Augmented Reality (AR) in the Classroom

A Unit for Incorporating AR in Social Studies

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1. AUGMENTED REALITY IN THE CLASSROOM

Primary Resources:

- HP Reveal formally known as Aurasma
- HP Reveal App for Android or iOS

1.1. INTRODUCTION

By using augmented reality (AR), students can bring information to life for the viewer. AR allows the user to interact with a virtual creation in the real world in order to have a richer experience. AR can be used to convey information or as a training tool for performing a complicated maneuver such as a surgery. Additionally, there are several applications for this technology in the classroom, such as creating exhibits, virtual tours, models, and enhancing stories, experiments, bulletin boards, and/or presentations.

HP Reveal software will be used to create the augmented reality experience. HP Reveal is a simple platform that allows the user to bring one dimensional objects to life by creating auras. The software is simple to use and requires very little technology to create the aura.

In this project based learning (PBL) unit, which does not have to be taught in consecutive days, students will create an augmented reality tour of a museum or monument in Washington, D.C. which will then be combined with other AR tours to recreate their Washington, D.C. trip. This project will serve as the capstone project for their eighth grade school year. Students will be able to conduct research prior to their trip to Washington, D.C. in order to select their location and build their background knowledge. While on their trip they will be able to gather various artifacts for their AR tour such as images, videos, interviews, etc. When the 8th graders return to school, they will then put together an AR tour of their trip to Washington, D.C. using HP Reveal. Finally, students will share their AR Washington, D.C. tour with an authentic audience.

1.2. MATERIALS

- Smartphone/Tablet with Android or iOS operating systems, iPads preferred
- HP Reveal App
- Skin & Bones App
- Computer
- Printer
- Poster board, chart paper, tri-fold board, etc.
- Art Supplies

1.3. OVERVIEW OF PLAN

Unit Goal: Students will create an augmented reality tour of their Washington, D.C. trip.

Objectives for the AR technology:

- Know – Students will know the vocabulary needed to create an augmented reality experience using HP Reveal.
- Understand – Students will understand how to use HP Reveal.
- Do – Students will create an AR Tour of a monument or museum in DC.

Driving Question: How can we create an augmented reality tour of our Washington, D.C. trip for our school community?

Key Vocabulary: augmented reality, trigger image, target image, overlay, aura

Student Deliverables: Items that students will submit as evidence of their learning and mastery of the goal.

Note: To access hyperlinked material, hold down the Ctrl key and click to follow the link.

1.3.1. PACING

- Day 1: Entry Event and Project Overview
- Day 2: Students Explore HP Reveal
- Days 3-4: Overview of Washington, D.C. Trip, Pre-Research
- Day 5: Introduce Logs, Group Students, Begin Research
- Days 6-11: Research Topics
- Days 12-16: Attend Washington, D.C. Trip
- Days 17-18: Share Research Gathered in D.C., Sort, Organize, Brainstorm AR Tour
- Days 19-23: Create AR Tour of Topic
- Days 24: Peer Feedback
- Day 25: Revise Projects
- Day 26: Project Share
- Day 27: Reflection Day

1.3.2. STUDENT DELIVERABLES/HANDOUTS

- Student Deliverables
  - Student Learning Log
  - Pre-Research Notes
  - Augmented Reality Tour (use the unit rubric to assess)
  - List of Resources (use the unit rubric to assess)

- o [Self-Reflection](#)
  - o [Group Work Reflection](#) (Teacher will select one reflection form for students to complete)
- Handouts/Planning documents
  - o [Project Overview Handout](#)
  - o [Augmented Reality Tour of Washington DC Rubric](#)
  - o [Project Process Log for AR tour](#)
  - o [Storyboard for video](#)
  - o [Presentation Planning form](#)
  - o [Peer Feedback Form](#)
  - o [Sample Aura](#)

1.4. AUGMENTED REALITY PROJECT LESSONS

1.4.1. DAY 1 ENTRY EVENT AND PROJECT OVERVIEW

Goal: Students will learn about the augmented reality project.

Access Prior Knowledge: *Prior to the lesson, the teacher will need to download the Smithsonian Institution's [Skin & Bones app](#) to a class set of iPads, reserve the set for the students to use, and print the [trigger images](#). The teacher will hang up the trigger images for the Skin & Bones app around the classroom.

The teacher will play a short video that demonstrates Hollywood's interpretation of augmented reality from the popular movie, *[Iron Man](#)*. After playing the video, the teacher will lead a discussion with students focused on whether the scene is fiction or non-fiction. The teacher will want to lead the discussion in the direction of how this technology could be used in real life.

The teacher will demo how the Smithsonian Institution is using augmented reality to bring some of their displays to life in the Natural History Museum by scanning one of the trigger images around the room. The teacher will show students the Smithsonian's [promotional video](#) to demonstrate how the app is used to engage the museum goer. Finally, the teacher will invite students to explore the Skin and Bones app using the iPads.

New Information: The teacher will go over the [Project Overview Handout,](#) the [Augmented Reality Tour of Washington DC Rubric](#), and answer questions about the project.

The teacher will be sure to emphasize the requirements of the AR tour:

The tour will highlight the monument's/museum's:

- History/Significance
- Visitor Information: location, tip for visiting
- A must see while visiting

The tour will contain 3 trigger/target images and overlays that contain:
- An original video created by students with narration
- An original image

Generalization: Students will write down a question they have about the project at the end of class.

1.4.2. DAY 2 STUDENTS EXPLORE HP REVEAL

Goal: Students will learn to use HP Reveal and create an aura for an image in their textbook.

Access Prior Knowledge: Display the Sample Aura on the board. Teacher will model an augmented reality tour presentation of the Smithsonian Institution National Museum of Natural History.

New Information: The teacher will introduce the students to HP Reveal and have students create accounts.

The teacher will go over the following resources for learning to use HP Reveal:

- [HP Reveal](#) website (see Figure 1) - the teacher will need to create an account (see Figure 2) to access their account and the help resources.
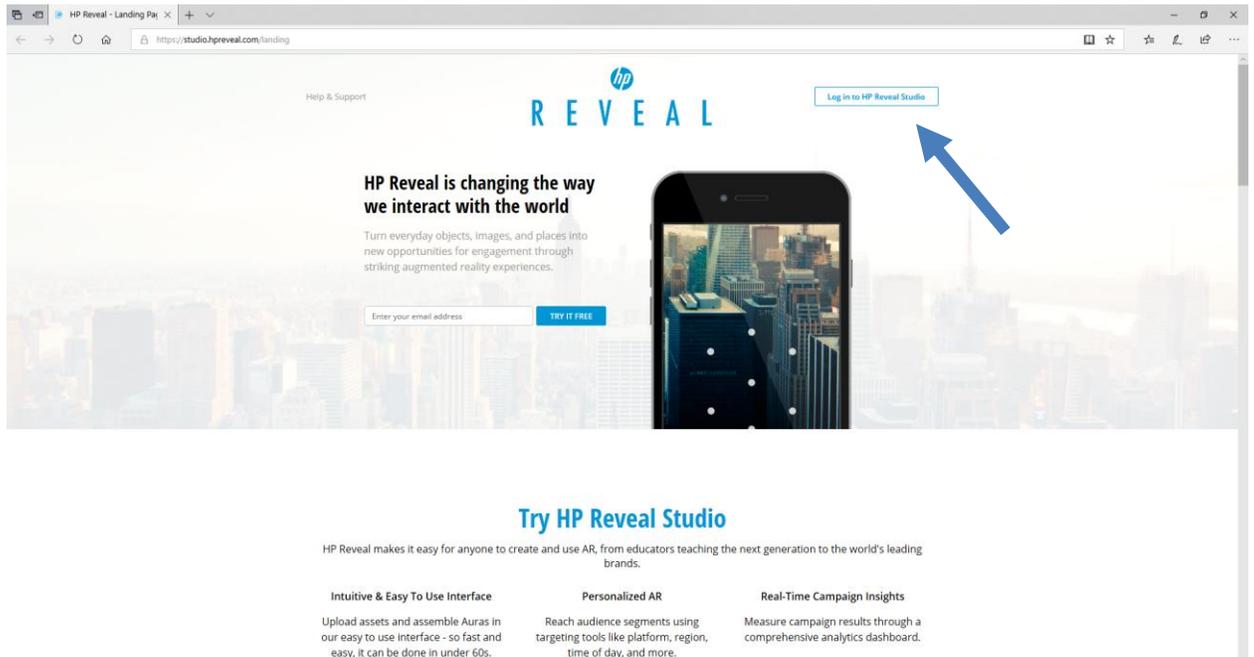

Figure 1. Landing Page for Creating an Account. © 2018 HP Reveal. Screenshot by author.
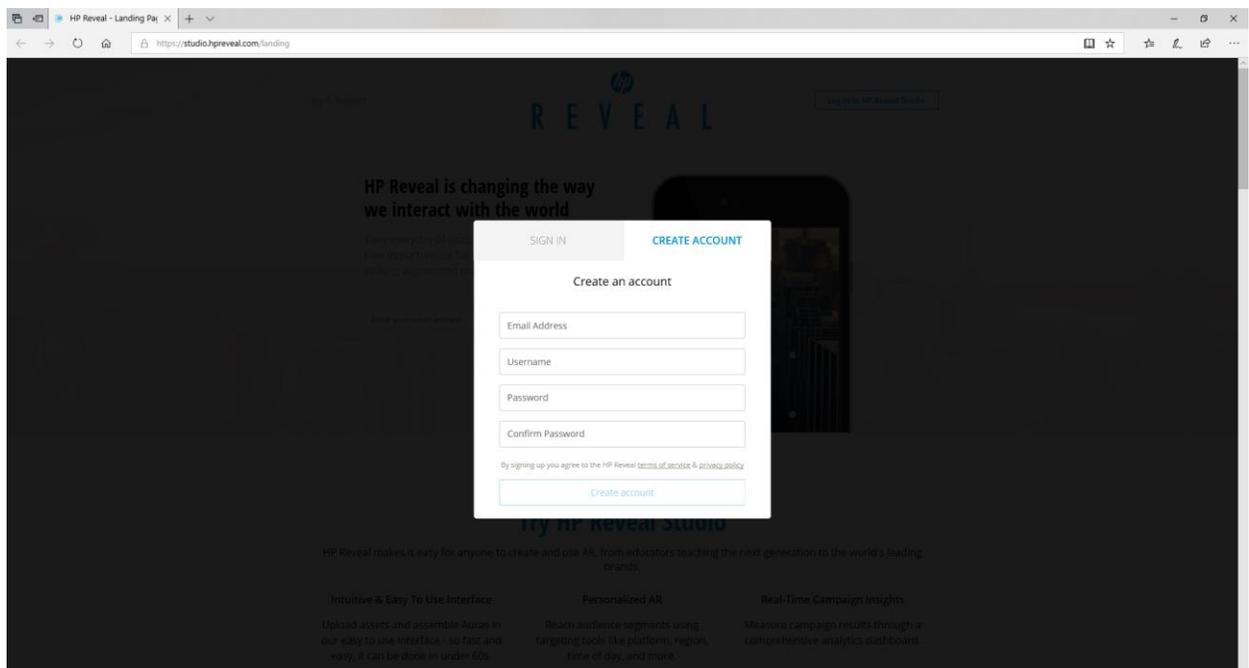

Figure 2. Create Account Menu. © 2018 HP Reveal. Screenshot by author.

- HP Reveal Help Resources: https://aurasma.zendesk.com/hc/en-us
- *Learn to Use HP Reveal* video: https://www.youtube.com/watch?v=Ix_6XHE116Y

Application: Students will utilize resources to learn how to use HP Reveal in order to create an aura for an image in their textbook. Students will share their auras at the end of class.

Generalization: On a piece of paper, students will define *trigger image*, *aura*, and *augmented reality* and turn in at the end of class.

1.4.3. DAYS 3-4 OVERVIEW OF WASHINGTON, D.C. TRIP, PRE-RESEARCH

Goal: Students will learn the requirements of the project and begin selecting their sites.

Access Prior Knowledge: The teacher will show a travel overview video of Washington, D.C. Suggested video: *Washington DC Vacation Travel Guide*

New Information: The teacher will go over the Washington, D.C. trip itinerary with students, providing brief explanations of the sites they will visit and answer student questions.

The teacher will review the Pre-Research Notes and answer questions.

Application: Students will conduct their pre-research and complete their notes in order to help them select a site for their project.

Generalization: Students will write down their top two choices of museums or monuments for their project.

1.4.4. DAY 5 INTRODUCE LOGS, GROUP STUDENTS, BEGIN RESEARCH

Goal: Students will learn about the organizational documents for completing the project.

Access Prior Knowledge: The teacher will display a messy pile of paper and ask a student to locate a specific piece of information found on a page in the pile.

New Information: The teacher will lead a discussion on the importance of organization and review the following logs:

- Student Learning Log
- Project Process Log for AR tour

Application: Students will make their first entry in their learning log and begin conducting research on their site. As they locate information, students will keep track of their resources in their project process log.

Generalization: The teacher will give students time to complete their daily Student Learning Log – What I Actually Accomplished Today section.

1.4.5. DAYS 6-11 RESEARCH TOPICS

Goal: Students will conduct research on their selected site.

New Information: On Day 6, the teacher will go over the Project Process Log for AR tour which will help students organize their research and plan their roles for collecting information while on their trip. The teacher will discuss the importance of gathering information from a variety of reliable resources. The teacher will refer to the rubric to show students the requirements for the project.

Application: Daily, the teacher will give students time to complete their Student Learning Log – Date and Goal sections.

Students will research and complete their project process logs in order to gather information for their selected site. The last day of research, students will meet and decide on their research roles as well as what images, videos, audio will be captured on their trip. Students will create their list of resources.

The teacher will circulate the room and assist students as needed while they conduct their research.

Generalization: Daily, the teacher will give students time to complete their Student Learning Log – What I Actually Accomplished Today section.

1.4.6. DAYS 12-16 ATTEND WASHINGTON, D.C. TRIP

Students will travel to Washington, D.C. – usually a 4-5 day trip – conducting research by collecting images, videos, audio, and information while visiting their selected sites.

1.4.7. DAYS 17-18 SHARE RESEARCH FROM WASHINGTON, D.C. TRIP, BRAINSTORM

Goal: Students will brainstorm their AR tours.

Access Prior Knowledge: The teacher will hold up an object such as a pen, tape dispenser, stapler, etc. and ask the students to brainstorm ideas to improve the object or for new uses of the object.

New Information: The teacher will lead a discussion on the importance and benefits of brainstorming ideas.

Application: The teacher will give students time to complete their daily Student Learning Log – Date and Goal sections.

On days 17-18, the students will work in their teams to brainstorm their AR tour and refer to the rubric to make sure their project will meet the requirements of the project.

Generalization: Daily, the teacher will give students time to complete their daily Student Learning Log – What I Actually Accomplished Today section.

1.4.8. DAYS 19-23 CREATE AUGMENTED REALITY TOUR

Goal: Students will collaborate as a team to create the AR tour.

Application: The teacher will give students time to complete their daily Student Learning Log – Date and Goal sections.

- Students will work as teams to compile research and create the AR tour of their site. The teacher will encourage students to refer to the Project Overview Handout and Augmented Reality Tour of Washington DC Rubric to assist them in creating their tour.
- The students can use a storyboard to help them plan their video overlay.

Students will update their list of resources as they conduct their research.

Generalization: Daily, the teacher will give students time to complete their daily Student Learning Log – What I Actually Accomplished Today section.

1.4.9. DAY 24 PEER FEEDBACK

Goal: Students will provide peer feedback.

Access Prior Knowledge: The teacher will sketch an animal on the board, such as a dog, cat, or chicken. The teacher will ask the students what is drawn on the board, how they know, and what could be done to improve the quality of the sketch.

New Information: The teacher will share with students the importance of giving and receiving feedback in order to improve performance. Feedback is kind, helpful, and specific to the goal of the assignment.

The teacher will give students time to complete their daily Student Learning Log – Date and Goal sections.

Application: Student groups will get together and share their AR tours, providing each other with feedback using the Peer Feedback Form.

Generalization: The teacher will ask the students to complete the following sentence on a post-it note: Feedback is important because _____.

The teacher will give students time to complete their daily Student Learning Log – What I Actually Accomplished Today section.

1.4.10   DAY 25 REVISE PROJECTS

Goal: Students will evaluate the feedback they were given and revise project.

Application: The teacher will give students time to complete their daily Student Learning Log – Date and Goal sections.

Students will meet in their groups to review their feedback, discussing their feedback and deciding what revisions to make in order to improve their AR tour. Students will revise their project.

Generalization: The teacher will conference with each group to find out what revisions will be made to the project.

The teacher will give students time to complete their daily Student Learning Log – What I Actually Accomplished Today section.

1.4.11 DAY 26 PROJECT SHARE

*The teacher will need to coordinate this event by securing the date, time, location, as well as inviting guests. Allow time for students to set up their projects prior to the arrival of the audience.

Goal: Students will present their projects to the school community.

Application: Students will engage their audience by presenting their AR Tours and answering questions.

Generalization: Exit Ticket – Students will write down one thing that they will take away from sharing their projects.

1.4.12 DAY 27 REFLECTION

Goal: Students will complete a reflection of their performance individually and as a group.

Access Prior Knowledge: Display an image of a mirror or bring in a real mirror. Teacher will ask students about the function and purpose of a mirror.

New Information: Teacher will then discuss how reflection is used to improve performance.

Application: Students will complete the Self-Reflection and Group Work Reflection.

Generalization: Prior to the end of class, the teacher will survey the class by asking students to select and share one word that represents their performance.

1.5 EXTENSION

In order to provide extension opportunities for students who are really interested in AR and/or computer science, the teacher will challenge the students to create their own computer modeled 3D overlays. The teacher will provide students with a few resources to assist them in getting started. The teacher's role is to assist in problem solving, providing feedback, and encouragement and is not expected to know how to model 3D overlays.

Links for creating 3D overlay tutorials:

Articles

- *Adding and Creating 3D Overlays*
- *3D Overlay Specifications*
- *3D Model Troubleshooting*

Video

- Aurasma 3D Object Maya Workflow
- Creating an Animated 3D Aura for Aurasma in Maya

Blender

- Free software download
- Tutorials

1.6 RUBRIC

Category	Proficient (3)	Approaching Proficient (2)	Beginning (1)	Points Earned	Comments
Research	4 or more quality sources of information; one of which must be a professional.	4 or more sources of information.	Less than 4 sources and/or sources are not reliable.	__ x 2= ___	

List of Resources	Uses MLA format for a variety of sources; few errors.	Uses MLA format for a variety of sources; 5+ errors.	Provides a list of sources, but does not use MLA format.		
AR Tour	The tour highlights the monument's/museum's: ▪ History/Significance ▪ Visitor Information: location, tip for visiting ▪ A must see while visiting	Tour highlights 2 of the 3 requirements.	Tour highlights only 1 requirement.	__ x 3= ___	
Content in the Tour	The tour contains 3 trigger/target images and overlays that contain: ▪ An original video created by students with narration ▪ An original image ▪ Link to a website	The tour contains 2 of the 3 requirements.	The tour contains only 1 requirement.	__ x 3= ___	
Presentation: Eyes, Body, Voice	▪ Maintains natural eye contact with the audience. ▪ Body positioned facing audience, appears confident, and uses hand gestures while communicating. ▪ Speaks clearly and loudly so	▪ Eye contact is sporadic, and/or unnatural. ▪ Body position shows some confidence with just a little fidgeting, and uses a few hand gestures.	▪ Does not look at the audience. ▪ Body position is closed, lacks confidence with fidgeting and/or slouching. ▪ Mumbles and/or pace		

	that all can hear. Rarely uses filler words.	▪ Speaks clearly and loudly most of the time. Occasionally uses filler words.	is too fast for the audience to hear. Frequently uses filler words.		
Presentation: Response to Audience Questions	Easily answers audience questions with clear and complete responses.	Answers audience questions but may not be clear and/or complete.	Unable to answer questions or does not address audience questions.		
Participation in Team Presentation	All members participate equally in the presentation and take turns answering questions.	All team members participate, but not equally.	Not all team members participate; only one or two speak		
Total				___/36	

1.7   RESOURCES

1. HP Reveal: https://studio.hpreveal.com/home
2. HP Reveal Help Resources: https://aurasma.zendesk.com/hc/en-us
3. *Learn to Use HP Reveal* video: https://www.youtube.com/watch?v=Ix_6XHE116Y
4. *Buck Institute for Education* Resources: http://www.bie.org/resources
5. *Iron Man Augmented Reality* video: https://www.youtube.com/watch?v=Y1TEK2Wf_e8
6. Skin and Bones App: https://itunes.apple.com/us/app/skin-bones/id929733243?ls=1&mt=8
7. Skin and Bones Promotional Video: https://cdnapisec.kaltura.com/index.php/extwidget/preview/partner_id/347381/uiconf_id/38110721/entry_id/1_kbcgfs5g/embed/dynamic
8. Skin & Bones Trigger Images: https://naturalhistory.si.edu/exhibits/bone-hall/Triggering_images.pdf

9. Student Learning Log: https://docs.google.com/document/d/1kVeM9-I0z--0IH5Cbqhs2re6z2fpncJnk0DvZim_Gio/edit?usp=sharing

10. Pre-Research Notes: https://docs.google.com/document/d/14x9MzVh4Nu_ut2XNN1b1wgxM9LBUn26tXWRpyh1caOQ/edit?usp=sharing

11. Self-Reflection: file://freenas/stem/0%20-%202018/Ferriell,%20Laini/Self_Reflection.pdf

12. Group Work Reflection Forms: http://www.lapresenter.com/coopevalpacket.pdf

13. Project Overview Handout: https://docs.google.com/document/d/100afRYzkHAyopAYSqPgrh200CMbivDwrdpRU1VSH2H4/edit?usp=sharing

14. Augmented Reality Tour of Washington, D.C. Rubric: https://docs.google.com/document/d/1do15opqfpqTSAz3fsoqWZRacfqIpR3IlKkAu0AASi7M/edit?usp=sharing

15. Project Process Log for AR Tour: https://docs.google.com/document/d/1oCfVntkNev4L7gK2hg-FqfKKqObN1DZKlQrQ8D-f9sA/edit?usp=sharing

16. Storyboard for video: file://freenas/stem/0%20-%202018/Ferriell,%20Laini/storyboard.PDF

17. Presentation Planning Form: file://freenas/stem/0%20-%202018/Ferriell,%20Laini/Presentation_Plan.pdf

18. Peer Feedback Form: https://docs.google.com/document/d/1ferYajqx8C0ypO78Ik6L_yVOx3BamhgvzlB90WAGGNY/edit?usp=sharing

19. Sample Aura: https://docs.google.com/document/d/1TlKR3WoyYNTVbvCyFQbB1i-e1QP74UD8tTfFuSjxcQI/edit?usp=sharing

20. *Washington, D.C. Vacation Travel Guide* video: https://www.youtube.com/watch?v=7dilTLvbHxc

21. *Adding and Creating 3D Overlays* video: *https://aurasma.zendesk.com/hc/en-us/articles/205571239-Adding-and-creating-3D-Overlays*

22. *3D Overlay Specifications* video: *https://aurasma.zendesk.com/hc/en-us/articles/206382776-3D-Overlay-Specifications-formerly-3D-Guidelines-*

23. *3D Model Troubleshooting* video: *https://aurasma.zendesk.com/hc/en-us/articles/205627909-3D-Model-Troubleshooting*

24. *Aurasma 3D Object Maya Workflow* video: https://www.youtube.com/watch?v=ccEEh_7I30E

25. *Creating an Animated 3D Aura for Aurasma in Maya video*: https://www.youtube.com/watch?v=aqMLMR8WpFE&t=144s

26. Free Blender software download: https://www.blender.org/download/
27. Blender Tutorials: https://www.blender.org/support/tutorials/