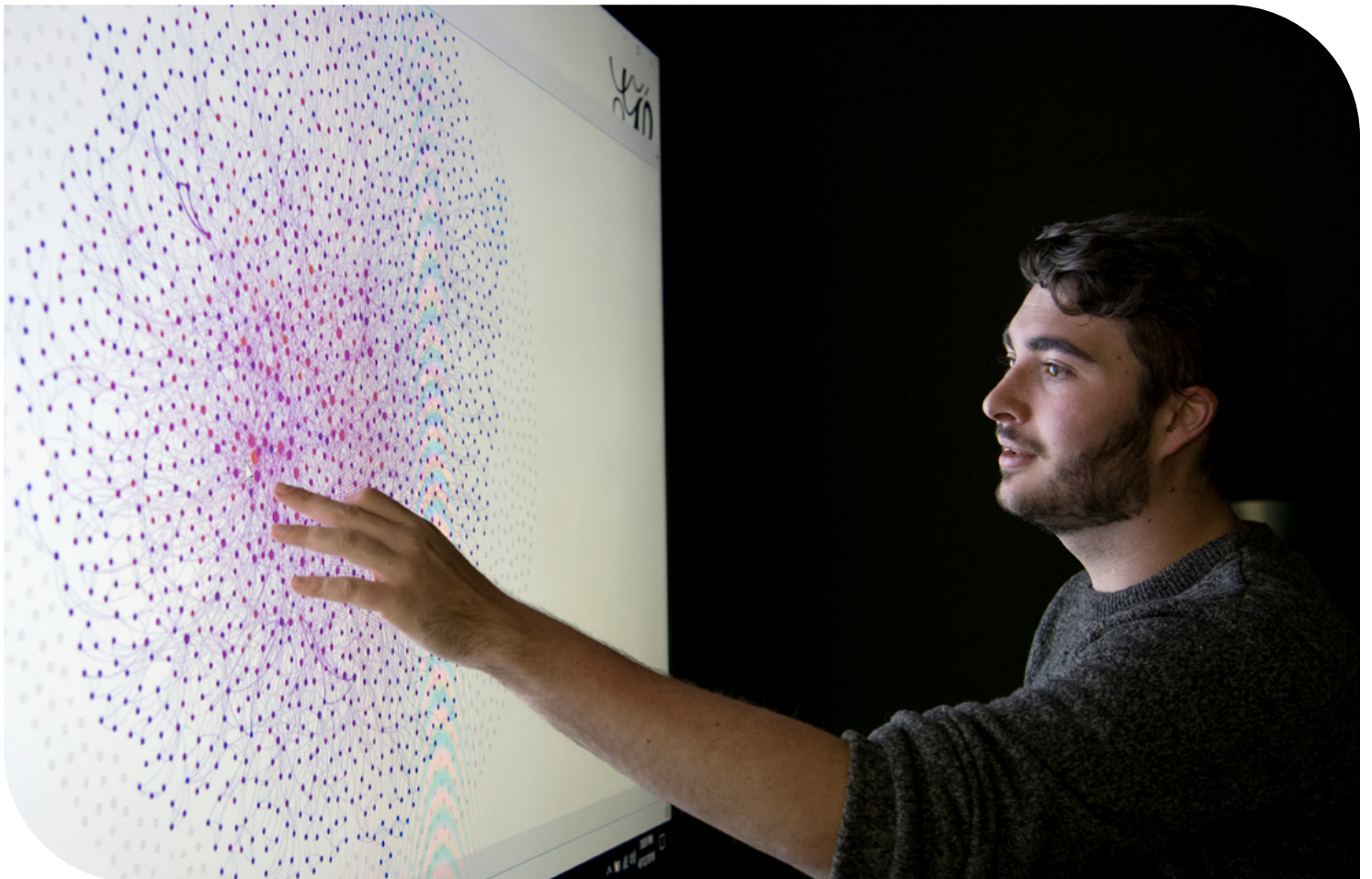


# CONNECTING THE PIECES

The Benefits of Blockchain for  
Higher Education



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Council on  
Education®

This paper is intended to provide an introduction to blockchain technologies and their potential applicability to education and the workforce. It explains the basics of how the technology works and offers examples of how blockchain can benefit both students and institutions.

For more information on blockchain, please visit the American Council on Education's Education Blockchain Initiative web page at [www.acenet.edu/EBI](http://www.acenet.edu/EBI) or read the report *Connected Impact: Unlocking Education and Workforce Opportunity Through Blockchain*.

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One Dupont Circle NW  
Washington, DC 20036

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# THE OPPORTUNITY COSTS OF BUSINESS AS USUAL

At the start of Chris's senior year of high school, he was excited to apply to college. Realizing he didn't know where to start, Chris met with his college counselor, Mr. Jones, who was the sole counselor for the senior class. After several meetings to figure out where he wanted to apply, Chris realized deadlines were quickly approaching and asked Mr. Jones if he could mail his transcripts to the eight colleges on his list.

A week later, Chris received emails from admissions offices at several schools notifying him that they had not yet received his transcripts. While some were willing to be flexible on this deadline, his top-choice school was unable to review his application. Chris was disappointed—at first with Mr. Jones. However, he remembered that he started applying much later than some of his friends.

Given his late start and the frustratingly slow bureaucratic processes, he worried that he wouldn't be able to attend one of the colleges on his list. He wondered why so much time was spent figuring out forms and getting them to where they needed to go. Why did he have to mail these sealed documents? And why were some schools requiring them to be faxed? Surely, in 2020 there had to be a more efficient way.

## BLOCKCHAIN TECHNOLOGY: AN OPPORTUNITY IN HIGHER EDUCATION

Applying to college in the U.S. is often a complicated process. It often requires students to fill out applications, complete the FAFSA by answering questions about their family and financial resources, and may involve taking entrance exams—not to mention, considering their future career path(s) and potential returns on investment.

Many students in the U.S. pursue a college education with the belief that going to college will help them figure out who they are, what they're passionate about, and how they can contribute to the world around them, and ultimately translate these experiences into career opportunities.

These sentiments are valid: going to college provides invaluable returns to intellectual growth and

economic mobility for students. Increasingly though, the diversity in the types of colleges, programs, formats, and credentials has made the path to such growth and mobility less straightforward. Going to college may depend on where you went to high school, if you have people who can help you apply, your financial resources, and your ability to interpret costs and pricing, among other considerations. Throughout the process, students navigate disconnected systems, requiring them to be savvy in applying, knowledgeable about articulation agreements if they want to transfer, patient with administrative processes, and hopeful that their program of study will land them a job.

In recent years, researchers have begun examining whether a new technology, blockchain, can create cohesive ecosystems capable of addressing these issues.

## What Is Blockchain?

In short, a blockchain is a digital ledger that shares its transaction records with multiple parties. The digital ledger maintains a record of all transactions of data, or “blocks,” that take place between users, with each transaction/block being cryptographically signed and linked to each preceding transaction/block, following consensus-based validation by multiple users.

Importantly, student-data itself is not stored on the blockchain. Rather, as a digital ledger, blockchains record information about when and between which parties data transactions take place, and point to *where* the data being transacted is securely stored. Thus, the digital ledger can be used to ensure data are transacted between trusted parties, increasing verifiability, security, and immutability of the data being shared.

In *Connected Impact: Unlocking Education and Workforce Opportunity Through Blockchain*,<sup>1</sup> Lemoie and Soares summarize blockchain this way: “At its core, a DLT (distributed learning technology) is about managing data, transactions, and relationships differently, particularly by avoiding reliance on a centralized authority to ensure that all participants on the blockchain, and their data, can be trusted. This lack of a centralized authority could usher in a time when individuals can have more control of their own data, enhancing their ability to make transactions of all kinds and allowing select people to see and use their ledger” (2).

This distributed ledger model increases:

- Reliability, as the information is less likely to be lost
- Security, as records are immutable and have to be verified by other trusted parties
- Trust, given record immutability, and in private blockchain systems, its location, as only verified parties are able to handle and view the records

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<sup>1</sup> Lemoie, Kerri, and Louis Soares. 2020. *Connected Impact: Unlocking Education and Workforce Opportunity Through Blockchain*. Washington, DC: American Council on Education.

# THE BENEFITS TO THE STUDENT: CLARITY IN EDUCATIONAL PATHWAYS

As another example, imagine a high school student who is considering attending college, Christine. Christine's high school has partnered with the local community college district and employers in the surrounding area to implement a blockchain for their education-to-employment pipeline. Participating schools, higher education institutions, and employers joined the effort and used the same blockchain.

## From High School to College

In high school, Christine's student record was created using her school's online education platform, which utilizes blockchain technology. She regularly logs in and can see the courses she has taken and her grades.

When she is ready to apply to college, Christine can select majors of interest to get information directly from local colleges through the same platform. After selecting institutions and majors of interest, those institutions can view Christine's educational record and transmit personalized information to her immediately based on her selections. Moreover, she didn't have to wait for a guidance counselor to print and mail her transcripts to each institution. With a streamlined application process, Christine applies to and enrolls in a two-year cloud computing program at her local community college.

## Transferring to a Four-Year Institution

Toward the end of her second year at the community college, Christine wants to enroll in a four-year degree program. The same blockchain-supported platform also contains information on local university options and allows her to connect with programs of interest. After she selects programs of interest, admissions staff are again immediately able to see her electronic record, understand and view her experience at the community college, and identify the applicability of courses she has taken and how they fit with the degree program she is interested in.

Because her current and prospective colleges are using the same blockchain, the institutions can view Christine's record if she chooses to apply. Blockchain eliminates the need to physically mail information, instead transmitting it instantly. Because Christine's academic record is verifiable and shared in a mutually agreed-upon format, the university can provide her with tailored information about application steps and transferring credits.

## **From Learning to Earning**

Christine graduates with her bachelor's degree. In addition to the physical diploma, Christine's institution also issues the degree as a digital credential. This credential is viewable on the same blockchain platform by potential employers who can see that she received a four-year degree in cloud computing from her university on May 20, 2020. As she applies to jobs, employers that participate on the blockchain platform can view detailed information on her degrees and academic record, including the courses she took, topics covered, and outcomes. Specific information, including the software used in these courses, programming languages taught, and extracurricular activities, provides more contextual information for employers.

This example depends on a network of schools and employers building a shared program and committing to a common framework. Blockchain is the backbone of this vision: it engenders trust and requires standardization, but it also creates fluency of information and full transparency for all participants.

## **Benefits to the Institution**

Blockchain made it easier for Christine to enroll in college, transfer, and ultimately graduate, and it also has several benefits for participating institutions of higher education, making it a win-win for students and schools.

### **REDUCE ADMINISTRATIVE BURDEN**

Blockchain can reduce the administrative burden of student-record management by moving records to electronic ledgers. Though students have ownership over the record, colleges, universities, and employers can still confer credentials to the record. Because blockchain is immutable, earlier records in the distributed ledger could not be changed without the changes being recorded, eliminating fraudulent activity and record tampering.

### **PROMOTE ACADEMIC INTEGRITY AND RESEARCH INNOVATION**

Blockchain can also serve as a platform for research dissemination and transmission between institutions, researchers, and public and private organizations. Similar to how student records and credentials would benefit from immutability, researchers and institutions may be able to develop similar mechanisms for their own work and intellectual property. Doing so would ensure academic integrity and identify where idea generation began, the authors or researchers involved, and dates of creation or publication.

## PAIR CURRICULAR OFFERINGS WITH WORKFORCE NEEDS

Increasingly, students are enrolling in college courses in fits and starts, looking to develop skills and content knowledge for specific occupations and career tracks. As micro-learning (e.g., badges, workshops, certificates) becomes more common, a platform based on blockchain could serve as a common transcript for credentials from multiple institutions of learning.

## Benefits to Students

Blockchain has the potential to allow students to interact with their learner records in new ways, making it easier than ever for them to manage and share those records with educational providers and employers.

## PERSONAL DATA AGENCY AND PRIVACY

If students control access and management of their records, they can share them as appropriate with schools and employers, no longer needing to rely on processing time or fees. The reliability and maintenance of records remain intact and more secure than before.

## PROMOTE LIFELONG LEARNING AND GIVE CREDIT WHERE DUE

Blockchain can recognize and document learning that occurs anywhere—in a classroom, on the job, through military service, or in one's free time. Leveraging this technology could make it easier for learners to summarize all of the skills they have acquired and potentially allow learners to receive academic credit through prior learning assessment policies. In addition, it could incentivize people to continue to learn throughout their lifetimes because they know that learning will be documented, recognized, and potentially rewarded.

## CREATING A COHESIVE ECOSYSTEM

Blockchain technology could help students navigate the fragmented educational and education-to-work pipeline. Giving students control over their own educational records and connecting

### **BLOCKCHAIN IN PRACTICE: REWORKING TRANSCRIPTS FOR EVERYONE**

Currently, if students or alumni need transcripts, they go to the registrar, request an official transcript, and pay the associated processing fee. If blockchain technology were used for transcripts, students would instead independently manage their electronic academic records. This digital access would allow them to share and transmit records instantly with admissions offices and potential employers. Importantly, blockchains can be edited and added to by trusted parties like schools or employers, but older records cannot be changed by a single party—increasing trust that records have not been tampered with. Using a blockchain, schools could issue a degree to a student's electronic record. That credential would be viewable by employers, and all stakeholders could trust that the record can't be edited.

students, K–12 schools, colleges and universities, and employers on a single platform could make it easy for students to share their records without having to navigate different information systems set up by various institutions and employers.

## **Challenges and Considerations**

### **ACCESS TO TECHNOLOGY AND THE INTERNET**

As the spring 2020 semester abruptly shifted to online instruction due to COVID-19, a key socio-economic issue became apparent: Internet access and access to technology is stratified. While blockchain holds promise for solving many issues facing students, institutions, and employers, without widespread Internet access, students who might benefit most will not see its effects.

### **ADOPTION OF BLOCKCHAIN: ONGOING DEVELOPMENTS AND SHIFTING COSTS**

Currently, blockchain technology has not seen widespread adoption. Adopting blockchain technology will require institutions and organizations to invest up-front costs in training staff and stakeholders on what it is, how it will change their work, and how it advances their missions.

## **Implementing Blockchain: Where Do We Start? And How?**

Leaders in higher education interested in learning more about blockchain technology and how to adopt it may find the blockchain webinar on the ACE Engage platform informative. The webinar features representatives from ACE, the U.S. Department of Education, OpenWorks Group, and the Dallas County Community College District, where the technology has been adopted for real applications in higher education. Additionally, this white paper from the World Economic Forum provides context for those seeking to learn more.



