

Learning Module #6 - Cryptocurrency Blockchain

Final Report

- **Goals:**

- Charlie originally wanted to create a fully functional public decentralized cryptocurrency blockchain. He achieved most of this, including creating the cryptocurrency, maintaining decentralization, creating full functionality of the cryptocurrency, and developing a logo and website to facilitate the blockchain.

- **Accomplishments and Problems:**

- Charlie succeeded in creating a fully functional decentralized cryptocurrency blockchain.
- Charlie implemented extra functionality to his blockchain, including dynamic difficulty adjustment, dynamic reward halving, proof-of-work algorithms, and more.
- Charlie failed at implementing a public aspect to his blockchain. He was having extreme difficulty implementing functionality for a peer-to-peer network including but not limited to dynamically finding current port, dynamically documenting that peer in a list of registered peers, and connectivity to a network.

- **Lessons Learned:**

- Charlie learned a lot for this learning module. Research and learning took up the majority of the project. Writing the actual code took the shortest amount of time. Charlie had to learn Go; a programming language that he has had no prior experience with. He also had to learn on deeper layers of abstraction as to what a blockchain is and how it functions. He needed to learn all of the moving parts that

make up a blockchain. Before this learning module, he knew the basics of cryptocurrency and the idea of decentralization as well as a rough idea as to what a blockchain is, but everything else he had to sink over 30 hours of research into learning what he needed to know to effectively create a cryptocurrency.

- If Charlie had redone this learning module, he would have probably focused on peer-to-peer networks and connectivity first instead of last, as this is a major component of the blockchain and is the entire “public” functionality of a blockchain. Without this, a blockchain exists only on one’s computer, with no way to automatically consolidate a singular correct blockchain.

- **Future Learning Module Advice:**

- Charlie recommends that others who pursue this learning module focus on creating a peer-to-peer network before delving into creating the blockchain. The order in which you learn and research aspects of the cryptocurrency you are trying to make will influence the speed and efficiency of what you get done. Here is an outline that Charlie recommends
 - First, research blockchains. Learn everything there is to know about how they function, all the moving parts needed, and research those moving parts individually to gain more insight as to how they work.
 - Then, research peer-to-peer networks in the context of cryptocurrency blockchains. Learn everything there is to know in order to create your own peer-to-peer network. Render is a great website to use to launch a network for free, or use an extra computer in your house to run the server 24/7 for relatively cheap.

- Next, create the peer-to-peer network, leaving out parts that would need to reference the blockchain.
- Finally, create the blockchain and all of its components. Spend time ensuring cohesiveness and functionality.
- Lastly, create a website or downloadable application to facilitate the usage of the cryptocurrency (mine, trade, view blockchain, create wallets, etc.)
- **What to Pursue with this Learning Module in the Future:**
 - Charlie plans to finish the peer-to-peer network and finally finish the “public” aspect of his blockchain project.
 - Once finished, Charlie is contemplating as to whether he should take his finished product to the school and possibly work out a way to utilize cryptocurrency in purchases managed by the school. (Event tickets, fundraisers, school merchandise, etc.)

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Log:

In School:

Day #1

1/8/2025

Charlie P.

Description of work: Charlie started to research node functionality within a blockchain to ensure decentralization of the blockchain. He started to implement the code for nodes and will be continuing his work tomorrow.

Day #2

1/9/2025

Charlie P.

Description of work: Charlie started to research node functionality within a blockchain to ensure decentralization of the blockchain. He started to implement the code for nodes as well as dynamic rewarding and will be continuing his work tomorrow.

Day #3

1/10/2025

Charlie P.

Description of work: Charlie finished adding node functionality and dynamic rewarding and implemented extra validation steps, dynamic difficulty adjustment, and started researching implementing safety features. He made a discovery that may throw a wrench in the full functionality of his program, as he learned that he might need to create a separate application as well as the website and blockchain. Without the application, the blockchain would not be fully decentralized and therefore not what Charlie had envisioned. Time is a massive factor with this newfound idea of needing to implement an application.

Day #4

1/14/2025

Charlie P.

Description of work: Charlie determined he did not need an application, he just needed a way users could download a version of the blockchain code in order to become a peer on the peer-to-peer network. This was a simple fix. He spent class adding this download link into his website and started fleshing out his website.

Day #5

1/?/2025

Charlie P.

Description of work: Charlie worked on developing a more robust proof-of-work algorithm to correctly validate blocks being added to the blockchain. Otherwise hackers and other malicious actors could alter the blockchain with false blocks.

Day #6

1/?/2025

Charlie P.

Description of work: Charlie continued implementing his proof-of-work algorithm. He had some difficulties choosing one but he settled on a relatively simple yet effective one.

Day #7

1/?/2025

Charlie P.

Description of work: Charlie finished up the proof-of-work algorithm and started development on dynamically adding peers to the network list instead of simply having a static port.

Day #8

1/?/2025

Charlie P.

Description of work: Charlie created a list inside of his blockchain that is appended to each time a new peer registers to the network. This list will never be too big, as the scope of this crypto's launch would be limited to students at Warren Hills.

Day #9

1/?/2025

Charlie P.

Description of work: All of Charlie's functions now had to be altered slightly to accommodate the integration of the dynamic peer system. He started working on that today.

Day #10

1/?/2025

Charlie P.

Description of work: Charlie continued work on altering his functions, while the functionality of his functions is not changing, the code is changing slightly. This process is very tedious. It took him all class with some errors and debugging.

Day #11

1/?/2025

Charlie P.

Description of work: Charlie supposedly finished the peer functionality until he ran the blockchain and the code he wrote wasn't pulling the port number from the computer. This was a big issue, as there was no way for a user to connect to the blockchain at all with this error. He spent all of class debugging this.

Day #12

1/?/2025

Charlie P.

Description of work: Charlie all of class swinging back and forth from researching and debugging, asking ChatGPT, googling, and watching YouTube videos on 2x speed. When he

went to try each of the possible solutions and fixes, nothing was working and time was dwindling, so he cut his losses and decided to pursue peer functionality later, as he needed his project functional for the showcase.

Day #13

1/?/2025

Charlie P.

Description of work: After a successful presentation, Charlie resumed research and debugging of this port discovery issue. He could not find a fix.

Day #14

1/?/2025

Charlie P.

Description of work: Charlie found a solution that has been the most promising so far. He started implementing it and found it would definitely not be done in time for the presentation, as it required him to rewrite almost a third of his 500+ lines of code. He decided to create a functional back up right here and continue working on it for his own goals, but as for the project goals, it did not look like he could finish the “public” aspect of his blockchain that he had hoped to finish.

Day #15

1/?/2025

Charlie P.

Description of work: Charlie continued working on his blockchain project for his own goals. The blockchain he is to present to the class is finished.

At Home:

Day #3

1/10/2025

Charlie P.

Description of work: Charlie went home after school and spent 2 hours researching the next steps in his blockchain. He deduced he did not need to make an app like previously thought in class. He learned about proof-of-work algorithms and started to look at peer-to-peer networks to make his blockchain public. He spent the rest of the time testing code and mapping where all of this new code would go in his blockchain.

Day #13

1/?/2025

Charlie P.

Description of work: Charlie went home after the library showcase and started researching methods on how to implement peer-to-peer functionality for an hour. He found one that is most compatible with his blockchain and the most likely to succeed. He plans to start implementing it next class period.