

Abstract

Once information is stored on the blockchain, it cannot be altered retroactively. This immutability makes blockchain systems the perfect technology to secure learning achievements and educational credentials. Keeping data trustworthy, secure and manipulation-proof has become an increasing issue in education, due to the rise of digital learning environments, which often combine learning experiences, testing procedures and educational credential management.

Currently, most digital learning environments safeguard their data using safety systems (e.g. password protection) that are not blockchain-based but controlled by a centralized authority. While these centralized systems provide a certain level of security against unauthorized access from outside the system, manipulation from within the system cannot be excluded. Users with high enough access rights (teachers, administrators, system managers) can still add, change or delete entries.

This becomes an even greater problem when learning achievements are to be reflected in fair and transparent credit systems, and especially when these educational credits are to be valid across different institutions or even countries.

Due to their ability to store data in a de-centralized, transparent and manipulation-proof way, blockchain-based technologies can provide solutions to this problem. However, it is necessary to first gain a sound overview of the different ways in which these technologies can be used in the educational sector and to assess the expected merits and drawbacks of these respective strategies.

In close cooperation with experts from the Massachusetts Institute of Technology's Comparative Media Studies / Writing Program, the MIT Game Lab and the MIT Education Arcade, the proposed project will investigate emerging strategies to combine blockchain-technologies and digital learning environments and assess what is needed to make worthwhile efforts in this direction. In this project, special attention is paid to game-based learning environments, as practitioners and researchers in the field of educational game design and the gamification of learning experiences are already highly familiar with the use of digital media and game-based tokens.

Key areas of investigation are:

- I. the current strategies to store and secure learning achievements, in particular the access status of potential manipulative interventions especially from within the security system;
- II. the effectiveness and limitations of 'off-blockchain' strategies in face of an increasing demand for globalized learning credit systems and the parallel demand for increased data security and privacy;
- III. the critical evaluation of existing and potential strategies which already make use of blockchain technologies through the identification and further improvement of good-practice examples and development of novel prototypical concepts in cooperation with the experts of the host institution through state-of-the-art concepts and technologies.

The goal of the project is to develop a conceptual model of current and emerging strategies to use blockchain systems for safeguarding learning achievements and educational credentials, aimed at researchers, educators and developers. Based on state-of-the-art educational as well as technological insights and making the requirements, merits and drawbacks of each strategy tangible and comparable, this model is intended to serve as a basis for design decisions as well as further considerations and research.