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Implementation towards Blockchain for Security and Maintenance of Educational Documents

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ABSTRACT: One of the key challenges facing educational institutions today is the need to collect, store, and analyse data on each student's academic journey. This data consists of individual learning outcomes, student portfolios, and academic progress. There are benefits and challenges to using blockchain in education. The ability to efficiently organize such data across different departments will help the institution improve student retention and graduation rates. On the other hand, the primary challenge is understanding how to integrate the technology into the existing educational systems. While traditional degrees are still highly valued by businesses and employers, especially in emerging economies, eventually, blockchain could transform the existing academic organizational infrastructure into a robust, secure, and publically-accessible ecosystem. Taking same into consideration the system is proposed for verification of certificates of students with Blockchain.

KEYWORDS: Blockchain, Education, Verify Documents, Smart Contract, Smart Ledger

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I. INTRODUCTION

Bitcoin, a popular cryptocurrency, is an example of a blockchain application. A blockchain is a digital asset that can only be transferred to a third party with the owner's permission. Moreover, this technology can be used for many other purposes in the education system. For instance, students can develop a skill such as poetry or math genius before reaching high school. Blockchain-based educational tools can recognize these skills and reward students accordingly. Another application for blockchain technology in education is the use of smart contracts for grading. With blockchain, educators can program entire exams into the system. Students can then take the tests, and grades can be recorded on the distributed ledger. The entire process of grading can be done using computers, but the results are encrypted and stored in the blockchain. Blockchain technology can improve the quality of online education. There are a lot of unaccredited online institutions, and this is where the blockchain comes in. This can help prevent fraudulent activity by recording accreditations on the blockchain. Another blockchain application for education lies in the rewards system. By using cryptocurrency, teachers and students can receive special credit for their efforts. For example, teachers can reward their students with special credit if they perform well on a test or have completed a homework assignment. Such an approach helps in motivating students to learn. Furthermore, it can improve record-keeping and make learning more convenient. The possibilities for use of blockchain are endless. The proposed system supports all major functions for certificate management includ1 ing issuing, verification, and retrieval.

The proposed system should achieve the following characteristics:

1. Decentralized Verification: Limit or eliminate the involvement of any third-party to avoid the single-point failure of the system like OpenBadges.
2. Transparency: Ensure the transparency of the total quantity of issued certificates is to limit the possibility of counterfeiting.
3. Privacy and Security: Secure and ensure the information integrity of issued certificates that are only accessible to persons authorized. However, they are almost impossible to be modified even by their owners. Additionally, it is convenient to build mechanisms for fraud detection and prevention.
4. Undeniable: The redistribution center will not be able to deny any certificates that have been issued. Combined with the transparency of the number of certificates issued, people's degree fraud comes from the center. For example, the center gives wrong information about the content of the diploma and issue certificates to the trainees who are not eligible for the certificate.

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5. Saving and Convenience: Digitize certificates and automate procedures instead of manual operations in certificate management such as application evaluation, printing, signing, and back-up storing for saving time and money as well as providing a convenient way. Additionally, automating processes provides the convenience for all involved parties.

The system is designed which takes the efforts focused on reporting and verifying academic certificates and transcripts. The System is focused on reporting and connecting in-depth academic records such as learning behaviour logs, learning contents and assessment data.

Paper is organized as follows. Section I gives brief introduction to the topic; Section II describes survey done to understand the problem and detect the underlying problem in system. The diagram represents the step of the process with blockchain. After transaction, how process takes place is given in Section III. Finally, Section V presents conclusion.

II. RELATED WORK

1. Enhancing Blockchain Technology Education with Innovative Active Learning Blockchain provides a decentralized ledger system that ensures the integrity of the recorded transactions. With its wide application comes the huge demand for blockchain researchers and engineers, however, most schools have not offered courses related to blockchain research and development. To fill the gap between the increasing needs for blockchain professionals and shortage of blockchain curriculum, we propose a portable labware that covers the complete cycle of blockchain development. In this labware we apply active learning strategies to engage students in learning the blockchain knowledge more efficiently and effectively.
2. Blockchain-based Solutions for Education Credentialing System: Comparison and Implications for Future Development Based on the Australian tertiary education credentialing industry, this paper presents an abstract credentialing workflow and involved stakeholders, identifies six practical problems in the industry, and proposes five desired attributes of ideal credentials infrastructure. In addition, the paper presents a layered framework for evaluating seven blockchain-based education projects, and provides insights into factors hindering the wide adoption of these blockchain solutions. Finally, we suggest future considerations for the application development of blockchain-based education solutions.
3. Blockchain Application in Education Data Security Storage Verification System This study aims to minimize errors and falsification of data in the field of education that has been verified inaccurate data storage. This study uses a workflow analysis method for valid data storage verification systems. The novelty of this research is that Blockchain offers additional security of central data storage as a cryptographic network regulator to provide verification and authentication that occurs in data exchange in the network. It can be concluded that online verification of data storage has become a more modern and secure container.
4. Review of Blockchain Application in Education Data Management This literature study focuses on answering three main questions: what type of application blockchain technology is used for, what kind of data is stored using blockchain, and unresolved constraints or challenges in adopting and implementing blockchain technology in education. The results of our study show that there is great potential that this technology can bring to education. We also found and discuss solutions to various challenges in certain data types and problems in implementing this technology in education management. The results of this literature study are aimed at researchers interested in carrying out research using blockchain technology in education by providing an overview of what needs to be done for further research.
5. Blockchain: Application in the System of Teaching Informatization Management of Higher Education Advantages of blockchain technology including decentralization, non-tampering, anonymity, traceability, etc. which provide the possibility to improve the security of the management of teaching informatization in higher education. We try to explore the application of blockchain in education to improve the practice of the system of teaching informatization management in higher education. This will be reflected in three main aspects: 1) Distributed ledger Technology: it could help the teaching informatization management system to decentralize; 2) Asymmetric encryption algorithm: it could ensure user privacy in teaching informatization management system; 3) Smart Contract: it would improve the credibility of the teaching informatization management system. We thought that the security of informatization storage would be ensured, the credibility of data supervision would be enhanced, the cost of management would be reduced, and the

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efficiency of higher education management is improved substantially if we could use the blockchain technology in the system of teaching informatization management.

6. The Main Limitations of Applying Blockchain Technology in the Field of Education The article discusses the effectiveness of the application of blockchain technology for the distributed registry and for mass application in the field of education. And also an estimation of the probability of the possibility of improving the educational process. The analysis of the advantages of the technology that allowed it to successfully spread its crypto currency in the market of anonymous transactions and their application in the subject field of education, in comparison with classical technologies, with the central node-regulator, for example, the client-server. attacks.

III. METHODOLOGY

The proposed system does not significantly change the steps of the current process in the traditional system. Instead, system only integrates several additional steps to be able to simultaneously issue both physical and digital certificates, in which the validity of a physical certificate will be compared with its digital one that is issued and stored on Blockchains. Each physical certificate is validated by the content and its origin. The content on a certificate is verified based on the verification process in which critical information such as signatures and seals will be used to verify its origin. Therefore, each issuer adopts a KYC (Know Your Customer) registration process to digitize its identification for adding to digital certificates. For example, a user provides some necessary information such as name, tax code, telephone number, and email address (KYC Level 1) to Authority/Service Provider to create a new account. Then, a confirmation is sent to the user's registered email. Finally, the user has to activate his account by email.

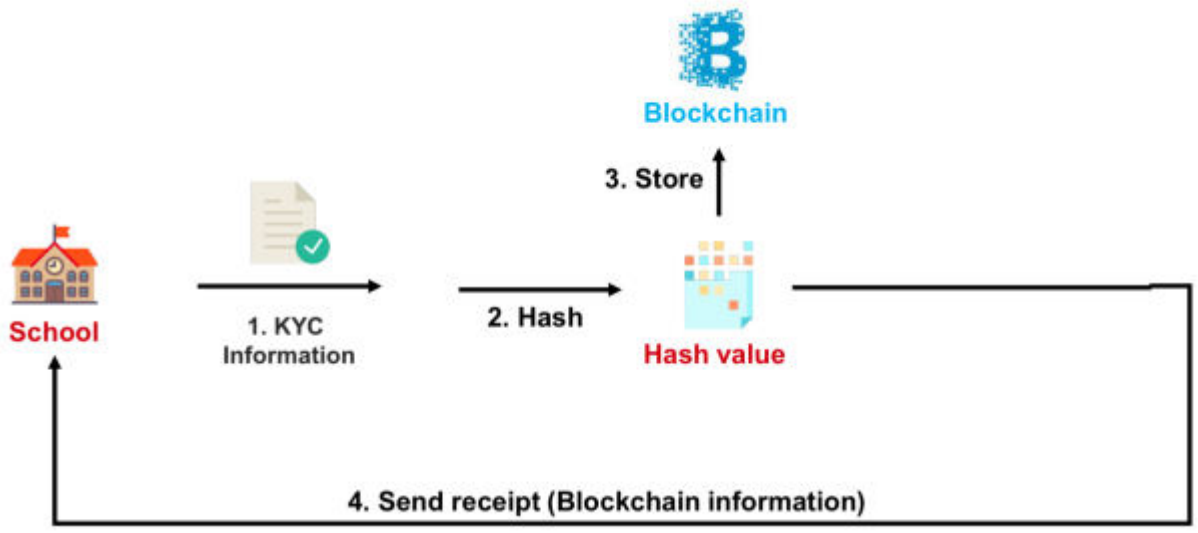

Figure: Step1 (KYC)

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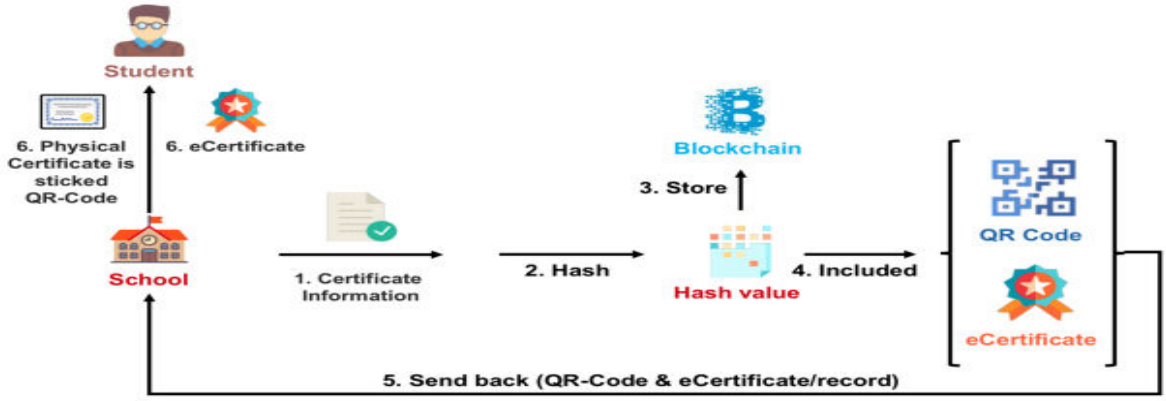

Fig 2: Step 2 (Issue of Certificate)

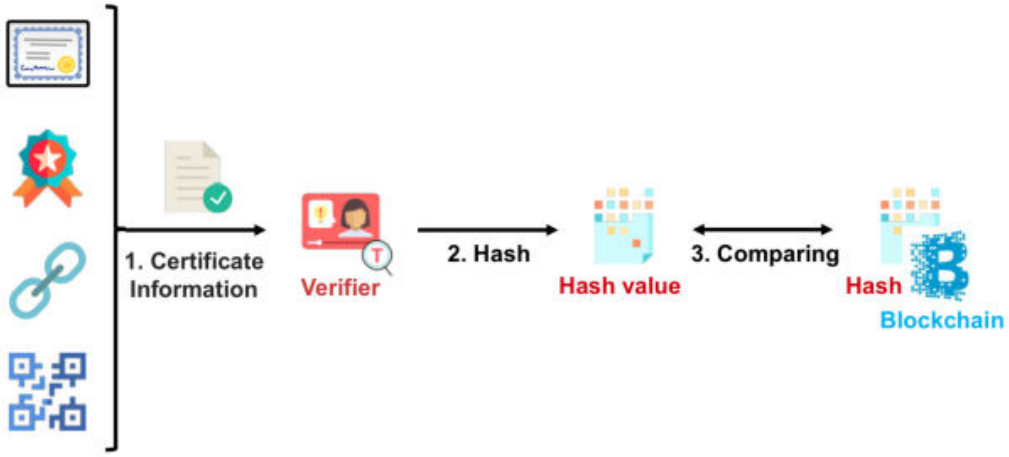

Fig 3: Step 3 (Verify)

Modules

1) KYC registration: Each certificate issuance organization (e.g., school)) provides KYC information that is verified by an authority or valid papers. Then, system will apply a hash function on the provided KYC information to generate an identification string so-called hash value that will be stored publicly in Blockchains. Finally, system sends a receipt that includes KYC information as well as identification string stored in Blockchains to the corresponding issuance organization via pre-registered email.
2) Certificate issuance:
Each digital certificate is stored in a format file that includes five followings' items

a) Hash: is generated by applying SHA256 function for hashing all content on the certificate to ensure the integrity of the certificate.
b) Blockchain zed Information: includes information to determine the index where the digital certificate is stored on the Blockchain system.
c) Certificate Owner Information: includes personal identification information such as name, identity card number, email, etc.
d) Certificate Content: Issuer's identification information, certificate of affirmation, proof of affirmation, date of certification, etc.
e) A snapshot of the physical certificate is used to compare with the physical one in verification process.

3) Verification:
The certificate owner shares the certificate information represented under various types such as physical form,

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eCertificate, and QR-Code to the verifier. Then, the verifier extracts the hash value to retrieve the immutable and correct information of the corresponding certificate from Blockchains. Finally, the verifier can compare the information provided by the certificate owner and the information obtained from Blockchains.

Algorithm:

SHA256:

SHA-256 (256 bit) is part of SHA-2 set of cryptographic hash functions, designed by the U.S. National Security Agency (NSA) and published in 2001 by the NIST as a U.S. Federal Information Processing Standard (FIPS). A hash function is an algorithm that transforms (hashes) an arbitrary set of data elements, such as a text file, into a single fixed length value (the hash). The computed hash value may then be used to verify the integrity of copies of the original data without providing any means to derive said original data. Irreversible, a hash value may be freely distributed, stored and used for comparative purposes. SHA stands for Secure Hash Algorithm. SHA-2 includes a significant number of changes from its predecessor.

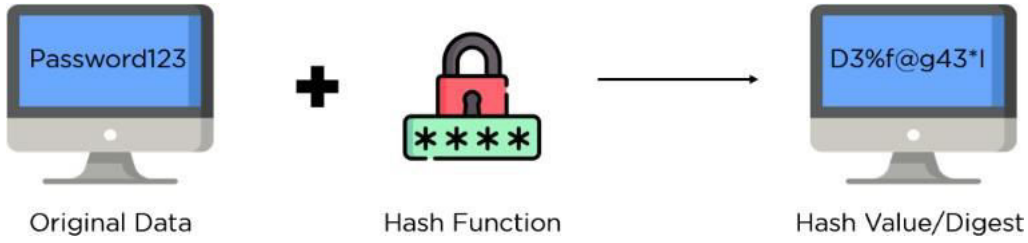
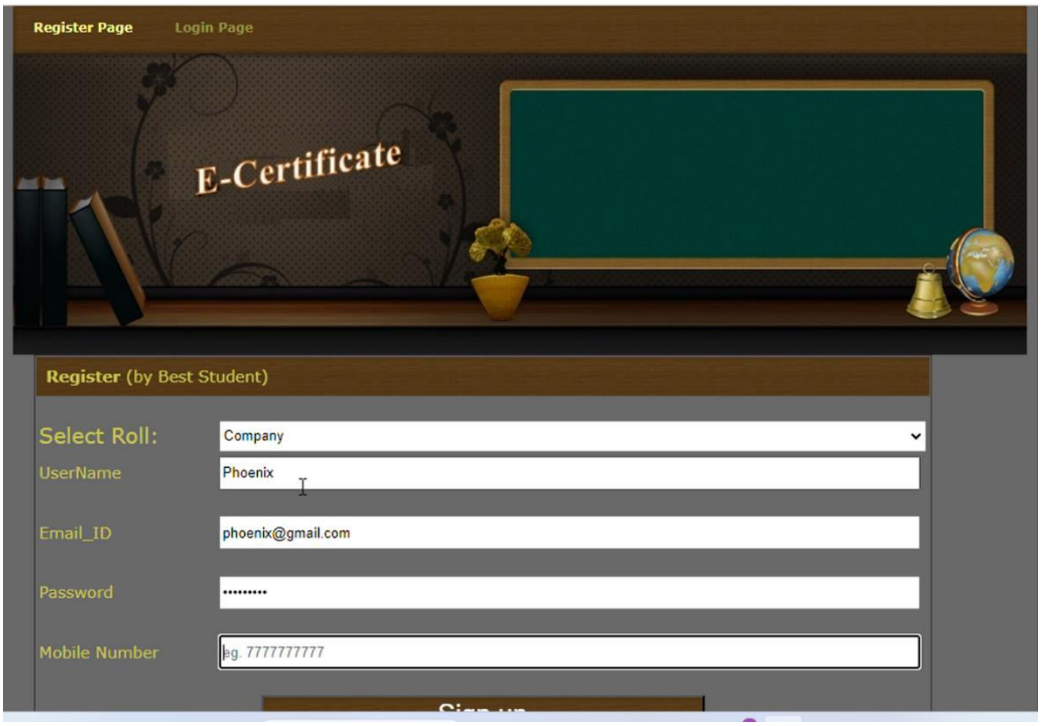


Fig. 2. SHA256

IV. RESULTS AND DISCUSSIONS



Registration Of company

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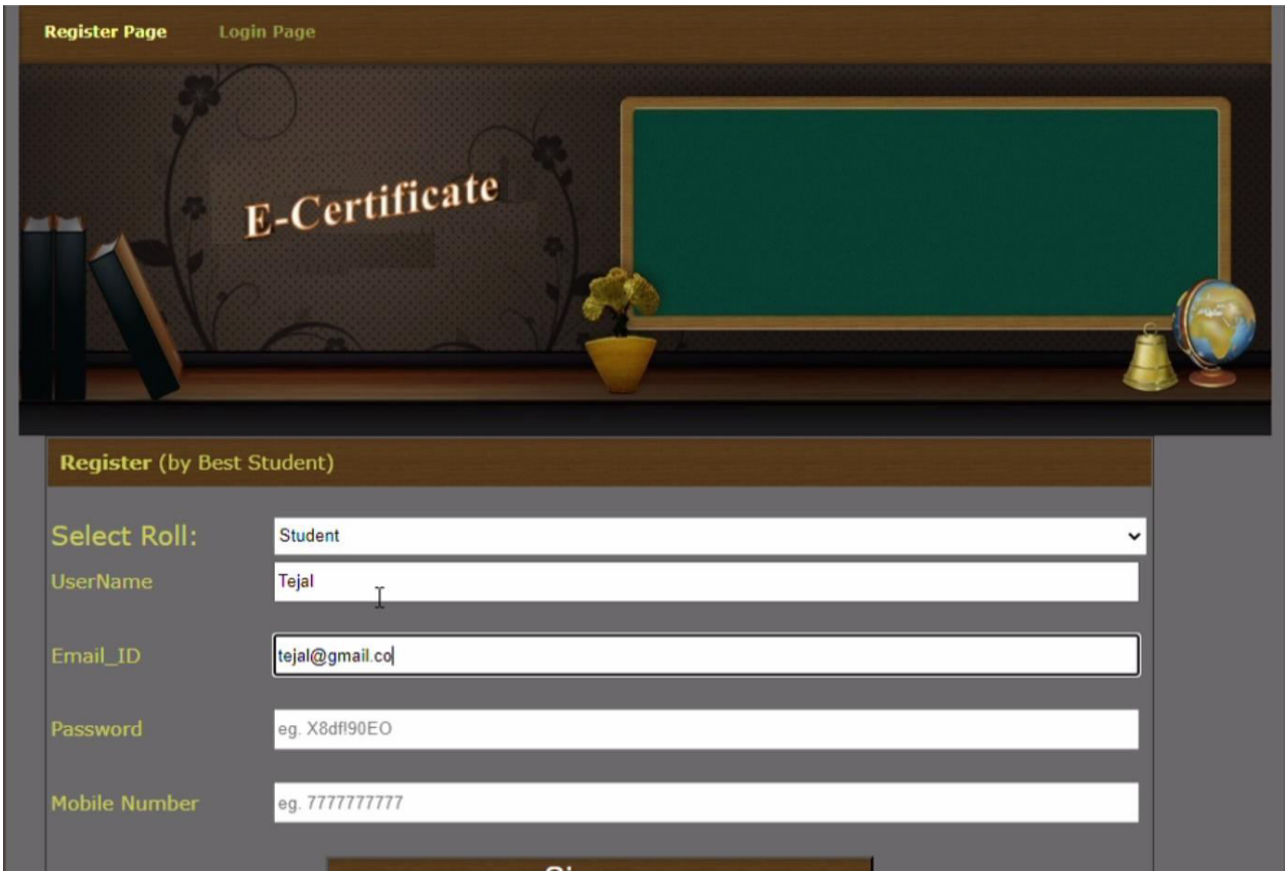
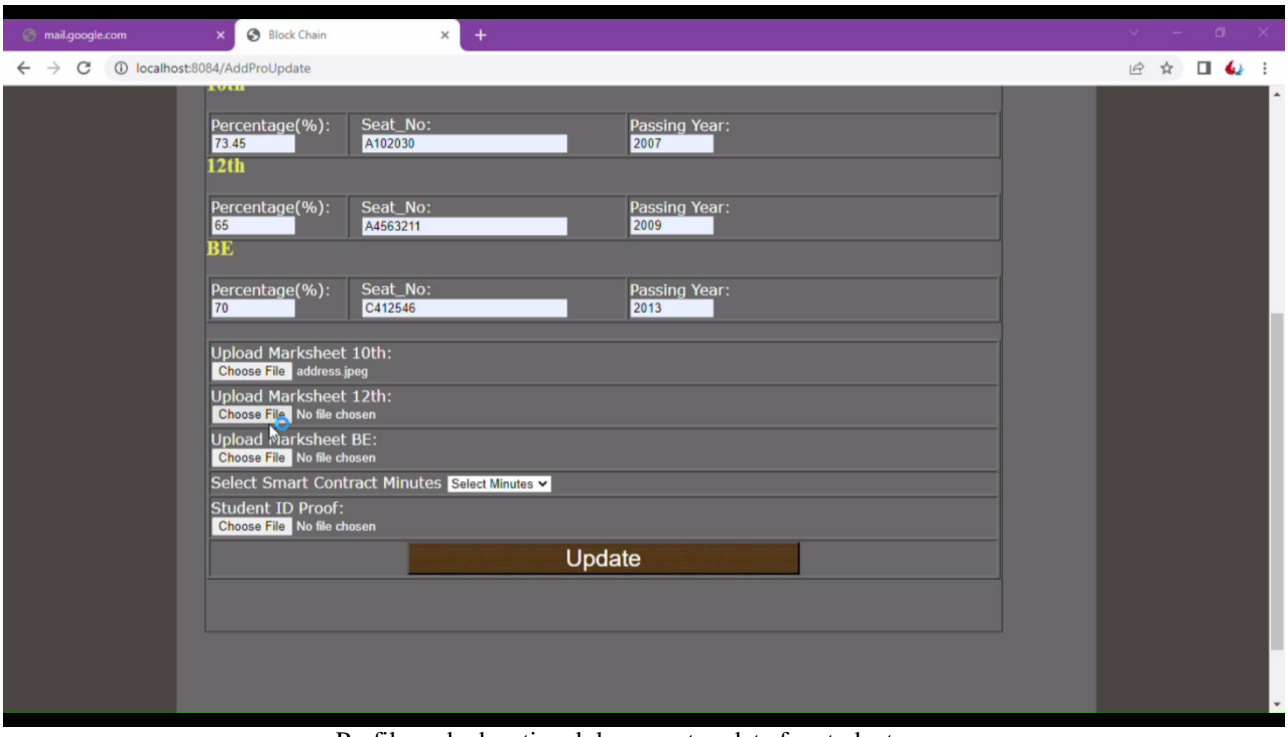


Registration for Student



Profile and educational document update for student

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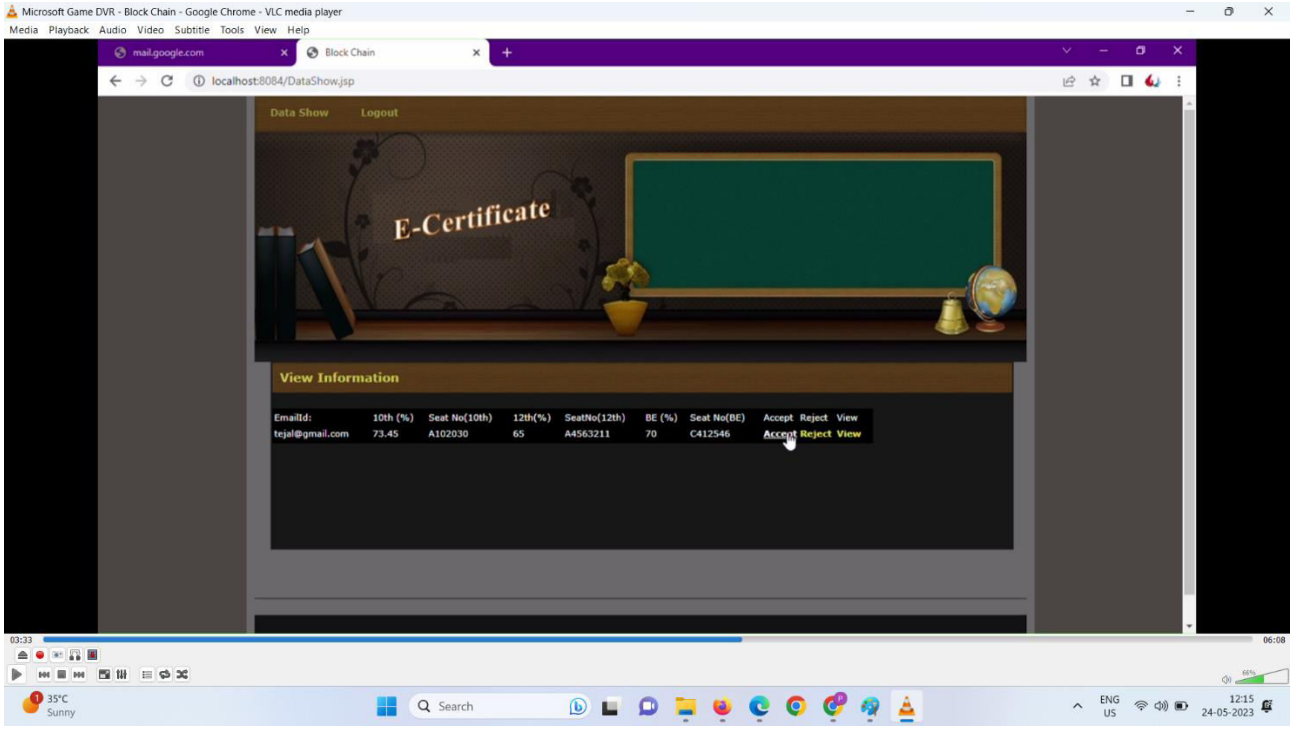
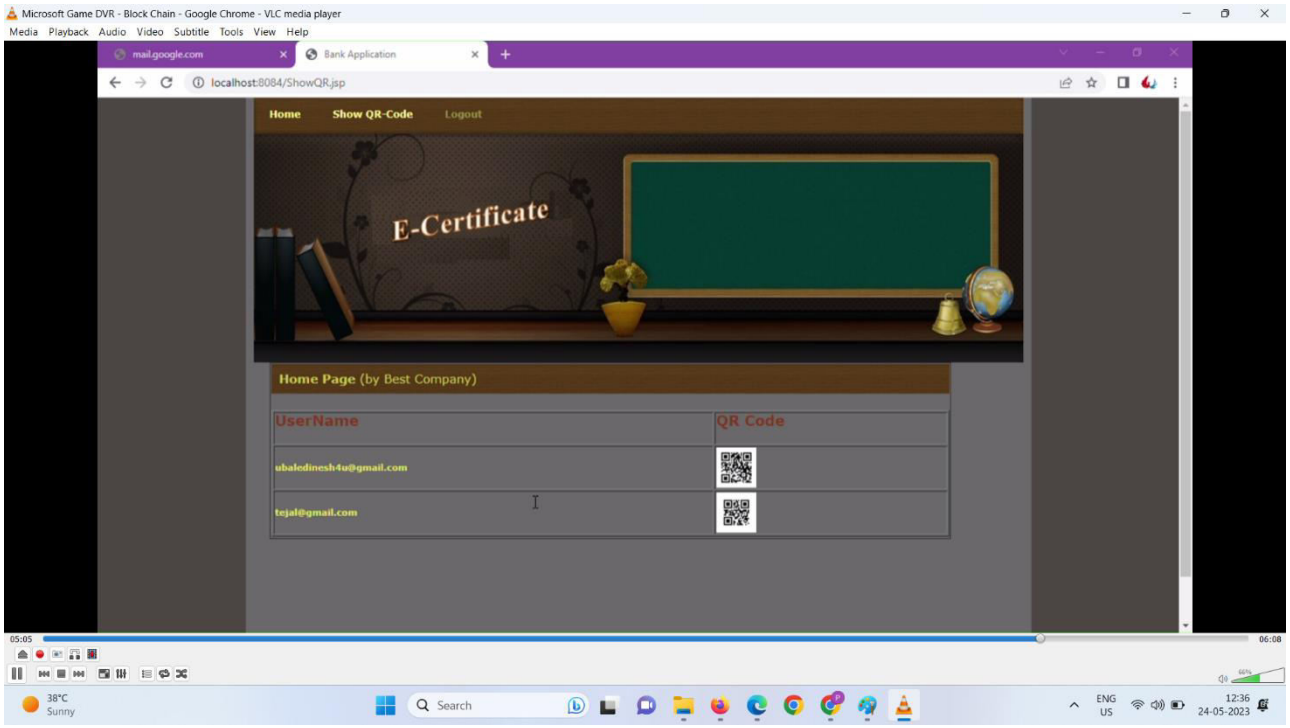


Verify Documents for students



Generate QR code for verification

V. CONCLUSION

In this system, we proposed a potential technique utilizing the advantages of Blockchain technology to digitize the certificate for preventing counterfeiting, illegal-modification, and repudiation. In addition, the system will become more transparent but still ensure the privacy and convenience of all parties involved in the ecosystem.The most valuable contribution in this paper is the smart contract architecture in proposed system which also makes our solution

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different with other approaches. The proposed system enables users including issuers (e.g. training organizations) and verifiers (e.g. recruiters) to perform operations accurately, quickly, cost-effectively and efficiently in digital certificate management. The successful pilot deployment indicates that system is applicable to wide deployment as a service for certificate.

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