiency and security of student data storage and management; 2) students can benefit from attractive, reliable, and continuous ways of collecting, proving, and sharing information; 3) employers looking for reliable, secure ways to assess competency skills and student certificates. blockchain technology, blockchain is a consistent, widely distributed site - a series of "blocks" that store information such as transaction dates, times, prices, and / or participants (blockchain participants are usually not personally identifiable). There are different types of blockchains: public, private, and permitted. The pubic blockchain allows anyone to join and contribute to the network (Zheng, et al., 2017). In this way, social blockchains are important because they provide truly segregated,

_____

[*]   Assistant Professor and Head Department of Commerce, S.S.G Pareek P.G. Girls College, Jaipur, Rajasthan, India.

democratic and non-democratic functions. Unlike social blockchains, blockchains are allowed only for certified participants, such as organization members, who are invited and certified before joining the network. The third type of blockchain is confidential; blockchain is confidential and permitted are the same, but the difference between them is that private blockchains are managed and maintained by a single organization There are many ways to ensure blockchain security. For example, each block within the blockchain retains the hash of the previous block. The hash function assumes a variable length input and generates output of fixed length. In this way, the hashing within the blockchain (i.e., the hash chain) makes it very difficult to replace the previous blocks, thus ensuring consistency. Additionally, miners who add blocks to the blockchain are encouraged to ensure network integrity by denying any malicious transactions. The nature of these benefits may vary based on the blockchain protocol used, but one of the most popular agreements, Proof of Work (PoW), requires "work" (i.e., integration capacity) for miners to add blocks to a chain, which is encouraging. not to waste important resources on authoritative operations / malicious blocks. Another technical blockchain name to be understood for the purposes of this paper is a smart contract - a computer program in blockchain, which contains the terms of an agreement between a buyer and a buyer. merchant, and could be automatically killed by miners (Zheng, et al., 2017). So a smart contract compels and directs negotiation and contract performance.


Step 1: Request for transaction

Step 2: Block creation for transaction

Step 3: Block is broadcasted to all other nodes in network

Step 4: All nodes certify transaction block

Step 5: Block is added to chain

Step 6: Transaction is executed

Literature Review

Blockchain is the basic technology used to create the cryptocurrency, Bitcoin, by maintaining a consistent distribution of thousands of nodes proposed by Satoshi Nakamoto in 2008 (Nakamoto 2008). It is considered to be part of the fourth industrial revolution since the introduction of steam engines, electronics, and information technology (Chung and Kim 2016; Schwab 2017). These disruptive technologies will have a profound impact on national governance, institutional activities, business operations, education, and our daily lives in the 21st century. It has the power to change the current Internet from "Internet of Information" to "Internet of Value Exchange." Blockchain technology is expected to transform business, industrial, and educational systems, and promote the rapid development of a knowledge-based economy around the world. Due to the consistency, clarity, and reliability of all transactions made on the blockchain network, this new technology has many potential applications (Underwood 2016). During the early stages of its appearance, blockchain technology was unable to attract much attention. However, as Bitcoin continues to operate securely and consistently over the years, the public has realized the great potential of technology following this renaming in its use not only in cryptocurrency but also in many other areas (Collins 2016). Blockchain technology has become a hot topic in many countries, institutions, businesses, and researchers. Currently, blockchain technology has been used in various fields such as crypto currencies in the financial sector, including Bitcoin, Ethereum, and Zcash (Zerocash), etc. Bitcoin is the first electronic payment platform blockchain for peer-to-peer payment technology. One of the key features of blockchain technology is how many nodes in a distributed blockchain network retain identical and the Bitcoin blockchain network accepts a hash-based distributed algorithm (PoW) (Nakamoto 2008). Ethereum is an open, public source, blockchain-based platform that integrates intelligent contract performance using algorithm compliance evidence (Beck et al. 2016). Zcash is a privately held cryptocurrency and is an open source like Bitcoin. However, it provides better confidentiality and transparency in selected interactions using an anonymous proof algorithm. Zcash payments are published on the public blockchain, but the sender, receiver, and transaction amount remain confidential (Peck 2016). In addition, other organizations and businesses are also trying to develop platforms that are segregated on the basis of blockchain technology. For example Arcade

City, called "Uber Killer," is a boarding company that has integrated its model into Ethereum, which integrates ownership and reputation systems (Zheng et al. 2017). Ubitquity is a digital asset management company that provides secure recording and tracking of records built into the blockchain platform. Swan (2015) has shown that the development of blockchain applications can be divided into three categories; Blockchain 1.0, 2.0, and 3.0. Blockchain 1.0 uses cryptocurrencies as a peer-to-peer payment system. Blockchain 2.0 is a broader blockchain system with simple financial functions, including stocks, bonds, loans, smart assets, and smart contacts. Blockchain 3.0 develops blockchain applications beyond the financial, financial, and market sectors, such as government, health, science, literacy, culture, and the arts. According to the above principle, current blockchain applications are in categories 1.0 and 2.0. Most people do not know the word "blockchain," let alone the possible use of blockchain technology. Although researchers are discussing the use of blockchain in the commercial environment (Swan 2015), a few studies have focused on how blockchain technology can be used in education (Devine 2015; Sharples and Domingue 2016).

Concept of Blockchain Technology

Blockchain is a system for recording information in a way that makes it difficult or impossible to change, hack, or cheat the system. Blockchain is a dynamic digital transaction log and distributed across a network of computer programs on the blockchain. Each block in the series contains a number of activities, and each time a new activity occurs in a blockchain, a record of that purchase is added to each participant's book. A multi-participant shared site is known as Distributed Ledger Technology (DLT) .Blockchain is a type of DLT where transactions are recorded with a static cryptographic signature called hash. This means that if one block in one chain is replaced, it will immediately become apparent that it has been stolen. If criminals want to damage the blockchain system, they will have to change all the chain blocks, in all the distributed versions of the chain.
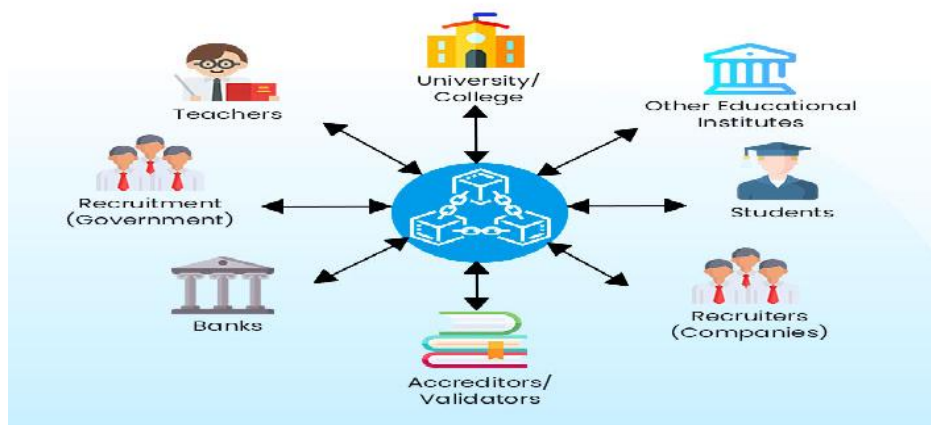
The Role of Blockchain Technology in the Education Sector

Today, there are many benefits to using blockchain technology in educational institutions. In this article, we look at different blockchain applications in education.

- **Helps Verify Student Records and Accreditation**

Blockchain technology transforms the keeping of certificate records and student information in institutions. There is no need for a consultant to verify degrees, certificates, diplomas, and other educational materials with blockchain technology. Blockchain technology can also assist educational institutions in accreditation. Many countries find it difficult to validate and approve many educational institutions. With blockchain technology, it will be much easier to ensure the suitability and quality of education provided by most educational institutions

- **Reduce Academic Fraud Charges**

There are many documented cases where job applicants have used fake educational credentials. Many people lie about their academic credentials when applying for a job. In some cases, the employer or the interviewer does not have the applicant's skills verification sheet. Therefore, it is possible for them to hire people who are unskilled or unfit for the job. Education is one of the most affected industries. Ideally, hackers can cheat and remove information from educational programs. They do this

mainly for politicians to get fake certificates. With blockchain technology, we can avoid all these educational fraud. Blockchain guarantees a consistent and transparent book for all educational qualifications. Once a college has recorded student information in an online manual, it is not easy to change it. You will need permission from network users to manage the information. Additionally, universities can build a ledger with a custom blockchain protocol. The forum is important for issuing student documents and certificates.

- **Distribute Online Learning**

Today, study centers offer online courses for students at home and abroad. There are online courses students can do at their favorite institution. Non-compliance is a challenge when choosing online courses at different learning institutions. Different learning institutions have their own unique information and structures. Most of them dictate what their students should read. This is because there is no real-time data exchange. They offer pre-recorded lessons that students should go through while studying. This means that there is no space for students to interact with their teachers or ask questions. It often leads students to get paid help from other online educators and paper writing services like essayservice.com. Learning institutions can use blockchain technology to ensure extended online learning. Helps students and teachers share information in real time. When blockchain technology expands online learning, institutions will not specify the type of courses to be published and the amount to be charged for all online courses.

- **Protection of Copyright and Digital Rights Violations**

In the professional world, cheating is a major problem for educational institutions that are struggling to cope. When students copy digital content when they come up with term paper and research proposal, it can be very expensive. For example, a university may withdraw certificates from such students for cheating. With blockchain technology, content creators will reduce the distribution of copyrighted material on the Internet. The technology will ensure that all people can access educational information with a secure and secure chain with advanced encryption. This ensures that the information is only accessible to authorized network users. Resources owners can track, verify access, and allow the use of their digital content.

- **Creating Better Learning Platform**s

Blockchain technology will be instrumental in developing the best online learning platforms. Significantly, universities can develop educational programs and projects that connect students and teachers. Through the concept of education, schools improve access to and sharing of learning resources. Users purchase internal tokens to request feedback from online educators who are waiting. They can also download study materials and access other educational resources.

Need to use Blockchain Application in Education Sector

The education sector has gained the same weight as other industries such as finance and healthcare. However, the sector has many areas that need to be improved using advanced technology. This is especially important as the education sector grows, estimated to reach $ 93.76 billion worldwide by 2020. Speaking of the integration of the latest technologies into the education industry, Blockchain will become an integral part of educational institutions around the world in a few years. Also, the benefits of Blockchain in education are beyond doubt.
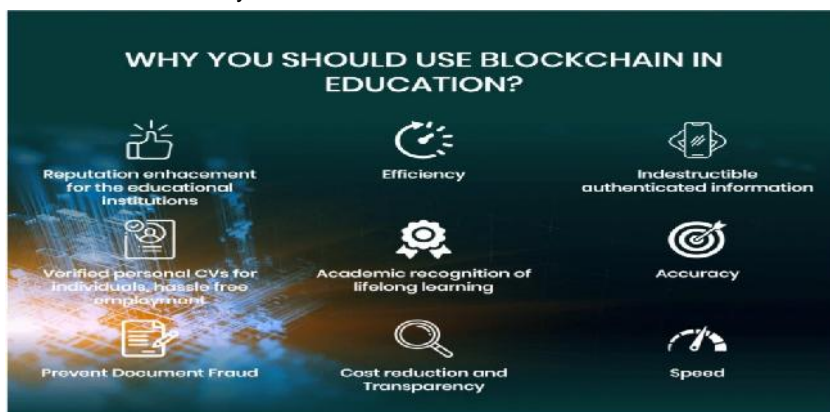
Prospective Issue of using Blockchain Technology In Education

- **Student self-study data**

    If student data such as data, skills learned, etc., is stored by Blockchain and is not a central administrator such as a university, the student may be able to store that data for life and to own and manage it effectively. This, in turn, proves that the information provided in their resume is accurate and puts loyalty to employers.

- **Improving the safety and efficiency of educational institutions and students**

    Blockchain has the potential to ensure the identity, privacy, and security of student data. With its consistency and hash function, Blockchain provides security and legitimacy. As a result, students are unable to change their previous academic data stored in Blockchain, which is much easier in the case of paper records. You can verify the privacy of data by not keeping it instead of using hash. Or you can encrypt data before saving it to Blockchain.

- **A combination of trust and openness between job seekers and employers**

    By using Blockchain, students are able to adjust their debt such as grades, degrees, and certificates, thus reassuring employers that job applicants have the necessary skills for the job. This helps employers find the best match for the job seeker they have applied for. This is especially true with distributed ledger technology.

- **Increasing efficiency in existing business processes**

    University of Blockchain university diplomas are visual documents or records of all academic achievements throughout one's life. This is a major advantage of Blockchain in education. This flexible transcript, which is a lifetime value, reduces CV fraud and reduces overhead related data verification across all sectors of the industry.

- **Produces a new market for digital goods**

    Blockchain has been used for the student payment process, which is another important area. Simplifying the payment process is another matter that requires a lot of staff including students, parents, financial institutions, scholarships, governments, and educational institutions. It is expected that cryptocurrencies will play a major role in this area in the future as a student payment method. Many institutions such as King's College in New York City accept bitcoin as payment.

- **Establish your additional information**

    Qualifications or certificates are not the only limit on student records. You may know many things like multilingualism, soft skills, technical knowledge, or any specific skill that you can keep in Blockchain and later provide a link to get your details. Since these skills are not easy to validate, such Blockchain records cannot be questioned. Services such as Open Badge Passport are the first step in this process.

- **Blockchain file storage**

    The institute deals with many records such as digital studies, degrees, and other information, records that will use a lot of space to store files. If they keep that in the local drive, then it may be a question of making the information put in one place. Second, they can keep it in the cloud, which may incur additional costs. Here Blockchain can be a viable solution that works as a backup file. A possible solution would be blockchain-based cloud storage services like Filecoin.

- **Executing Lessons and courses**

    In this application do automated lessons and activities using smart-contract-capable blockchains. That means courses and courses can be set to Blockchain and automatically executed when certain conditions are met. For example, the teacher may assign activities to students. Smart Blockchain contracts can automatically guarantee the completion of each task. Upon completion of all activities, teachers could receive payment in crypto tokens, and students could be given credits. All courses can be organized this way.

- **Publishing in the research area**

    There are many high quality products that are produced every day in the study area. But timely self-publishing is a major problem. But publishing on blockchain can help new writers, researchers, and many others enter the industry. Blockchains can also assist in rights management and crime prevention.

- **The benefits of Blockchain Education are lower in cost**

The applications mentioned above, many of which are time-consuming and labor-intensive processes. But by using Blockchain, we can use them automatically. This leads to a reduction in the cost of educational institutions, which could turn into student savings. Schools and universities can reduce costs associated with file storage and cut off intermediaries from multiple jobs.

Challenges of Adopting Blockchain in Education & Potential Solutions

However, like any other technology, the blockchain comes with its own set of drawbacks, that is, worse. While the benefits of blockchain acquisition in the field of education are evident, there are doubts among teachers who are reluctant to make a difference. In this article, we will look at the challenges of using blockchain technology in the education sector to find possible solutions to improve it in the best possible way. . Challenges to Installing Blockchain in Education

- **Integration with asset plans**

Although the benefits of blockchain acquisition are obvious in the field of education, educators are still unwilling to make changes. There is a challenge for companies on how to integrate the blockchain with their legacy system (s). This is not surprising given the obvious barriers that institutions face when moving away from their legacy software solutions. In many cases, if they decide to use the blockchain, organizations need to completely redesign their previous system, or devise a way to successfully integrate the two technologies. Due to the lack of skilled developers, organizations are unable to access the required pool of blockchain talent to participate in the process. Relying on an outsider can alleviate that problem. But many of the solutions available in the market require the organization to invest a lot of time and resources to complete the transformation. Every business is reserved and unwilling to make changes to its website, and for good reason, as data loss or data corruption poses significant risks.

- **Growth of Blockchain**

One major blockchain technology challenge is related to network technological scalability that can complicate the adoption process, particularly on social blockchains. Ad asset networks are known for their ability to process thousands of jobs per second. Visa, for example, is able to process more than 2000 transactions per second. However, the two major blockchain networks, Bitcoin and Ethereum, are far behind when it comes to transaction speed. While the Bitcoin blockchain can process three to seven transactions per second, Ethereum can handle up to 20 transactions per second. This lack of scalability is not such an issue in private blockchain networks, because the nodes in the network are deliberately designed to process transactions in the domain of trusted groups, which makes sense commercially.

- **Blockchain has natural costs**

And last but not least the use of superpowers is another challenge to blockchain adoption. Most of the blockchains available in the market use a high amount of power.Most blockchain technologies follow bitcoins infrastructure and use Proof of Work (PoW) as a mutually agreeable way to verify transactions. These protocols require users to solve mathematical dilemmas and require considerable computing power to verify and process the operation and security of the network.

- **Lack of blockchain developers**

While the demand for professional blockchain staff is growing exponentially, the blockchain environment is facing a severe shortage of adequately trained and skilled / qualified people to develop and manage the complexity of peer-to-peer networks. Blockchain technology however requires additional qualifications and knowledge. According to some, the demand for blockchain-related activities increased by almost 2000% between 2017 and 2020. Having enough pool of trained developers is a major concern of the industry. Many businesses find it difficult to understand and use Blockchain Technology to create the desired applications and fail to use them properly, ultimately missing out on their business goals.

The Possible Solutions to Overcoming the Challenges of Blockchain in Education

- **How to integrate a blockchain with a company asset (s)**

New technologies have recently been developed that allow legacy systems to connect to a blockchain backend. One such approach is the Modex Blockchain Database, a product designed to allow consumers with no technical background to access blockchain technology benefits while avoiding the risks associated with data loss.

- **Blockchain scalability solutions**

There will be exciting solutions to the resilience problem soon. For example, Lightning Network involves adding a second layer to a larger blockchain network to allow faster transactions. Sharding is another interesting method, which divides subset nodes into sub-networks or "shards", each of which is responsible for its own set of transactions. When used in conjunction with the consistent evidence-based approach, it has the potential to increase blockchain use in education.

- **Reduce energy taxes**

To address these environmental costs challenges, many proponents of blockchain technology in education work on consortium-saving approaches. Stake-proof protocols (PoS) were established, which integrate the participant's part of the network in a way that provides authentication function locally. This technology greatly reduces energy consumption because participants do not have to solve complex puzzles. In addition, private blockchains are ideal for providing strong interests from a business perspective, as they allow for limited access, an additional layer of privacy to protect trade secrets, and are more energy efficient.

- **Blockchain developer solutions**

Blockchain technology is still in its early stages and continues to evolve. It will take time for the engineering community to embrace it and for educational institutions to offer blockchain-related courses. While this will reduce market demand, the results will not be visible until the students have completed their training, which will take some time.

Conclusion

Blockchain can improve the education system in many ways. The technology is ready to store secure information, sharing, and communication. With the help of this advanced system, many processes can be faster, easier, and safer. It closes the gap in authentication, copyright protection, and effective communication. These standard processes will benefit from the blockchain soon. New technologies are coming into our lives, and we must use them wisely to allow development to go smoothly. The present-day students are those who will live in the brand new world! We must support them, embrace change, and learn to make things better. Blockchain technology is a rapidly growing technology. Today, we see its great benefits in the field of education and banking. The education sector is made up of different programs. These programs come together to train students to get a job. Blockchain technology is essential to address the issue of informal learning and to ensure academic credibility. As a new technology with a promising future, the blockchain will soon remain. Blockchains have already changed the state of the economy through cryptocurrencies. Let us have an analytical perspective on how blockchains could affect education in 2021 and beyond. Blockchain is actually a widely distributed ledger technology, which uses cryptograph techniques and distributes synchronization algorithms to create segmentation, traceability, consistency, and financial structures. Its financial structures have the potential to spawn many new educational programs. For example, by recognizing that "learning leads," blockchain technology can stimulate students' learning motivation. It can maintain a complete, reliable record of academic activities that integrates processes and outcomes into formal and informal learning environments. It can also record teachers' teaching behavior and performance as well as provide a reference for teaching. In short, for both students and teachers, blockchain has excellent applications for teaching building, ethical recording, and analytical and constructive assessment. At the same time, it brings challenges and opportunities to researchers, developers, and educators. For researchers, the blockchain has great potential for widespread use in education. However, very little research has been done. It can be challenging to learn more about topics such as, what opportunities can I offer for educational change. For developers, these creative ideas are the first steps to using the blockchain in education. It is also an important part of developing educational platforms and software, which poses challenges for developers. For educators, one of the benefits of adopting blockchain technology is to design intelligent contact-based learning activities that are contract-based learning activities can be validated, robust, and tracked. This transparency feature is a strong protection for teachers who have done a good job. In addition, school administrators on teaching performance appraisal should also be changed to accommodate this new technology.

References

1.   https://www.researchgate.net
2.   https://onlinejournals.org
3.   https://www.readcube.com

4.   https://www.slidegeeks.com

5.   Alzahrani, B. Bahaitham, H. Andejany, M. Elshennawy, A. How Ready Is Higher Education for Quality 4.0 Transformation According to the Lens Research Framework? Sustainability 2021, 13, 5169

6.   Swan, M. Blockchain for Business: Next-Generation Enterprise Artificial Intelligence Systems. In Blockchain Technology: Platforms,Tools and Use Cases; Purdue University: West Lafayette, IN, USA, 2018.

7.   Narman, H.S.; Uulu, A.D.; Liu, J. Profile Analysis for Cryptocurrency in Social Media. In Proceedings of the 2018 IEEE.

8.   International Symposium on Signal Processing and Information Technology (ISSPIT), Louisville, KY, USA, 6–8 December 2018;pp. 229–2

9.   : Applications of Blockchain Technology to Higher Education Arena: A Bibliometric AnalysisCarlos Reis-Marques , Ronnie Figueiredo 2,3,4,* and Miguel de Castro Neto Chen, Guang & Xu, Bing & Lu, Manli & Chen, Nian-Shing. (2018).

10.   Exploring blockchain technology and its potential applications for education. Smart Learning Environments. 5. 10.1186/s40561-017- 0050-x. Bartolomé, Antonio & Torlà, Carles & Castañeda, Linda & Adell, Jordi. (2017).

11.   BLOCKCHAIN IN EDUCATION: INTRODUCTION AND CRITICAL REVIEW OF THE STATE OF THE ART. 61. 10.21556/edutec.2017.61.

12.   Alammary, Ali; Alhazmi, Samah; Almasri, Marwah; Gillani, Saira. 2019. "Blockchain-Based Applications in Education: A System

13.   Forrest P., (2016). Blockchain and non-financial services use cases.Linkedin.https://www.linkedin.com/pulse/blockchain-non-financial-Services-use-cases-paul-forrest.

14.   Taxonomy of Decentralized Consensus Systems. 23rd European Conference on Information Systems, Munster, 1-18.

❖◆❖