Exploring Education Students' Awareness and Knowledge of Blockchain Technology in Education

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Abstract

This study examines the awareness, knowledge, and perceptions of blockchain technology in education among 16 Chinese nationals enrolled in an international education program in Thailand, using a 5-point Likert scale questionnaire. The results show general interest in blockchain's potential applications in education, particularly in areas such as credential verification, transparency of academic records, and secure digital student records. However, the findings reveal a significant gap in respondents' understanding and familiarity with blockchain technology. Still, there is strong optimism about its future role in education, with many participants expressing interest in learning more about blockchain. The study suggests that educational institutions should offer training programs, implement pilot projects, and collaborate with blockchain experts to close the knowledge gap. Future research could explore the practical implementation of blockchain in education, its impact on learning outcomes, and the obstacles to its adoption.

Keywords: Blockchain technology, education, awareness, credential verification, transparency, digital records, educational technology.

Introduction

Blockchain technology is making significant advancements in the education sector, offering applications that could transform academic practices. Universities and educational institutions are adopting blockchain to improve data management and security, as well as streamline administrative processes. Blockchain provides secure, decentralized systems for storing and verifying academic records, reducing the risk of fraud and ensuring data integrity. It is increasingly used for managing student credentials, such as diplomas, certificates, and transcripts, facilitating the verification of academic histories. This system allows students to control their academic records, making it easier to share credentials when applying for jobs or transferring between institutions (Maryville University, 2021). Beyond record-keeping, blockchain also influences curriculum management, online education, and tuition payment systems.

One major advantage of blockchain technology in education is its ability to improve transparency and security in academic record-keeping. Institutions can issue verifiable and tamper-proof diplomas and certificates, reducing the occurrence of fraudulent credentials (Maryville University, 2021). Additionally, blockchain's secure infrastructure ensures that once data is recorded, it cannot be altered, maintaining the authenticity of academic achievements. Blockchain also supports decentralized systems, reducing reliance on centralized administrative structures and enabling institutions to share academic records

securely across borders. This promotes student mobility and transparency in accreditation processes, benefiting both institutions and students (Loukil, Abed, & Boukadi, 2021). However, the widespread adoption of blockchain in education faces obstacles related to integration with existing systems, scalability, and user acceptance.

In addition to its use in credentialing, blockchain technology offers various applications for improving the efficiency of educational operations. Blockchain enables the creation of smart contracts, automating administrative tasks such as grading, issuing certificates, and managing course content. Smart contracts also improve the management of online education platforms, ensuring secure, traceable assessments and increasing trust between students, faculty, and institutions (Loukil et al., 2021). Moreover, the decentralized nature of blockchain supports access to open educational resources, promoting lifelong learning initiatives. These developments have the potential to make education more accessible and personalized, benefiting students, educators, and institutions. However, blockchain adoption remains in the early stages, and many institutions face difficulties in integrating it into existing infrastructures (Bhaskar, Tiwari, & Joshi, 2021).

Blockchain's role in education extends to improving the management of research data, ensuring the security and accessibility of academic research. Universities like the University of Utah and MIT are adopting blockchain to enhance data access and collaboration in scientific research (Doughman, 2024). Through blockchain's decentralized nature, research institutions can securely store large datasets, making them more accessible to researchers worldwide. Blockchain's ability to create immutable records ensures that research data remains tamper-proof, promoting transparency and accountability in scientific discovery. Additionally, blockchain is being integrated with artificial intelligence (AI) to address global issues such as healthcare and environmental sustainability (Doughman, 2024). This integration improves data security and supports responsible research practices by maintaining the integrity of shared data.

Blockchain technology faces several obstacles in widespread adoption, particularly related to scalability and cost. As educational institutions handle large volumes of data, the increased load can slow blockchain transactions, presenting scalability issues (Maryville University, 2021). The cost of implementing blockchain systems, including infrastructure and training, can be a significant obstacle, especially for smaller institutions with limited resources. Concerns regarding data privacy and compliance with state and federal regulations also complicate implementation (Kohli & Liang, 2021). To address these issues, initiatives such as the Education Blockchain Action Network and the Education Blockchain Initiative are working to develop collaborative solutions to support blockchain integration in education (Maryville University, 2021).

Another significant aspect of blockchain in education is its potential to reshape the delivery of learning itself. Blockchain has been integrated into learning management systems (LMS) to enhance both the administrative and instructional aspects of education. For instance, blockchain can facilitate the development of digital curricula, improve the use of educational applications, and process educational data in a secure, transparent manner (Rahardja et al., 2022). This is particularly valuable in online learning environments, where blockchain provides secure platforms for managing digital assessments and enabling collaborative learning. By ensuring the traceability and privacy of student activities, blockchain technology can enhance the trust between students, faculty, and educational institutions. As a result, the learning process becomes more efficient, transparent, and secure, particularly for students in remote or non-traditional education settings.

The widespread adoption of blockchain in education faces several obstacles. For blockchain to be integrated into educational systems, it must address issues related to technical infrastructure, user acceptance, and scalability (Berdik et al., 2021). As the

technology evolves, institutions and organizations must invest in the necessary infrastructure and training to ensure effective implementation. Additionally, the education sector must resolve concerns related to data privacy, regulatory compliance, and the integration of blockchain with existing systems. However, ongoing research and development of blockchain technologies, along with growing interest from educational institutions, suggest that blockchain will continue to have an increasing impact on the future of education (Kohli & Liang, 2021).

Blockchain technology has the potential to transform education, yet there is limited awareness and understanding of its applications within educational settings. Many educators, students, and administrators lack familiarity with how blockchain operates and how it can be integrated into educational practices. Although blockchain is recognized for improving transparency, security, and decentralization in education, its actual implementation remains in the early stages. This research aims to examine the level of awareness and understanding of blockchain in education and explore its potential uses, such as in credential verification, data privacy, and learning accessibility.

This research will provide valuable information about the current state of blockchain awareness and understanding in the education sector. It will help educational institutions identify the potential and limitations of blockchain adoption. The findings can inform the development of educational programs, pilot projects, and strategies for integrating blockchain into educational settings. Additionally, this research will contribute to the academic discussion on educational technology by examining how blockchain can improve efficiency, security, and accessibility in education. The study will also serve as a foundation for future research on the practical use of blockchain in education.

The primary objectives of this research are to assess the level of awareness and understanding of blockchain technology among educators, students, and administrators in educational settings. The study aims to identify perceptions regarding the potential applications of blockchain in education, particularly in areas such as credential verification, data privacy, and learning accessibility. Additionally, the research seeks to examine the current use and implementation of blockchain-based platforms or technologies within educational institutions. Finally, the study aims to explore the factors influencing the adoption of blockchain technology in education and propose strategies for enhancing its integration into educational practices.

Literature Review

Blockchain technology has the potential to reshape educational systems globally. It offers a decentralized framework that ensures transparency, security, and immutability, qualities that are valuable in educational settings. Blockchain securely stores academic credentials, transcripts, and diplomas, preventing fraud and simplifying the verification process (Maryville University, 2021). As educational institutions seek to reduce administrative overhead, blockchain provides a solution by automating tasks such as grading and certificate issuance through smart contracts (Loukil, Abed, & Boukadi, 2021). These features can reduce the time, effort, and costs associated with traditional administrative systems, making the education process more efficient.

Blockchain has the potential to transform research data management in education. Universities such as the University of Utah and MIT are experimenting with blockchain to improve access to and collaboration on scientific data (Doughman, 2024). Blockchain's record-keeping ensures that research data remains untampered, promoting trust and accountability among researchers. It also facilitates more efficient data sharing, opening

opportunities for collaborative research and global scientific cooperation. Providing a secure and transparent platform for storing and sharing datasets, blockchain could address the ongoing issue of data manipulation in academic research.

Blockchain has the potential to enhance personalized learning and lifelong education. Its ability to securely store and manage educational records allows students to control their academic histories and share achievements with prospective employers or institutions (Loukil et al., 2021). This student-focused approach is particularly valuable in lifelong learning, where individuals continuously develop and refine their skills. Linking blockchain with online learning platforms enables educational systems to track a learner's progress across multiple courses, programs, and institutions, creating a flexible educational experience that extends beyond traditional degree pathways. The technology's secure and transparent record-keeping in online learning environments can address concerns over academic integrity and improve trust among students, faculty, and institutions (Rahardja et al., 2022).

The adoption of blockchain in education faces several obstacles. One significant issue is scalability. As educational institutions and online platforms adopt blockchain technology, the volume of academic records and transactions will increase. This could lead to performance problems, such as delays in transaction processing, unless blockchain systems are optimized for high-volume environments. Additionally, the cost of implementing blockchain remains a major concern, especially for smaller institutions with limited financial resources. Institutions must invest in the necessary infrastructure, training, and security measures to fully integrate blockchain into their systems (Kohli & Liang, 2021). The initial investment and ongoing maintenance costs could be too high for many schools, particularly in developing regions with limited resources.

Privacy concerns are a major factor in limiting blockchain's widespread adoption. Blockchain's transparency, while an advantage, can also pose risks to personal privacy. In education, this is especially important since students' academic records contain personal and confidential information. Blockchain allows for decentralized storage, but ensuring that students maintain control over who accesses their data is vital. Institutions must address these concerns and comply with privacy laws such as the GDPR in Europe and FERPA in the United States (Maryville University, 2021). As blockchain technology evolves, educational institutions will need to collaborate with privacy experts to develop solutions that balance transparency and data protection.

Blockchain integration into educational institutions requires careful consideration of existing systems and infrastructure. Many institutions rely on legacy systems that may not be compatible with emerging technologies. This issue emphasizes the need for thorough assessments before transitioning to blockchain-based systems. Successful adoption depends on the ability to integrate blockchain with current administrative systems, learning management systems, and student information systems (Berdik et al., 2021). Additionally, technical staff and faculty must receive training to effectively use blockchain technologies, which may require ongoing support and professional development.

The potential of blockchain to enhance educational processes is not limited to administrative functions or data security. It also extends to areas such as accreditation, where blockchain can increase transparency and trust. By allowing institutions to securely and transparently manage accreditation data, blockchain can simplify the process of certifying courses and programs, ultimately benefiting both students and employers. Blockchain also creates opportunities for global collaborations in research and education, facilitating international partnerships and exchanges by offering a standardized and universally recognized method of verifying credentials and achievements (Doughman, 2024). Furthermore, blockchain's use in managing intellectual property and patents within

academic research can ensure that the creators of new innovations receive due credit and compensation, fostering a more equitable research environment.

Methodology

This study examined the levels of awareness and knowledge of blockchain technology in education among 16 Chinese nationals studying in an international education program in Thailand. A 15-item questionnaire was used, featuring statements assessed on a 5-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree." The questionnaire addressed participants' understanding of blockchain technology, its potential applications in education, and its perceived impact on the future of educational systems. The questionnaire was pre-tested for reliability (.90) and administered to participants in a group setting in person.

Data were analyzed using descriptive statistics, focusing on the mean and standard deviation of responses to identify trends and variations in participants 'awareness and knowledge of blockchain in education. The study aimed to provide insights into how well-prepared education students were to engage with emerging technological tools, such as blockchain, within the context of teaching and learning. Ethical considerations, including informed consent and data confidentiality, were maintained throughout the research process.

Results and Discussion

The following section reveals the questionnaire results based on the awareness and knowledge of Blockchain in education.

I am familiar with the concept of blockchain technology.
Strongly Agree=12.5%   Agree=18.8%   Neutral=25%   Disagree=25%   Strongly Disagre=18.8%   Mean=2.81   Standard Deviation=1.33

I understand how blockchain works.
Strongly Agree=12.5%   Agree=12.5%   Neutral=25%   Disagree=18.8%   Strongly Disagree=31.3%   Mean=2.56   Standard Deviation=1.41

I believe blockchain has potential applications in education.
Strongly Agree=50%   Agree=37.5%   Neutral=6.3%   Disagree=6.3%   Strongly Disagree=0%   Mean=4.31   Standard Deviation=.87

I have heard of blockchain being used for credential verification in education.
Strongly Agree=25%   Agree= 25%   Neutral=25%   Disagree=25%   Strongly Disagree=0%   Mean=3.50   Standard Deviation=1.15

I know that blockchain can help in creating secure digital records for students.
Strongly Agree=37.5%   Agree=25%   Neutral=25%   Disagree=12.5%   Strongly Disagree=0%   Mean=3.88   Standard Deviation=1.09

I am aware of how blockchain can be used to improve data privacy in educational institutions.

Strongly Agree=12.5%   Agree=31.3%   Neutral=31.3%   Disagree=18.8%
Strongly Disagree=6.3%   Mean=3.25   Standard Deviation=1.13

I believe blockchain can support decentralized learning platforms.

Strongly Agree=37.5%   Agree=37.5%   Neutral= 12.5%   Disagree=0%   Strongly Disagree=12.5%   Mean=3.88   Standard Deviation=1.13

I think blockchain technology can improve the transparency of academic records.

Strongly Agree=37.5%   Agree=37.5%   Neutral=   Disagree=0%   Strongly Disagree=6.3%   Mean=4.00   Standard Deviation=1.10

I have used blockchain-based platforms or applications for educational purposes.

Strongly Agree=18.8%   Agree=18.8%   Neutral=18.8%   Disagree=18.8%
Strongly Disagree=25%   Mean=2.88   Standard Deviation=1.50

I believe blockchain will play a significant role in the future of education.

Strongly Agree=62.5%   Agree=31.3%   Neutral=6.3%   Disagree=0%   Strongly Disagree=0%   Mean=4.56   Standard Deviation=.63

I think blockchain could make education more accessible to people globally.

Strongly Agree=50%   Agree=37.5%   Neutral=12.5%   Disagree=0%   Strongly Disagree=0%   Mean=4.38   Standard Deviation=.72

I feel confident in using blockchain technology for educational purposes.

Strongly Agree=37.5%   Agree=31.3%   Neutral=12.5%   Disagree=12.5%
Strongly Disagree=6.3%   Mean=3.81   Standard Deviation=1.28

I believe blockchain could enhance the efficiency of administrative processes in education.

Strongly Agree=37.5%   Agree=31.3%   Neutral=18.8%   Disagree=6.3%   Strongly Disagree=6.3%   Mean=3.88   Standard Deviation=1.20

I think blockchain could help in reducing academic fraud and cheating.

Strongly Agree=37.5%   Agree=31.3%   Neutral=12.5%   Disagree=12.5%
Strongly Disagree=6.3%   Mean=3.81   Standard Deviation=1.28

I would like to learn more about the use of blockchain in education.

Strongly Agree=68.8%   Agree=18.8%   Neutral=12.5%   Disagree=0%   Strongly Disagree=0%   Mean=4.56   Standard Deviation=.73

The results of the questionnaire reveal a mixed level of awareness and understanding of blockchain technology in the context of education. While there is significant optimism about its potential, there is also a noticeable gap in actual knowledge and experience with blockchain.

In terms of familiarity, respondents indicated a moderate level of awareness, with 12.5% strongly agreeing and 18.8% agreeing that they are familiar with blockchain technology. However, 25% disagreed, and another 18.8% strongly disagreed, resulting in a mean score of 2.81, which lies between "Neutral" and "Disagree." This suggests that many participants have limited knowledge of the technology. Similarly, understanding of how blockchain works was also low, with a mean of 2.56, closer to "Disagree." A notable portion (31.3%) strongly disagreed with this statement, indicating limited comprehension of the technology's mechanics.

Despite these gaps in understanding, a large majority of respondents (87.5%) expressed the belief that blockchain has potential applications in education. This was reflected in the mean score of 4.31, which is strongly positive. Respondents also showed moderate awareness of blockchain being used for credential verification in education, with a mean score of 3.50, indicating a neutral to somewhat positive stance. Furthermore, 62.5% recognized that blockchain could help in creating secure digital records for students, suggesting confidence in its security applications in education.

In terms of blockchain's broader impact on education, the responses were generally positive. A strong majority (75%) agreed that blockchain could support decentralized learning platforms, with a mean score of 3.88. Similarly, respondents believed that blockchain could improve the transparency of academic records, with a mean of 4.00. This indicates a solid understanding of blockchain's potential to enhance trust and accountability in academic processes.

When it came to actual experience with blockchain-based educational platforms, only 18.8% of respondents reported having used such platforms. The mean score for this item was 2.88, suggesting that practical experience with blockchain in education is still limited. Similarly, confidence in using blockchain technology for educational purposes was moderate, with a mean of 3.81, but there were still a number of respondents who were unsure or disagreed. This indicates that while there is interest, there is a need for further education and confidence-building in using blockchain tools.

Looking to the future, respondents expressed a strong belief that blockchain will play a significant role in the future of education, with a mean score of 4.56. A similar level of optimism was expressed regarding blockchain's potential to make education more accessible globally, with 87.5% agreeing. Additionally, there was a clear desire to learn more about blockchain's use in education, with 87.5% indicating interest in further education on the subject. This was reflected in the mean score of 4.56, which demonstrates a strong curiosity and a willingness to engage with blockchain technology.

Although there is a positive outlook on blockchain's potential to improve various aspects of education, including credential verification, data privacy, and transparency, the results highlight a gap in actual understanding and experience. There is a strong desire for further education and training, which presents an opportunity for educational institutions to introduce blockchain-related learning initiatives. By increasing awareness and offering practical experience, educators and students could be better prepared for a blockchain-enhanced educational future.

Conclusion and Suggestions

The results of this questionnaire highlight a growing interest in and optimism about the potential of blockchain technology in education. Respondents acknowledge the ability of blockchain to enhance transparency, improve credential verification, and create secure digital records. However, there is a noticeable gap in familiarity and understanding, as many participants demonstrated limited knowledge of how blockchain functions and have not yet had direct experience with blockchain-based educational platforms. Although there is clear enthusiasm about blockchain's future role in education, the lack of hands-on experience and practical understanding suggests that more education and exposure to the technology are needed. Overall, the data reflects a positive outlook for blockchain in education, alongside the recognition that further learning and engagement are necessary for its successful integration.

To bridge the knowledge gap and make the most of the optimistic outlook surrounding blockchain, there are several key recommendations for educational institutions. First, offering education and training programs aimed at improving understanding of blockchain is crucial. These programs could include workshops, webinars, or online courses designed for both educators and students, with a focus on the practical applications of blockchain in education. Furthermore, pilot programs that implement blockchain-based solutions for credential verification, student records, or decentralized learning could provide valuable, hands-on experience for participants. These pilot programs would allow stakeholders to understand first-hand how blockchain works in practice and assess its effectiveness in real educational contexts.

Additionally, collaborations with blockchain experts and technology firms would help institutions stay up-to-date with the latest blockchain developments and explore real-world use cases. By partnering with experts in the field, universities and schools could build more informed strategies for integrating blockchain into their systems. Finally, awareness campaigns are needed to highlight the potential of blockchain in education. These campaigns could include publications, case studies, and discussions that show successful applications of blockchain technology.

There are several areas where future research could deepen our understanding of blockchain's role in education. One important area is the practical implementation of blockchain in various educational contexts. Future studies could explore how blockchain can be integrated into different educational environments, such as schools, higher education institutions, or vocational training centres. Research could focus on the challenges, benefits, and scalability of blockchain-based solutions in these diverse settings. Additionally, examining the impact of blockchain on learning outcomes would be valuable. Researchers could assess whether blockchain improves access to education, enhances data security, or streamlines administrative processes, offering insight into its broader educational impact.

Another key area for research is user experience and adoption. Understanding the issues to blockchain adoption, such as resistance to change, lack of technical knowledge, or concerns about data privacy, would help to identify strategies for overcoming these challenges. Investigating these factors can provide useful guidance for institutions looking to implement blockchain technology successfully. Longitudinal studies would also be beneficial to track the long-term effects of blockchain on education. Research could explore whether blockchain leads to greater trust in academic records, reduces fraud, or improves student mobility over time. Finally, comparative studies could investigate the differences between institutions that have adopted blockchain and those that have not, providing further insight into the tangible benefits and challenges of blockchain integration.

Although blockchain has significant potential to transform education, further exploration and practical application are necessary to fully understand and realize its capabilities. By focusing on education, pilot programs, and collaborations, educational institutions can move closer to realizing the benefits of blockchain. With continued research and experimentation, blockchain could play a key role in reshaping the future of education.

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