

Blockchain National Forum

Executive Summary

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Introduction

Discussions of blockchain technologies evoke sentiments that can range from promise and excitement to skepticism and disbelief. For many of us—even those of us with strong opinions about the merits of blockchains—the technology itself nonetheless remains somewhat *mysterious*. What is a blockchain? How does it work? What makes it special compared to other information technologies? Establishing a baseline understanding of blockchain technology fundamentals is important for the success of any blockchain endeavor. We look to libraries to point us in the direction of educational resources and blockchain is no exception.¹

The central question then becomes: What are the key ingredients in effective blockchain education? Here, I offer my answer to this question from the context of my background as a systems engineer and cognitive scientist.

Cognitive barriers to understanding blockchain technologies

I identify *cognitive barriers* that can hinder our understanding of blockchain fundamentals. The computer/network systems most familiar to us tend to be centralized with a client-server design, tend to rely on a trusted authority to ensure accuracy and security, and tend to be developed and controlled by large organizations. Blockchains, on the other hand, are decentralized with a peer-to-peer design, tend not to require a trusted authority, and are developed and led according to the principles of open source software communities. Many of the cognitive barriers to understanding blockchain stem from habits of thinking inherited from our personal history of routine experience interacting with applications and systems which have a central-authority design.

How can we design blockchain education to effectively target these cognitive barriers? I group the ‘key ingredients’ of blockchain education into five strategies: (1) get hands-on experience interacting with a live blockchain, (2) learn the historical facts about the development and evolution of existing blockchains, (3) acquire (basic) understanding of the component technologies that blockchains are made of, (4) participate as a ‘peer’ in existing peer-to-peer blockchain networks, and (5) complete coding exercises where you create an application that interacts with a blockchain.

Hands-on experience interacting with a live blockchain

Before we can understand how a thing works we must first understand how to use it. Hands-on learning is incredibly effective. We can get hands-on experience interacting

¹“America's libraries are a place where a lot of people go and research Bitcoin ... One of the most frequently searched items from a library computer is ‘Bitcoin’. So, we’re teaming up with CFPB to go out to America’s libraries and educate librarians (who often get questions asked) to direct patrons to use our Bitcoin website and other resources.”

- [Senate Banking, Housing and Urban Affairs Committee Hearing on Virtual Currencies](#), Feb 6, 2018. Available at: <https://www.c-span.org/video/?440770-1>.

with a live blockchain by simply using cryptocurrencies in the most basic way. For example, learners can acquire a small amount (say, \$10 worth) of Bitcoin and use it to complete learning exercises, such as: create a new bitcoin address and transfer funds to it; view your balance using a public blockchain explorer; pay for goods and services; create backups of your wallet private keys; create a paper wallet; etc. Cryptocurrencies are the first successful live production implementation of a blockchain. Hands-on experience using cryptocurrencies is a unique and powerful tool for learners to begin to understand the fundamental concepts of blockchain.

Learn about the history of blockchains

Knowing the history of Bitcoin and later cryptocurrencies will also enhance your understanding of blockchains. Bitcoin was created to address a need and solve a problem; it combined existing technologies in novel ways to accomplish these goals. Books² and documentaries³ about the birth of blockchain can be integrated into educational offerings.

The component technologies of a blockchain

Blockchain technologies are novel and innovative in part because of the ways in which they combine *existing* technologies, such as public key cryptography, decentralized peer-to-peer networks, distributed systems, and open-source software communities. Acquisition of a (basic) understanding of each of these component technologies is a powerful way to understand blockchain. Moreover, educational materials already exist for these topics and these materials could be integrated directly into blockchain education offerings.

Participate as a ‘peer’ in a peer-to-peer blockchain network

Much of the power of blockchain lies in the number of ‘nodes’ or ‘peers’ in the peer-to-peer mainnet. You can become a ‘peer’ by running a full node on your computer. Becoming a peer can be an educational exercise which can facilitate deeper understanding of how a blockchain functions as a collection of decentralized nodes.

Code an application that interacts with a live blockchain

If you code, you can build a simple ‘exercise’ software application that interacts with a live public blockchain. This hands-on process will present many opportunities to deepen your understanding of blockchain technologies. Coding exercises of various levels of difficulty could be integrated into blockchain education offerings.

Conclusion

Effective blockchain education strategies are increasingly in-demand. We can identify cognitive barriers and target them with specific educational strategies. Libraries have a major role to play in providing blockchain education Here I offered some basic points to initiate the conversation about blockchain education.

² Antonopoulos, A. M. (2017). *Mastering bitcoin : programming the open blockchain*. Sebastopol, CA: O’Reilly.

³ Cannucciari, C. Banking on Bitcoin (documentary). USA. Available at: <https://www.imdb.com/title/tt5033790/>.