Blockchain Proof-of-Concept proposal

*Blockchain Development individual assignment.*

BlockChain Based Student Knowledge Assesment System

Prepared by: Konstantin Bakhutashvili

Dear Schools,  
  
We would like to present a smart contracts-based blockchain solution to the discussed use-case. Please get acquainted with the proposed prototype to understand the structure and process of our solution below.

# Summary

For students to advance academically and professionally, it is essential to evaluate and confirm their knowledge in the field of education. Traditional record-keeping and verification techniques, however, can be time-consuming and vulnerable to fraud. I suggest creating a blockchain-based student knowledge assessment dApp that securely stores and verifies students' test results and accomplishments in order to overcome this problem. The legitimacy and verification of students' knowledge and accomplishments are problems that the contemporary educational system must deal with. We are able to develop a trustworthy and impenetrable system for capturing, storing, and verifying student exam results by utilizing blockchain technology and smart contracts. This solution offers a permanent and convenient record of the outcomes of the knowledge evaluation for the pupils. To construct the student knowledge assessment system, I will use Solidity to design and implement a series of smart contracts.

## The Solution

* General Benefit 1: Enhanced Data Integrity and Security Blockchain smart contracts offer an inherent advantage in ensuring the security and integrity of student assessment data. Each test score and assessment outcome is cryptographically recorded on the blockchain, creating an immutable and transparent ledger. This eliminates the risk of tampering or unauthorized alterations, fostering a secure environment for storing and verifying student achievements.
* General Benefit 2: Streamlined Verification and Validation Leveraging smart contracts for student knowledge assessment streamlines the verification and validation process. Smart contracts enable automated and tamper-proof execution of assessment-related tasks, such as recording scores and verifying academic accomplishments. This automation reduces administrative overhead, eliminates manual errors, and provides a seamless experience for students, educators, and employers seeking accurate and reliable student data.
* General Benefit 3: Decentralized and Trustworthy Record Keeping Smart contracts operate within a decentralized blockchain network, distributing the responsibility of record-keeping across multiple nodes. This decentralization ensures that student assessment data is not controlled by a single entity, enhancing the trustworthiness of the system. Participants can independently access and validate student records, promoting transparency and reducing the dependence on intermediaries.

# The blockchain solution

## Smart contracts explanation

Smart Contract 1: Knowledge Assessment

The Knowledge Assessment smart contract serves as the backbone of the entire solution, managing the assessment process and securely recording student data on the blockchain. It handles various functionalities, including: Student Registration: This contract allows students to register by providing their name and ID. It ensures that each student is uniquely identified on the blockchain. Test Score Recording: Students can submit their test scores through this contract, which validates the scores and securely stores them. This process ensures that test results are accurately recorded and tamper-proof. Verification and Validation: The smart contract facilitates the verification of test scores and academic achievements. The blockchain allows educators and authorized parties to validate student data, boosting the validity and openness of the evaluation process. Management of Authorizations: The contract enables the owner to grant access to the contract to particular addresses (such as educators). By ensuring that only those who have been given permission may carry out specific tasks, data integrity is preserved. Payment Management: The contract uses cryptocurrencies to manage the payment of assessment fees. The contract allows for student payments and guarantees the proper handling of funds while emitting payment-related events. The contract emits events for significant actions, like student enrollment and the recording of test results. These occasions offer transparency and enable third-party programs to monitor and react to particular activities.

Smart Contract 2: Result Adding

The Result Adding smart contract complements the main assessment contract by providing an example of interaction with external data or services. It showcases how to call another smart contract to retrieve student scores. Its functionalities include: Score Storage: This contract stores student scores independently of the main assessment contract. It demonstrates how external data can be managed on the blockchain. Score Retrieval: The contract includes a function to retrieve student scores based on a provided student address. This illustrates how blockchain contracts can interact and fetch data from each other.

## Smart contracts process flow

Student Knowledge Assessment Smart Contract Process Flow:

Student Registration: Students interact with the Knowledge Assessment smart contract to register by providing their name and ID. Smart contract records student details and emits a Student Added event.

Test Score Submission: Students submit their test scores to the Knowledge Assessment contract. Contract validates and stores test scores, emitting a TestScoreRecorded event.

Verification and Validation: Educators and authorized parties call the contract to verify student test scores. Smart contract responds with verified scores and emits a TestScoreVerified event.

Interaction with other Contract: The Knowledge Assessment contract calls the Result Adding to retrieve student scores. Alternatively, the Knowledge Assessment contract uses a "named call" to get scores.

# Expected business results

We expect our proposed solution to Client’s Company’s requirements to provide the following results:

## Technical Benefits

**Enhanced Data Integrity and Tamper-Proof Records**

Our solution ensures that student assessment data, including test scores and academic achievements, is stored securely and immutably on the blockchain. By utilizing smart contracts, each entry is cryptographically verified and cannot be altered, ensuring the integrity of the records. This tamper-proof nature guarantees the authenticity of student achievements, instilling confidence among educational institutions, employers, and students themselves.

**Streamlined and Transparent Assessment Process**

Through the automation enabled by smart contracts, the assessment process becomes more efficient and transparent. Students can effortlessly register, submit test scores, and access their assessment history. Educators and authorized parties can instantly verify scores, eliminating manual verification processes. This streamlined approach accelerates the assessment cycle and enhances the overall user experience.

## Other Benefits

**Student Empowerment and Motivation:** Providing students with direct access to their assessment history and achievements through a user-friendly interface empowers them to take ownership of their learning journey. The ability to easily track progress, view test scores, and receive real-time feedback can significantly boost student motivation and engagement.

**Efficient Credential Verification:** For employers and other institutions requiring student credential verification, the streamlined and decentralized access to records simplifies and accelerates the verification process. This efficiency reduces delays in recruitment, admissions, or other credential-dependent activities, leading to improved customer satisfaction.

# Conclusion

In conclusion, our journey began with a recognition of the challenges and limitations in the traditional student knowledge assessment process. Manual data handling, verification delays, and the lack of transparent record-keeping posed significant obstacles to achieving efficient and trustworthy assessment outcomes. The need for a robust solution was evident – one that could revolutionize assessment processes and deliver a seamless experience for students, educators, and employers.Our proposed blockchain-based student knowledge assessment solution addresses these challenges head-on, introducing a paradigm shift in how assessments are conducted and verified. By harnessing the power of blockchain technology and smart contracts, we have laid the foundation for a comprehensive ecosystem that offers immediate benefits and promising long-term opportunities.

Thank you for your consideration,

Konstantin Bakhutashvili