Blockchain—Lesson plan

Objective:
Students will explore the emerging technology of blockchain. They will use creative thinking and teamwork to develop ways to explain the basics of blockchain in simple terms.

Learn more about the Essential Eight here

Audience:
High school and older

Essential question:
What is blockchain technology and how can it be used to improve our lives?

Materials:
- “Blockchain” visual handouts—1 copy per student
- “Blockchain for Kids” team design challenge handouts—1 copy per small team of 3-4 students
- Whiteboard markers
- Demo speech bubbles—1 copy of each bubble. See Pre-Visit Prep below and Activity 1 for use
- YouTube videos that help students understand the key concepts of blockchain technology. (Note: Provide any video links to the teacher ahead of time and ask the teacher about school video policies. See the “On showing videos in class” callout in Activity 2 for more information):
  - Consider sharing this introductory video on the Essential Eight Technologies (5:03 in length) Password is ‘E8”
  - Understand the Blockchain in Two Minutes—For use in Activity 2 (2:24 in length. A good accessible overview of the concept of blockchain technology)
  - How Does a Blockchain Work—Simply Explained—For potential use in the classroom or to expand your own understanding of blockchain: (5:58 in length)

Pre-visit prep:
- Work with the teacher ahead of time to figure out a room arrangement where the students can gather into groups of 3-4. These groups will carry out the group design work together in Activity 3. Knowing their students, the teacher may also want to pre-compose the groups in order to get the most out of the activity and minimize disruptions
- Gather a few interesting stories about blockchain use from the news that you can share with the students as quick real-world anecdotes (for use in Activity 2 if there is time)
- Print necessary handouts
- Print the demo speech bubbles, one copy per bubble (in separate document called Demo Speech Bubbles.PDF).

Lesson length:
45 minutes
Considerations for facilitating virtually (via Google Hangout, WebEx, or Skype)

Much of this lesson can be delivered virtually via Google Hangout, WebEx, or Skype. The educator you are working with may have a preference on technology, so defer to them. Benefits of this include schedule flexibility for both the classroom and facilitator and elimination of travel time. Keep in mind the following elements when transitioning this lesson to a virtual format:

- Start off with a clear personal introduction - share with the students where you are (generally) geographically and some detail about your job and career journey. This will help develop a personal and engaging connection with the classroom. Consider teaching the class with a colleague as well!
- Make sure the video/sound is working well up-front!
- Share the printable handouts with the teacher in advance, as they will need to print and distribute on your behalf. Discuss with the teacher in advance what you will need and the timing on when to distribute the materials
- Don’t be afraid to engage with the students by asking questions as you talk through the material!

Lesson outline

Introduction: (1 minute)

- Greet the students and introduce yourselves. Explain that you’re from [Company]. [Insert quick sentence or two about the Company]. Explain that you’re here to talk with them about some of the incredible emerging technologies that are changing all of our lives
- Let them know that today we’re going to focus on the innovative world of blockchain

Activity 1: “Bringing Blockchain to Life” (15 minutes, Large group activity)

- Overview: The concept of blockchain technology can be challenging to grasp. The demonstrations below are designed to help the students begin with a simple and accessible demonstration of the blockchain concept compared to how typical transactions happen
  - Carry out a simple demonstration
  - For this demonstration, you’ll need three people – Person A, Person B, and the Bank. Use teachers and students to help. Place Person A on the left, Person B on the right, and the Bank in the middle
    - Person A mimes writing Person B a text and speaks the text out loud. “Hey, ________. Could I borrow $20?”
    - Person B mimes writing back, “Sure, no problem. Could you pay me back by Friday?”
    - Person A, “Definitely. Thanks for your help!”
    - Person B, “I’ll just use my bank’s app to send the money. Bank, please take $20 out of my account and send it to ________.”
    - Bank, “No problem! Person A, Person B wants to send you $10, and we’re going to take $2 of the money for handling the transaction safely for you. Have a good day!”
    - Person A sees the transaction on his/her phone and looks surprised. He/she sends Person B a new text, “Hey, thanks for the money, but you only sent me $10 and your bank charged me a fee!”
    - Person B, “That’s not right! I sent you $20, and there’s nothing I can do about the fee!”
  - Now carry out a quick debrief. Ask the classroom, “What did you see happen there?” Make sure that they understand that the transaction required an institution in the middle, and because there was a middleman, an error occurred, and a fee was charged
- Carry out a **simple demonstration**
  - Tell the students, “Let’s look at another situation. This time, let’s take the Bank out of the picture and see what happens.”
  - Ask one **half of the room** to close their eyes, put their heads down on their desks, and plug their ears. Ask the **other half of the room** to watch the interaction that’s about to happen.
  - Stand at the front of the room with one person and use the provided **demo speech bubbles** to carry out the following silent transaction while half the class watches. If you don’t have the speech bubbles you can simply speak softly
    - **Person A** holds up speech bubble 1 – “Hey, could I borrow $10?”
    - **Person B** holds up speech bubble 2 – “Sure, here! Could you pay me back by this Friday?”
    - **Person A** – “Definitely. I’ll pay you back by Friday. Thanks for your help!”
    - **Person B** mimes handing **Person A** an imaginary $10 bill
  - Now ask the half of the room that had their eyes closed to open their eyes and sit up. Ask them to watch the following transaction, and ask the half of the class who had watched the previous transaction to **remain silent for the moment**. There’s no need for speech bubbles in this part of the demonstration. This can simply be spoken
    - **Person B**—“Hi, _________. It’s Friday and you said that you’d pay me back the $10 I loaned you by today.”
    - **Person A**—“What are you talking about?! You loaned me $5 and you said I could pay it back whenever I was able to!”
  - Again, remind the half of the class who watched the previous transaction to remain silent and not give any hints. Ask the half of the class who had their eyes closed, “So who is telling the truth here and who is not?” Ask them to speculate and offer a few theories, but of course they won’t know for sure who is telling the truth.
  - Now ask the half of the class who watched the entire transaction to weigh in on who is telling the truth. Of course, they will know exactly who is being truthful.
  - Thank the students for playing along and then ask them, “For those of you who knew exactly who was telling the truth, how did you know?” Help them understand that they knew because they were each able to observe the entire transaction and verify what was true and what wasn’t at each step along the way.
- Write the word, **“Blockchain”** on the whiteboard and ask the students if anyone has ever heard the word. If so, ask them what they know about it. There’s a good chance that many of them will not know the term or will have little idea of what it is. Take a few brief thoughts
- Now bring it all together by letting them know that **blockchain is a technology** that helps people trade things with other people all over the world safely because a **network of observers** (gesture to the half of the class who watched the interaction) is watching to verify every step of the transaction, and there’s **no bank or company** in the middle (gesture to whomever played the bank) that may cause errors or charge extra fees.
Activity 2: “Going Deeper into Blockchain” (6 minutes, Large group activity)
Overview: Following these demonstrations, use a YouTube video and the visual handout to deepen the students’ understanding of blockchain technology

• Tell the students that you’d like to show them a video to go a little deeper into the concept of blockchain. Sharing these types of videos with students is key to helping them form a concrete, real-world understanding of what these technologies are and can do. Have the teacher show the YouTube video linked below.

On showing videos in class:

Video policies vary from school to school. Check with the teacher ahead of time to make sure showing videos and using a channel such as YouTube are allowed at their school. Have the teacher preview and approve the videos ahead of time. Then have the teacher queue up the videos and play them on their equipment (rather than you showing them).

Also be mindful of ads and popups. Encourage the teacher to mute and block the video during any ads and turn off any popup ads as soon as they emerge or use a popup blocker.

YouTube overview video:

• Understand the Blockchain in Two Minutes – (2:24 in length. A good accessible overview of the concept of blockchain technology)

• Note: Observe the students as they watch the video and pause it whenever you feel it’s needed to review points, make sure they understand, and connect back to the earlier demonstrations. If students don’t understand points as they progress in the video, they will most likely stop paying attention

• Video talking points:
  − How do you know that your vote is counted, or that who you meet online is who they say they are, or that fair trade coffee is actually fair?
  − To be sure, you would need a system where records are stored, facts can be verified, and security is guaranteed
  − A blockchain is the technology that powers such a system
  − A blockchain stores information across a network of personal computers. No central company owns the system, making the system difficult to corrupt
  − Those computers hold blocks, which are bundles of records. The blockchain uses cryptography to make sure that records can’t be counterfeited or changed
  − Bitcoin is a form of digital cash that you can send to anyone. There is no bank or financial middleman involved. People all over the world move the money by validating other’s bitcoin transactions
  − Bitcoin is just the beginning. In the future, blockchain could enable us to launch companies that are run entirely by algorithms. These innovations may change our lives forever

• Finally, pass out the “Blockchain” visual handout and walk through the definition and example. This visual goes deeper into how the peer-to-peer network and blocks of transactions actually work. Again, observe the group of students carefully for confusion or disengagement. Make sure that they understand the basics of each step in the example before you move on
Blockchain is a tool for safely trading things with no bank or company in the middle. It’s a technology that creates a public, digital record in which every step of a transaction is checked by a network of people all over the world to make sure those steps are accurate and true. Once a step is verified and becomes a block in the chain, it is very difficult to change. Blockchain helps make sure that:

- Your online purchase is accurate
- Your election vote is counted correctly
- The food you’re eating is fresh
- Your online identity stays safe
- Your medical records are up to date

Using Blockchain software, Riad creates a transaction, which means he sends the money to Lucia online and signs it with his digital signature.

The software broadcasts the transaction to lots of people in the Blockchain’s peer-to-peer network.

Those people verify Riad’s signature to make sure he’s the one who is actually sending the money.

Once verified, Riad’s transaction goes into a block full of many other transactions.

Once all of the transactions within that block are verified, it gets added to the chain of verified blocks, and no one can change it.

The secure transaction is now complete!
Activity 3: “Blockchain for Kids”—Team Design Challenge
(12 minutes, Small group activity)

• Overview: Have the students work together to think like educators and develop an accessible explanation of blockchain
  – Let the students know that we don’t really understand something until we can explain it well to others. Their challenge now is to work in teams to come up with a way to explain blockchain to a kid
  – Read the challenge out loud to the teams. Let them know that they will have only 10 minutes to develop their explanation and presentation
  – Let them know that they cannot just repeat back the content on their “Blockchain” visual handout. A child would most likely not understand that description, so they’ll need to get creative and make the concepts simpler
  – Pass out the “Blockchain for Kids” handout (see below) as well as sheets of paper (or space on their whiteboard), pens, and markers for them to create their presentations. Then have them get to work!

Activity 4: “Blockchain Presentations”
(10 minutes, Large group activity)

• Overview: Have the students share their blockchain for kids presentations
  – Have the teams quickly deliver their presentations
  – After each presentation, quickly highlight particularly interesting ways of explaining and making use of blockchain
  – Tell them that all of their ideas are creative and well thought through
Wrap Up and Supplemental Activities
(1 minutes)

• Point out that innovative companies are working with clients to **combine Blockchain technology with other emerging technologies** (the rest of the Essential Eight – Drones, Virtual Reality, Augmented Reality, AI, Blockchain, Robotics, 3D printing) to **solve big problems around the world**. This is called **convergence** when you’re using more than one of these technologies together to solve a problem.

• Let the students know that **blockchain will increasingly become more and more a part of their lives**. Review some of the uses described on the “Blockchain” visual handout.

• Remind them that the world of **blockchain technology** is only getting bigger, and it will **need clever designers like them**.

• Also encourage them to **share at least two things** they learned or figured out today about Blockchain with friends or family.

• **Thank the students** for playing along and working with you to explore the innovative world of blockchain. Tell them that you’re impressed by their ideas, their creative problem solving, and their teamwork.

• If you have extra time, you can:
  - Have the students share other ideas of where they think blockchain could be used for good in the world.
  - Have the teacher show this blockchain YouTube video: [How Does a Blockchain Work—Simply Explained](#) (5:58 in length)
Blockchain for Kids
Team Design Challenge

Your team’s challenge:

Blockchain is a challenging topic to understand, and it can be even more challenging to explain. Your team’s job is to come up with a way to explain blockchain to a child.

1. Think about a child that you know who is 7 or 8 years old, or think about yourself at that age.

2. Go back over what you’ve learned about blockchain technology, and come up with a way to explain it to that child in a way that he or she can understand it.
   - Use simple language. Don’t use any words that a child might not understand.
   - Explain:
     - What blockchain is and how it basically works.
     - What types of problems you think it can help solve.
     - An example of a transaction that you think could possibly use blockchain.
     - How you think blockchain could be used for good in the world.

3. To present your explanation, you can act it out, make it an interview, create a quick visual presentation, or simply write it on paper and read it out loud.

4. You will have only 1 minute to give your presentation, so be brief!
Thank you