Explainer

Blockchain in Higher Education

What is blockchain?

Blockchain, which proponents have called a technological breakthrough potentially as important as the internet, can be described as a permanent, digital public ledger. Essentially a kind of database that supports the making and secure tracking of transactions, blockchain's most common application today is as the foundation for Bitcoin and the burgeoning cryptocurrency industry. Advocates say blockchain promises a new way to store, validate, secure, and trust digital information.

How does blockchain work?

Blockchain starts with a transaction, such as a bank deposit or an entry on a medical record. The transaction is sent to a decentralized network of computers run by users who share an interest in tracking information and data. That network of computers verifies the integrity of the transaction based on previously agreed-on rules. Verified transactions are bundled into blocks that in turn are chained together — creating a "blockchain." Each block is given a unique tag known as a "hash," which connects the block to the blockchain in a specific order. Any attempt to make even the smallest change in a block would change its hash and thus break the blockchain, signaling that the data had been tampered with. These processes encrypt transactions and make them virtually impossible to change after the fact. Another advantage to blockchain is that it does not relegate data to a centrally controlled repository — instead, everyone in the computer network can see the transaction. Blockchain has been described as a more democratic means of sharing data and for ensuring security, authenticity, and transparency of given transactions.

How are colleges using blockchain today?

While it is still very much in the early days, a few colleges and universities have begun to experiment with blockchain as a means to verify academic credentials like degrees, certificates, and transcripts. One

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driver of this activity is the need to deal with counterfeit academic credentials. Blockchain makes it harder to forge such credentials (or, for that matter, to fake an "A" on a transcript).

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Another driver is interest in providing platforms through which students can "own" and control records of their academic achievement. In addition to encrypting credentials, blockchain offers a means for documenting and tracking the breadth of a student's learning experiences. That's particularly useful for the growing number of students who study online, for those who may take courses at multiple institutions, and for lifelong learners who take courses during their careers. In Australia, for example, the University of Melbourne has pioneered the posting of blockchain-based, recipient-owned education credentials, part of a broader effort to "build a more diverse credentialing ecosystem," according to an official there. Experts find that students have a growing interest in having access to and more control of the records that document their learning as a means of proving their knowledge base to employers. Accordingly, experts also suggest that colleges have a role in showing employers the value of blockchain-based credentials and learning portfolios.

In the United States, the Massachusetts Institute of Technology has pioneered the

use of blockchain-based credentialing. Working with a company called Learning Machine, the MIT Media Lab has developed "Blockcerts," a technology for creating, issuing, viewing, and verifying blockchain-based certificates. In June 2018, Southern New Hampshire University presented graduates who had earned bachelor's and associate degrees with credentials in both a paper version and via Blockcerts. In 2017, Central New Mexico Community College became the first community college to issue student-owned digital diplomas using blockchain. In announcing that program, the college said the digital credentials can be securely and easily accessed via a smartphone or computer, enabling alumni to "independently manage" their own education records and "securely share them with employers or other schools for the rest of their lives."

How might colleges use blockchain in the future?

Blockchain has the potential to significantly change the way colleges and universities conduct business. Today, a handful of universities around the world accept tuition payments in Bitcoin. A few institutions — including MIT and the Georgia Institute of Technology — have experimented with accepting Bitcoin in places like the campus store. In the relatively near term, more institutions may adopt blockchain-based currency to pay for transactions.

For now, however, the primary university play in blockchain seems to be in research. This summer, for example, Columbia University created a new center devoted to research, education, and innovation in blockchain technology and data transparency. The center, which includes a business incubator, seeks to advance applications for blockchain.

Looking ahead, some futurists believe that blockchain has the possibility to enhance pedagogy, in part by supporting deeper interdisciplinary collaborations. Experts suggest that blockchain may provide a valuable new channel for researchers and professors to create and share intellectual property while still maintaining control over its use.

Blockchain is also seen as a linchpin in the next-generation library platform called University 2.0. Researchers at the San José State University School of Information, for example, are investigating how libraries might use blockchain technology for enhanced metadata centers, protecting sales of digital rights to library materials, and facilitating organizational partnerships.

What are further implications of blockchain for higher education?

In the short term, if blockchain becomes a standard format for issuing academic credentials, that could eliminate the traditional role of the college registrar as the distribution point for such records, which might be something of a double-edged sword. While it could erase a university income stream, turning to blockchain for credential distribution might also eliminate a task that can be cumbersome and time-consuming to administer. At the same time, students who gain access to their academic record via blockchain would likely realize added access, flexibility, and security for their credentials.

A more significant potential impact might come if blockchain technology gains the kind of traction that some experts believe it is capable of. That could create a significant need for

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skilled talent to manage blockchain applications. If that comes to pass, one of the most noteworthy benefits of blockchain in higher education might then be the sparking of new blockchain-focused academic courses, programs, and possibly even majors. Some institutions have already plunged into this new market. A recent study found that 42 percent of the world's top 50 universities now offer at least one course on cryptocurrency or blockchain. At the University of Pennsylvania, for example, a business professor and an engineering professor team-teach the course "Blockchain, Cryptocurrency, and Distributed Ledger Technology." Princeton University recently teamed with the ed-tech company Coursera to offer a course on cryptocurrency technology. Cornell, Duke, MIT, Stanford, and the University of California at Berkeley are among a growing number of other institutions that also offer courses on blockchain and cryptocurrencies.

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