LESSON OVERVIEW

Name: Tracy Brown | **Grade:** 10-12 | **Subject:** AP Computer Science | **Location:** Orangeburg, SC

Context & Purpose: The unit that my students were exploring was Digital Information Dilemmas. I wanted to achieve two key objectives from this unit:

- Argue whether the digitization of information has broadly speaking improved or damaged society
- Examine articles to identify the social benefits and harms caused by information digitization

My purpose for using the QFT process was for my students to explore the digitization of the punch card and the US Census. Since the punch card was used for storing and processing information in the first tabulating and sorting machines, I felt this would give students the opportunity to see the benefits caused by information digitization. At the same time, I thought students might speculate about its accuracy when processing the information collected by the US Census. It also gave students the opportunity to learn about how companies such as IBM came into existence. Furthermore, it served as a foundation for the next unit that my students would be doing, where they would develop their own app.

Lesson Procedure:
1. Students will look at an image of the punched card plate and speculate about what it was, what it was used for, and how it relates to computers and digital information.
2. Student will follow a modified QFT procedure. Since they are virtual, they will do the QFT independently and then share their questions using Google Forms.

Next Steps (i.e. how student questions will be used after the QFT):
- Students will read an article about the history of the punched card machine and its use for the US census.
- They will write a reflection on the questions that were answered for them and what was left unanswered.
- After learning more information, students will ask and prioritize three new questions about the impact of the census on the development of modern computer technology.

LESSON OUTCOME

Question Focus:
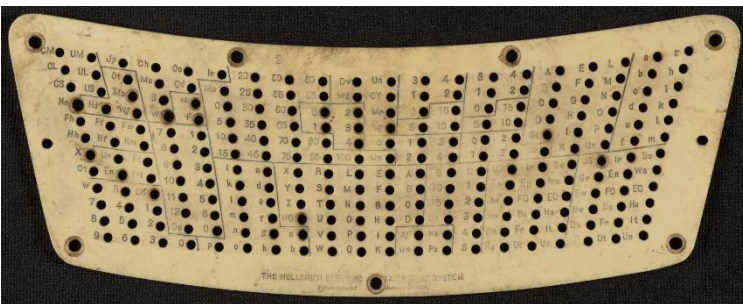
Image 9 of Plate, punch card, and instructions for Herman Hollerith's Electric Sorting and Tabulating Machine, ca. 1895.

https://www.loc.gov/resource/mcc.023/?sp=9

Student Question Examples:
- What is it?
- Why do we need this?
- What is it used for?
- How do you read it?
- Does it work with electricity?
- What type of electronic is this?
- Who created this?
- How does a punch card work?
- What do the letters and numbers mean?
- Is there a pattern to how the letters and numbers are set up?
- Why are there holes?
- Why is it shaped like that?
- What are the holes on the outside for?
- Does this need any other pieces to use it correctly?
- How old is this piece?
- Is the card useful or workable?
- Where do they belong?
- How can they help us today?

Student Reflections:
- "I learned that when asking questions there are different types and that those different types of questions can lead to different answers."
- "I learned that just from an image or a piece of information you can literally start entire research. Matter of fact, another thing I learned was that just with that piece of information, you can follow the rules [for producing questions] and that would make you have a better idea of what you are trying to find out although you don't know what it is."
- "[I learned that] questioning can help to figure things out better and easier."

TEACHER REFLECTIONS

Reflect on your QFocus. This might include the process through which you decided, or it might speak to how students responded.

When pairing primary sources with the QFT process I had to think about how I was going to present the information to the students. So my challenge(s) were 1) Which primary source about the census would be most beneficial to my students? and 2) How much information was I going to give to my students about the primary source I chose? I tried to come up with something focused enough that the questions wouldn't go too "out there", but it would still give them the opportunity to struggle with it and to ask detailed how and why questions. When I came across the punch card, I thought it was great because my students were learning about digital information: the benefits, downsides, how it has come along, and the overall effects. I thought that looking at something like the census would make it all come together very nicely. When I chose the image of the punch card, I also had to think about: Was I only going to show the image only or show the image and give other information? I chose to only show the image of the punch card and not give any additional information. I thought that that was very, very important, so that the students were coming up with the questions entirely themselves and because the practice of questioning what an object is, is used for, and for whom is an important skill needed in computer science, for example when designing their own apps and considering how they will be used. I feel that my students responded well since it was their first time doing the QFT and doing it independently.

Which student questions stood out to you? Why?

I thought that all the questions were great, but I will list just a few:
Does it work with electricity? – I thought it was interesting how this question came about just from the image of a punch card. In my mind, I thought: What made the student even think that electricity might be used with the card?
How do the punch cards work? - I thought this question was a nice "thought process" question. It was good to see a student interested in how things work, realizing that even in something that seems so simple there is a "how" involved**.**
What is the purpose of this object? - This question stood out to me because to me it indicated that this student was thinking about why this object was created or the reason for this object.

Speak to the role of student questions in subsequent lessons, or in the next steps you took after the QFT.

After my students did the initial QFT with the punch card, I had them read an article: "Making Sense of the Census: Hollerith's Punched Card Solution" and then see if they could now answer any of their questions about what the punch card was and was used for and how. Then, they wrote a reflection on the social benefits and harms of digitization and added more questions. It is important that as students develop and design different things they think about benefits and harms about what they are doing. I thought that the QFT process was essential to my students designing apps. Students have to understand the audience they are designing for and the purpose of the app. Therefore, in order to answer these questions often questions need to be asked first.

Overall, what did you learn from this experience?

I learned a lot from the QFT experience. First, I learned that getting students to generate their own questions helps them to take ownership of their learning and personalize their own learning. Second, I learned that having my students go through a process like the QFT set the foundation for them to be able to do activities at a higher level. For example, from simply questioning what an object is or is used for, they were able to use the same questioning process at a higher level when designing an app. Thirdly, I learned that using a process like the QFT can help my students collaborate better with one another. Lastly, I learned how pairing the process with resources from places like the Library of Congress can help my students expand their learning and be able to integrate subjects such as computer science and history together.