(VR) Venice: An Engineering Phenomenon & Challenge

Year level: 9-10

(Image: Pixabay, Mentor_Henry)

Summary

In this sequence of lessons, students learn about the great engineering innovations that were used to build Venice in Italy and the current and future challenges that face Venice as a result of the impact of water rising and floods. Students use VR/360 experiences to immerse themselves in Venice and to engage their senses and inquiry skills. Students critique the current engineering solutions proposed for Venice and propose their own solutions.

Required Resources

1. Virtual Reality headset (e.g. Lenovo Daydream Mirage Solo or Oculus Quest) or access to a computer/laptop or tablet device and Internet (for some apps that can be used without VR).
2. Headphones or speakers to listen to audio content.
3. Access to Internet and a computer/device to view the DW Documentary video “Venice's need to rescue its future” (27:44) https://youtu.be/fxpGWcACW6k
4. Access to the following apps (on device or desktop if available)
    a. Google Expeditions (https://edu.google.com/products/vr-ar/expeditions)
    b. Google Arts & Culture VR (available on VR and desktop) (https://play.google.com/store/apps/details?id=com.google.vr.museums&hl=en_AU)
    c. Flood Maps (http://flood.firetree.net)

Suggested steps

The following are some suggested lesson sequences.

1. **An introduction to Venice**

The teacher asks the class if they have ever visited or seen Venice before and invites students to share what they know (and don’t know) about the city.

Students individually or as a whole class watch the first half (up to 15:52) of the video “Venice's need to rescue its future” (by DW Documentary https://youtu.be/fxpGWcACW6k) as an introduction to the engineering innovations that were used to build the city of Venice on water and the challenges the engineers had to overcome. This provides background information and some context to support students in their observations during their VR/360 experience for features such as the way buildings are constructed, the watermarks on the walls of canals, and more that were mentioned in the video. *The second half of the video (about water levels rising) will be viewed later.*

The class uses Virtual Reality to visit Venice in 3D with Google Expeditions, taking turns. While students are waiting for their turn they could be researching information about Venice to learn more about the fascinating city.

To access the app, turn on the VR headset and navigate to the Google Expeditions App. Use the “search” bar to find an expedition on “Venice” and select the scene you would like to start with (see images below). If you do not have access to a VR headset, this lesson can be done through a tablet or smartphone device with the Expeditions App, providing a virtual 360 experience, but not fully immersive. *https://edu.google.com/products/vr-ar/expeditions*

Teachers can run this as a whole class experience, where students take turns with the VR headset as the whole class watches on a screencast of the VR to a television screen. Otherwise, teachers could have students break up into small groups and within the groups, take turns using a VR headset.

Students navigate and explore Venice in VR. The teacher invites them to reflect on what they see, the key locations and what information is presented on the tour.

After experiencing Venice in VR, students individually or as a whole class watch the remainder of the video about Venice's current challenges with water levels rising and floods on the DW Documentary video "Venice's need to rescue its future" (16:28 onwards) https://youtu.be/fxpGWcACW6k. After watching the video, the class discusses the current proposed solutions for Venice's challenge and the impact that floods and rising water levels have on Venice, its people, economy and culture. These key discussion points are recorded by students/the teacher.

2. Investigating the rising water and flood crisis in Venice

Students can be divided up into those using the VR and those using computers or devices. One group uses the VR headsets to view the VR experience "Canaletto's Secret" from Google Arts and Culture VR and the other group uses computers/devices to examine the impact of rising water on Venice in comparison to other parts of the world using Flood Maps (http://flood.firetree.net).

Group 1: "Canaletto's Secret"
To access "Canaletto's Secret", students turn on the VR headset and navigate to the Google Arts & Culture application. Open the application and navigate to "Canaletto's Secret". This application provides an experience for students to view artworks in VR with audio information about each piece. Canaletto's artwork is displayed along an art gallery wall. The audio talks about the artwork, with the first painting being about how Scientists are now using the artworks to support their investigations into rising water levels and as a comparison of what Venice once looked like. Students can zoom in and examine the artwork up close. *If you do not have access to a VR headset, students can view the experience on a desktop with a browser at: https://g.co/arts/N8XJ4UDuWsJwHFnX8*

Group 2: Flood Maps
Further investigating the impact and extent of sea levels rising and impacts of flooding, students can experiment with visualisation tools, such as Flood Maps (http://flood.firetree.net), that allow them to interact and see the impacts of sea levels rising at particular levels (e.g. +2m or +7m) in areas across the world. They can look at the impact on Venice and compare it to their own local area and other parts of the world. The teacher can ask them to investigate what will happen when sea levels rise 1 metre, 2 metres or more. Students can review areas of

Venice that would go under water and determine what places of interest (e.g. museums, transport systems, areas) would be greatly affected. “When Sea Levels Attack” by Information is Beautiful (see appendix) could be provided to students to aid in their investigations and comparison of rising water levels in key locations around the world.

3. **Proposing solutions for Venice’s future**

Students can work on a project that involves developing an informative digital project with their own engineering solutions to Venice’s floods and rising water crisis. Students can engage in a Design Thinking process to research and brainstorm solutions for Venice (e.g. https://dschool.stanford.edu/resources/getting-started-with-design-thinking). Students begin by researching and documenting the challenges that Venice face and the causes. Once they have a deep understanding of the problem space, they brainstorm multiple solutions (you could give them a number, say, 20 or 50). These could be simple solutions or big ideas, with no idea being considered bad. From here students select one or two best ideas to develop further. Students build a digital project to inform others of the challenges Venice faces and their proposed solutions (see Assessment section)

Discussion

- What is unique about Venice? What were some of the key engineering innovations that were used? What materials did engineers use and why?
- What challenges currently face Venice? What impact would rising water levels and frequent flooding have on Venice, its people and culture?
- What are the proposed engineering solutions to reduce water levels rising and flooding? What other solutions could be proposed?
- (Digital Technologies related) What types of digital information are being presented to you to learn more deeply about Venice?
- (Digital Technologies related) What is it about the VR experience that adds value to your understanding about Venice?

Why is this relevant?

Virtual Reality can enhance learning by placing students in an immersive experience they would otherwise never experience. In this activity, students are engaged in *using* digital technology but are also thinking about how the technology supports them in better understanding the location through the integration of media.

Assessment

The following is a suggested assessment project that engages students in applying knowledge and skills in Technologies.

Digital Project

Students prepare a digital project about Venice in a form that they would like, justifying the selection of digital technologies (as well as other media) and how it is appropriate for communicating information to achieve their goal. Technological examples could include something like the use of Google Tour (using Google Tour

Creator at https://vr.google.com/tourcreator), a video presentation with presentation software, or a digital animation.

Students can continue to revisit the Venice VR experiences to support their project development in combination with their own research.

The goal of the project is for students to create a digital presentation that:

- presents an overview of Venice and identifies the unique engineering aspects (and types of materials used) that went into building the city of Venice.
- explains the current crisis Venice faces in relation to flooding and water levels rising in the city, the causes and the impact (or potential future impact) on Venice.
- the explanation and visual representation of a solution/solutions for the crisis of water rising or flooding in Venice.

The proposed solution must include the following:

- a description of how their solution addresses the crisis while also meeting the needs of Venice and its people.
- a visual representation (animation, drawing, process map) of the proposed solution.
- an explanation of how their proposed solution works and a critical self-evaluation of possible outcomes and impacts.
- justifications for materials, systems, components, tools, technologies and equipment that are used to build the solution and how they work together.

Objective	**Yes / No / Partially**	**Comments**
Digital Technologies Justifies and explains their selection of digital technologies for their interactive solution and how it meets their goals. Takes into account safety, social contexts and legal responsibilities in terms of using and sharing information in their project.		
Design and Technologies Critically analyses proposed solutions for Venice, including social, ethical and sustainability considerations and impacts on preferred futures. Identifies the needs of Venice and its people and selects materials, systems, components, tools and equipment to develop design ideas that meet those needs.		

Describes, using scientific evidence, how the characteristics and properties of materials, technologies, systems, components, tools and equipment in proposed solutions can be combined. Develop, modify and communicate design ideas by applying design thinking, creativity and innovation. Develop project plans using digital technologies to plan and manage projects individually, taking into consideration time, cost, risk and production processes.		

For further advice, examples and support around assessment please visit the Digital Technologies Hub at digitaltechnologieshub.edu.au/teachers/assessment.

Curriculum links

Links with the Digital Technologies curriculum area

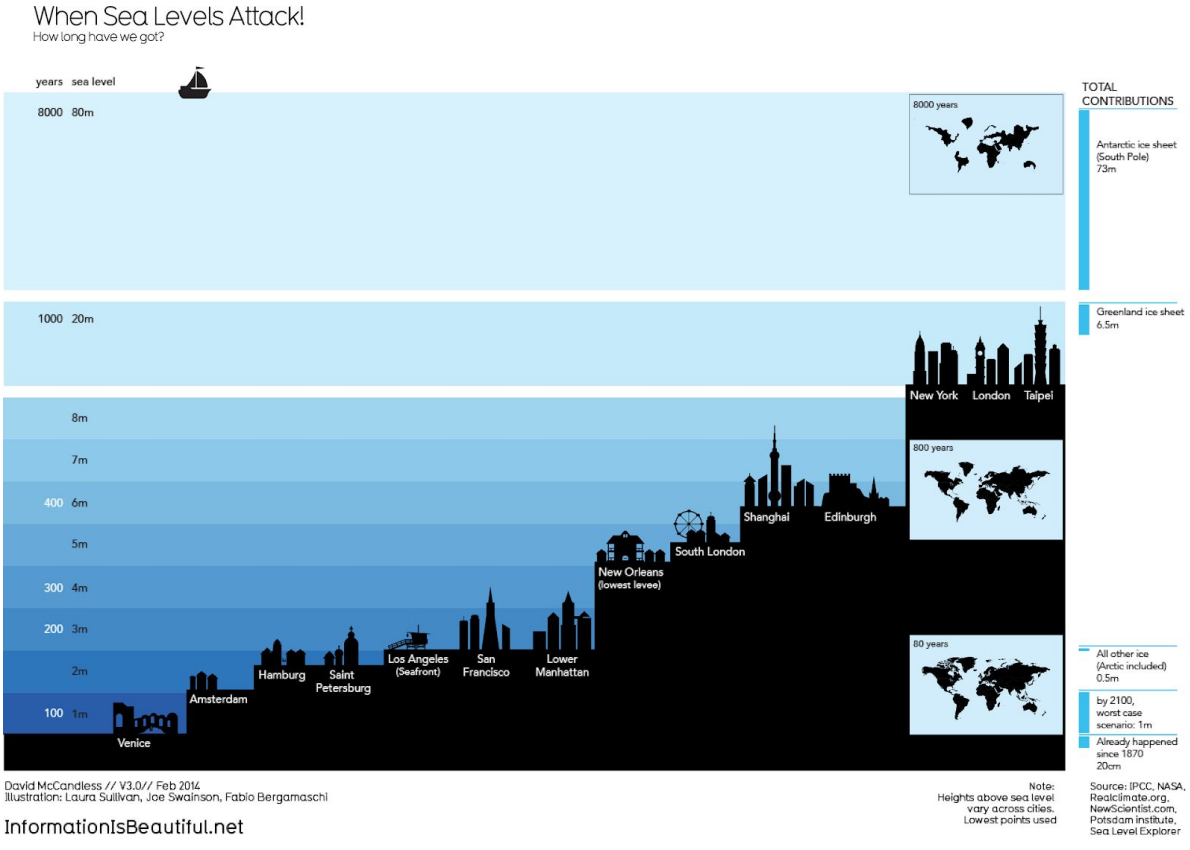
Year band	Strand	Content description
Years 9-10	**Knowledge and Understanding**	Create interactive solutions for sharing ideas and information online, taking into account safety, social contexts and legal responsibilities (ACTDIP043) Plan and manage projects using an iterative and collaborative approach, identifying risks and considering safety and sustainability (ACTDIP044)

ADD Links with other curriculum areas

Year band	Learning area	Content description
Years 9-10	**Design and Technologies**	Critically analyse factors, including social, ethical and sustainability considerations, that impact on designed solutions for global preferred futures and the complex design and production processes involved (ACTDEK040) Investigate and make judgements on how the characteristics and properties of materials, systems, components, tools and equipment can be combined to create designed solutions (ACTDEK046) Investigate and make judgements, within a range of technologies specialisations, on how technologies can be combined to create designed solutions (ACTDEK047) Critique needs or opportunities to develop design briefs and investigate and select an increasingly sophisticated range of materials,

		systems, components, tools and equipment to develop design ideas (ACTDEP048) Develop, modify and communicate design ideas by applying design thinking, creativity, innovation and enterprise skills of increasing sophistication (ACTDEP049) Develop project plans using digital technologies to plan and manage projects individually and collaboratively taking into consideration time, cost, risk and production processes (ACTDEP052)

Appendix



"When Sea Levels Attack" by Information is Beautiful
https://informationisbeautiful.net/visualizations/when-sea-levels-attack-2