

Guest Editorial: Blockchain in Smart Education

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ABSTRACT: In a smart educational environment, the significant challenges faced by its stakeholders are trust, privacy, and transparency-related issues in sharing and retrieval of any information. Since blockchain is a sole technology provides extraordinary features such as decentralization, traceability, and immutability; integrating this technology in a smart educational environment it can overcome all the technical risks, potential threats, and privacy concerns. This special issue aims at presenting the current state-of-the-art research and future trends on various aspects of the implementation of blockchain technologies that address the gaps prevailing in copyright and credential related issues, which can be seen as a promising sign for any virtual or innovative developments in teaching and learning platform. Papers selected for this special issue represent recent progress in the field, including works on VR Assisted Learning Environment, Secure Scoring Mechanism for Online Learning, Psychological Distance of Online Education.

Keywords: Blockchain, Smart education, Virtual reality, Online learning, Education theory

1. Introduction

Blockchain is one of the ingenious technologies which are disrupting the future of many industries. This encrypted digital ledger technology has all the potential to reshape areas such as healthcare, education, and finance. Education is one such area where these blockchain-based techniques and properties can trigger a wide range of opportunities. In a smart educational environment, the significant challenges faced by its stakeholders are trust, privacy, and transparency-related issues in sharing and retrieval of any information. Since blockchain is a sole technology provides extraordinary features such as decentralization, traceability, and immutability; integrating this technology in a smart educational environment it can overcome all the technical risks, potential threats, and privacy concerns. Whether the educational environment is formal or informal the data can be stored and accessed more securely by using blockchain appropriately. Moreover, the application of blockchain in a smart educational system shall also provide smart assistance for implementation, evaluation, tracking, delivery, and management of any information concerning both the teacher and the learner.

Due to the huge volumes of educational data across various learning platforms, the protection of sensitive and valuable information needs the embracement of robust and intelligent technology. This leads to the development of a decentralized distributed blockchain technology, where each node is secured by a blockchain ledger which can be accessed only by the private key. Furthermore, the principal advantage of the blockchain technology is that the information is stored within the blockchain network with a unique identity, so that when the information is accessed by the users it is checked and validated properly by comparing all the related data. On the other hand, Smart Contracts is a traceable digital transaction facilitator used along with the blockchain which can enhance trust, privacy, and security in virtual or online education. Hence, implementing Blockchain technology in a smart educational environment could make the overall system more secure, reliable and more transparent.

This special issue aims at presenting the current state-of-the-art research and future trends on various aspects of the implementation of blockchain technologies that address the gaps prevailing in copyright and credential related issues, which can be seen as a promising sign for any virtual or innovative developments in teaching and learning platform. The main areas covered by this special issue or main topics cover methodologies, modeling, analysis and newly introduced applications. Besides the latest research achievements, this special issue also deals with innovative commercial management systems, innovative commercial applications of educational technology, and experience in applying recent research advances to real-world problem.

Papers selected for this special issue represent recent progress in the field, including works on VR Assisted Learning Environment, Secure Scoring Mechanism for Online Learning, Psychological Distance of Online

Education. All of these papers not only provide novel ideas and state-of-the-art techniques in the field, but also stimulate future research in the sustainable learning environments.

2. VR assisted learning

In order to conform to the glacier terrain environment and textbook knowledge, the system was continuously discussed and revised with the high school geography teachers during the development process to ensure that the terrains observed by students conform to the textbook teaching materials and the actual teaching content. The paper by Chen and Chen (2022), entitled “Exploring the Effect of Spatial Ability and Learning Achievement on Learning Effect in VR Assisted Learning Environment,” constructed a teaching software of glacier terrain, which allows students to explore freely in virtual environment and the effect of different learning modes. This study also collected students’ spatial ability and geographical learning achievement, and explored whether students’ spatial ability and geographical learning achievement affects their learning effect. Through statistical analysis, it is found that “Spatial Visualization” in students’ spatial ability positively affected their learning performance in virtual reality software. This study verifies the value of using virtual reality to assist geography course learning, and provides more references and suggestions for future researchers.

3. Secure online learning

With the rapid increase in online learning and online degree programs, the need of secure and fair scoring mechanisms for online learning becomes urgent. The paper by Tsai et al. (2022), entitled “Design and Development of a Secure Scoring Mechanism for Online Learning Based on Blockchain,” designed and developed a secure scoring mechanism based on blockchain to build transparent and fair interactions among students and teachers. The proposed scoring mechanism was implemented by employing Ethereum and its three autonomous smart contracts, and the robustness was also verified by experiments to prove the feasibility of the system. This system helps manage interactions among students and teachers during the process of educational assessment, and encourages all on-chain members to trust the online learning process. These system features also help conduct peer evaluation and self-management that are essential for a student-centered and collaborative learning environment, for which is what emerging educational trend advocates.

4. Online education theory

In education reform, people actively promote education innovation through the application of intelligent technology. Especially, blockchain in smart education has the technical characteristics of peer-to-peer transmission, data fidelity, intelligent contract, etc., which provides a feasible technical scheme for educational reform. The paper by Zhang et al. (2022), entitled “A Grounded Theory Research on the Psychological Distance of Online Education,” reconstructed the theoretical model of psychological distance in the process of online education. The authors investigated the psychological perception of online education users and combine psychological distance and grounding theory. Findings are (1) The key to online education is to increase users’ psychological distance; (2) Four new dimensions of psychological distance in online education; (3) Factors influencing psychological distance in online education; (4) Resulting evaluation of online education - psychological perception evaluation.

5. Conclusions

All of the above papers address either technical issues in educational technologies or information security or propose novel application models in the various smart-learning systems and social computing fields. They also trigger further related research and technology improvements in application of novel educational technologies. Honorably, this special issue serves as a land-mark source for education, information, and reference to professors, researchers, and graduate students interested in updating their knowledge of block chain, cyber-physical-system, augmented reality, and novel application models for future on-line learning and teaching systems.

The special issue of this journal covers different aspects of the problem, from both the theoretical and the practical side. After a large open call, an international editorial committee selected three research papers.

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