Lesson Plan:

AI in Archaeology - Deciphering the Herculaneum Scrolls



Subject: History, Technology, Al Literacy Level: Secondary Education (12-15 years old) Duration: 60 minutes

Curriculum Links:

This lesson aligns with the following Junior Cycle History learning outcomes:

1.5: investigate the job of the historian, including how s/he finds and uses evidence to form historical judgements which may be revised and reinterpreted in the light of new evidence

1.6: debate the usefulness and limitations of different types of primary and secondary sources of historical evidence, such as written, visual, aural, oral and tactile evidence; and appreciate the contribution of archaeology and new technology to historical enquiry

1.11: make connections and comparisons between people, issues and events in different places and historical eras

Key Skills:

This lesson will help develop the following key skills:

- Managing information and thinking: Students will gather, record, organize and evaluate information about the Herculaneum scrolls and AI in archaeology.

- Being creative: Students will explore options and alternatives for using AI in historical research and archaeology.

- Communicating: Students will listen and express their ideas clearly during class discussions about AI in archaeology.

- Being literate: Students will express ideas clearly and accurately in their worksheet responses and homework assignments.

- Working with others: Students will learn about collaborative efforts in the Vesuvius Challenge.

Materials Needed:

- Computer with internet access and projection capability

- Video: "Virtual Unwrapping of Herculaneum Scrolls" (transcript provided in Appendix)

https://www.youtube.com/watch?v=e5XMdsprAMo



- Printed copies of Worksheet 1: Video Comprehension
- Printed copies of Worksheet 2: Reflection and Future Impact
- Whiteboard or digital board for class discussion

Lesson Structure:

- 1. Introduction (5 minutes)
- 2. Video Viewing (10 minutes)
- 3. Individual Work: Comprehension (10 minutes)
- 4. Group Discussion: Video Content (10 minutes)
- 5. Introduction to AI in Archaeology (5 minutes)
- 6. Individual Work: Reflection (10 minutes)
- 7. Class Discussion: AI in Archaeology (8 minutes)
- 8. Conclusion and Future Thinking (2 minutes)

Introduction (5 minutes)

"Good morning/afternoon, class. Today, we're going to explore an exciting development in the world of archaeology. We'll be learning about the Herculaneum scrolls - ancient texts that were buried and carbonised by a volcanic eruption nearly 2,000 years ago.

These scrolls have posed a significant challenge to archaeologists and historians. They're incredibly fragile, and traditional methods of unrolling them would likely destroy them. But now, thanks to cutting-edge technology and artificial intelligence, we're on the brink of uncovering their secrets without ever physically opening them.

We'll be watching a video about this process, called 'virtual unwrapping'. As you watch, I want you to think about how this technology might change the way we study history. What new possibilities does it open up? What challenges might it present?"

After Video Viewing (10 minutes)

"Now that we've watched the video, let's see how much you've understood and remembered. I'm handing out a worksheet with some questions about the video. Please answer these individually. Don't worry if you're not sure about every answer - we'll discuss them as a class afterwards."

Group Discussion: Video Content (10 minutes)

"Let's go through the worksheet together. Who would like to share their answer to the first question? ... Excellent. Does anyone have a different answer or something to add?"

(Continue this process for each question, encouraging discussion and clarifying any misunderstandings.)

Introduction to AI in Archaeology (5 minutes)

"As we've seen in the video, artificial intelligence plays a crucial role in deciphering these ancient scrolls. Al and machine learning are becoming increasingly important tools in archaeology and many other fields of historical research.

In this case, AI helps to analyse the vast amounts of data from the scans of the scrolls, identifying patterns that might be letters or words. It can process this information much faster than a human could, and can sometimes spot details that we might miss.

The Vesuvius Challenge, mentioned in the video, is a great example of how AI and human collaboration can work together. By opening up the challenge to teams around the world, they've been able to make rapid progress on a problem that seemed almost impossible just a few years ago."

Individual Work: Reflection (10 minutes)

"Now, I'd like you to think more deeply about what we've learned. I'm handing out another worksheet with some questions about the implications of using AI in archaeology. There are no right or wrong answers here - I want you to really think about your own views on this topic."

Class Discussion: AI in Archaeology (8 minutes)

"Let's share some of our thoughts on these questions. Who would like to start? ... That's an interesting point. Does anyone have a different perspective?"

(Facilitate discussion, encouraging pupils to consider different viewpoints and the complex implications of this technology.)

Conclusion and Future Thinking (2 minutes)

"We've covered a lot of ground today. We've learned about the Herculaneum scrolls, virtual unwrapping, and the role of AI in modern archaeology. As we've seen, technology is opening up new possibilities for understanding our past.

For homework, I'd like you to research another example of how AI or advanced technology is being used in historical research or archaeology. Write a short paragraph explaining what the technology is, how it's being used, what benefits it provides, and any potential drawbacks or ethical concerns you can think of.

As you leave today, I encourage you to keep thinking about how technology might shape our understanding of history in the future. What other historical mysteries might we solve with the help of AI?"

Homework Assignment:

Ask pupils to research another example of how AI or advanced technology is being used in historical research or archaeology. They should write a short paragraph (5-7 sentences) explaining:

- 1. What the technology is and how it's being used
- 2. What benefits it provides to researchers
- 3. Any potential drawbacks or ethical concerns they can think of

Extension Activities:

1. Virtual Museum Curator: Pupils create a digital presentation about the Herculaneum scrolls, imagining they are curating a virtual exhibit.

2. AI Ethics Debate: Organise a class debate on the ethical implications of using AI to "read" sealed historical documents.

3. Future Archaeologist: Pupils write a short story from the perspective of an archaeologist in 2100, describing how they use AI in their work.

Assessment Criteria:

- Active participation in class discussions
- Completion and quality of responses in both worksheets
- Understanding of key concepts demonstrated in the homework assignment

Additional Resources:

- https://www.youtube.com/watch?v=3xKZaJRjnDs (1min)



- Vesuvius Challenge Website <u>https://www.vesuviuschallenge.com/</u>
- Competition website https://scrollprize.org/grandprize

- Fantastic video (3 mins) on papyrus and how the scrolls were "destroyed". <u>https://twitter.com/natfriedman/status/1703422593670541437</u>

Appendix

https://www.youtube.com/watch?v=e5X MdsprAMo



Video Transcript:

Brent Seales: Virtual unwrapping was born from a vision that I had where we might be able to explore the interior of something without having to actually physically open it. And so how to do that was really a software problem. Once you take an image that goes all the way through the middle of something like an x-ray and look at it and unwrap it and unfold it without ever having to do that to the real object...

Brent Seales (continued): The scrolls from Herculaneum were not excavated in a way where they were pristine. I wish that were true, but in fact, had they been perfectly preserved, they might not have survived. The irony there is that the volcanic eruption that carbonised them, which is to say made them like charcoal, probably also saved them. It's an extremely difficult technical challenge to then figure out how to actually read them. At the Diamond Light Source facility outside of Oxford, we imaged two of their scrolls in a high-energy physics context. Stephen Parsons: The Herculaneum scrolls in particular are basically the most challenging they could be in every way. It's kind of amazing that this is even possible. We released a lot of our code and methods, so we made those open source, and we invited people to build on them and contribute. First of all, to test and sort of reproduce and verify our results, and then to help us move it forward.

Brent Seales: What the Vesuvius Challenge, which is a competitive prize, allowed us to do was to enlist over a thousand research teams to work on a problem that normally we would only have five people working on. And those people working on that problem for three months, I estimate they probably spent 10 person-years and probably two compute years over those three months working just on the problem of Herculaneum ink.

Luke Farritor: Working on this challenge for a very long time since it basically launched, and I got a text from someone else on the Vesuvius Challenge team, and they said, "Hey, we've just uploaded this new flattened piece of papyrus. Seems kind of interesting. It's got these patterns that we've been talking about." So I'm like, "Oh, that's kind of interesting." You know, I pull out my little phone and I type in, you know, "Please run your... please run the algorithm on this new fine piece." And I see these letters, not as clear, but I saw these letters.

Luke Farritor (continued): I absolutely think it's doable. You know, you look at this image, you can see a bunch of other letters peeking out. These ones with the box are ones we've kind of really confirmed. So you just got to take this, iterate, work really hard, lots of experiments. I think it's very, very doable.

Brent Seales: Probably in the 20th century, the biggest revelation of text from the ancient world was the Dead Sea Scroll collection from the 1940s and '50s. I think revealing Herculaneum, with the size of that corpus in the 21st century, would be the biggest discovery from the ancient world.

Worksheet 1: AI in Archaeology - Video Comprehension

Name: ______ Date: _____

After watching the video about virtual unwrapping of ancient scrolls, answer the following questions:

1. What is "virtual unwrapping" according to Brent Seales?

2. How did the volcanic eruption at Herculaneum both damage and preserve the scrolls?

3. Where were the Herculaneum scrolls imaged, and why was this location chosen?

4. What is the Vesuvius Challenge, and how did it contribute to the research?

5. How many research teams were enlisted to work on the Herculaneum ink problem through the Vesuvius Challenge?

6. What did Luke Farritor discover when he ran his algorithm on a new piece of flattened papyrus?

7. According to Brent Seales, how significant would revealing the Herculaneum scrolls be in comparison to other historical discoveries?

8. What role did open-source methods play in this research, according to Stephen Parsons?

9. How long does Brent Seales estimate the Vesuvius Challenge participants worked on the problem in total (in person-years and compute years)?

10. Why are the Herculaneum scrolls particularly challenging to work with, according to Stephen Parsons?

Worksheet 2: AI in Archaeology - Reflection and Future Impact

Name: ______ Date: _____

Based on the video and your own thoughts, reflect on the following questions:

1. How do you think AI and machine learning are changing the field of archaeology?

2. What are some potential benefits of using AI in deciphering ancient texts like the Herculaneum scrolls?

3. Can you think of any potential drawbacks or ethical concerns about using AI in archaeology?

4. How might the use of AI in archaeology change our understanding of history?

5. In what other ways do you think AI could be used to study or preserve historical artifacts?

6. How do you think the role of human archaeologists might change as AI becomes more advanced in this field?

7. The video mentioned crowdsourcing through the Vesuvius Challenge. How do you think combining AI with human collaboration could benefit scientific research?

8. If you were an archaeologist, how would you feel about working alongside AI tools? What opportunities and challenges might you face?

9. How might the techniques developed for the Herculaneum scrolls be applied to other areas of historical research or even other fields?

10. Imagine you're living 1000 years in the future. How do you think future historians might use AI to study our current time period?

Final Reflection: Based on what you've learned, do you think AI will have a mostly positive or negative impact on the field of archaeology? Explain your reasoning.