Edutainment Attractions: Educational Technology Final Project, Fall 2020

Joshua Andrew Galang, jgalang3@gatech.edu
Davina Wooley, davinawooley@gatech.edu

1. Introduction: Summarize Goals and Learning Objectives.

Our goal was to create a ride that will introduce and expose theme park visitors to the harmful effects that pollution has on our marine and space environment and the difficulties associated with cleaning it up. Participants choose the environmental missions that they would like to participate in, and they will be equipped with tools to help decrease the pollutants in an environment. Participants use their blasters to zap away pollution from environments around the Earth. This attraction's objective is to expose riders to the harms presented by pollution and to develop environmental awareness that is beneficial and comprehensive by individuals of all ages and extent of background knowledge. This ride presents an interactive and immersive experience and comprehensive narrative that educates and entertains. This ride was inspired and based off of Dr. Seuss' The Lorax book and 2012 film. This attraction was created using the game Planet Coaster, a theme park simulator, and incorporates original videos, designs, and audio cues as well as gamification elements in Planet Coaster.

Figure 2: Graphic representation of the Sea Pollutants and their point values presented to users.

Learning Goals

1. Participants will understand and articulate the complex tasks relating to improving environmental conditions, the harms of unsustainable practices, and they will grasp the message that pollution prevention is the best way to protect environments.

2. Participants will be able to reflect and analyze the correlation between what is happening in the environments in the world of Dr. Seuss and the real world and potential next-steps to improve environmental conditions.

3. Participants will be able to build upon and apply their knowledge and mental models to think critically about environmental needs to develop effective solutions.

Learning Objectives

1. Participants will be aware and understand the relationship that environmental factors and mission requirements play in making informed interaction decisions that yield successful end results to zap the most trash to earn a high score.

2. During the attraction, participants can ‘zap’ trash among a variety of themed settings to determine the environmental impact of certain pollutants and how, despite their best efforts, the best pollution solution is prevention.

3. Participants will benefit by gaining a greater appreciation for environmental cleanliness and awareness of pollution in the world around them when exhibited by familiar Dr. Seuss characters.

4. Schools can use the park as a location to teach children about modern technologies and the problems of the world - and how humanity is addressing them using familiar characters and fun stories.

5. Participants will be safe as the type of ride specified in our literature review is a family trackless dark ride - which requires only flat surfaces for easy evacuation, and lower speeds when compared to more thrilling attractions such as roller coasters.

6. Participants will be able to weigh opportunity costs associated with determining which pollutants to target in response to the limited resources that they have which is time.

How and Why Learning Objectives Evolved While Designing and Testing

Our Learning Objectives did not change significantly during the design and testing process. We spent a significant amount of time conducting research and planning how we would develop this project and the necessary interactions and deliverables that would be needed for the lessons to be effective. We thought through the topics that wanted to teach thoroughly, each team member viewed the Imagineering Story on Disney Plus and completed the Pixar and Khan Academy course, Pixar in a Box, to learn about the storytelling and planning aspects needed to develop a ride attraction. We also watched many videos of EPCOT and Universal Theme Park rides and critiqued the experiences and what we walked away learning from the interaction. As a result of the research completed and the helpful feedback provided prior to prototyping, we were able to develop a lesson that was delivered in a comprehensive way.

2. Background: What theory or theories of learning motivated your design? How did you enact those theories in your design?

The theories of learning that motivated our design. Researchers have concluded that young children's reasoning skills are capable of grasping basic scientific principles and their relationships to numbers, narrative, and intentions (Bransford, Brown, & Cocking, 2000). In response to this theory we concluded that young learners would be able understand the concepts of pollution and sustainability. We also believed to make this more kid friendly and nostalgic for some adults adding a fun and familiar fantastical world with a narrative would help riders be more engaged and retain the information presented.

Learners can transfer knowledge gained from the context of a story or narrative to new settings (Bransford, Brown, & Cocking, 2000). Children begin drawing conclusions regarding how things are done at a young age, and these assumptions can be either incomplete or inaccurate (Bransford, Brown, & Cocking, 2000). Our goal is to teach the general functions that technology plays in riding pollutants from environments, in a very visual and comprehensive way. This provides learners of all ages the accurate functionalities needed from technologies, but not an accurate representation of the technologies used. This ride provides foundational knowledge that can be understood by learners of all ages, learners can then seek additional resources to further understand the concepts presented.

Our design goals were inspired by a learning principle stating that the goal of education is better conceived as helping students develop intellectual tools and strategies to then gain knowledge that will allow them to gain knowledge and think critically (Bransford, Brown, & Cocking, 2000). We wanted to provide learners with the information needed to further their knowledge and spark curiosity.

We wanted to develop a learning environment that promotes understanding the problems associated with pollution, not just the memorization of facts (2015, Abrahamson). Facts are important to learning but our goal was to explain existing problems, providing the user a concept of what is wrong and the difficulties associated with mitigating the effects. The concepts and lessons presented are informative and present important information in a memorable way that will provide "usable knowledge," comprehensive and applicable knowledge, to learners as opposed to simply a list of facts (Bransford, Brown, & Cocking, 2000). This interaction allows users to understand how problems relate to others in the context of this fictional world, they are then equipped with an understanding that will allow them to

draw conclusions to the real world. This provides a high level understanding of the components and impacts of different pollutants.

To address the fact that all riders, or learners, will have preconceptions regarding pollutants, we wanted to introduce learners to a fictional world (Bransford, Brown, & Cocking, 2000). Learners will be immersed and can remove some preconceptions as it can be assumed that new environments, especially in the fantastical world of Seuss, might have different ways of tackling problems. Instead of being critical, knowledgeable learners will be able to draw connections to the fictional technological solutions and how it is done in reality. Learners with less in depth experience will acknowledge that these solutions are not "how the problems are actually mitigated," but they will obtain the essence of the functions that the technology must complete, and they will gain an idea regarding the difficulties that cleaning up different pollutants present.

This ride also presents a sense of togetherness among riders. Riders are working together to rid pollutants, and individuals will be presented with scores representing their individual contributions. Togetherness is facilitated as many individuals are physically together sharing an experience (Khanapour, DesPortes, Cochran, & DiSalvo, 2017). Riders are a team, this was essential to teach that one-person alone can not solve this problem (Khanapour, DesPortes, Cochran, & DiSalvo, 2017). Also, Collaboration is introduced as riders are working together to achieve a common goal (Khanapour, DesPortes, Cochran, & DiSalvo, 2017).

The blaster is effective as it metaphorically targets the technologies needed to mitigate the effects of the pollutant. This allows users to "detect the underlying analogical metaphor (Paul, 2016)." We agree that although a learner might prefer a certain learning style it might not be the best way for them to learn effectively (Paul, 2016). We wanted to incorporate attributes to the design providing reinforcement through the four learning styles to present information in the way that learners prefer and how they learn best.

We completed an assessment of the ride with our user-test participants, similar to how it is done in industry. Test groups ride the attraction and complete surveys regarding the attraction, with questions involving the enjoyment and understanding of story and lesson material. This is completed because theme park visitors can not complete assessments upon completion of each ride. The test groups expresses opinions, likes, dislikes and pain points.

3. How does your design support metacognition?

Metacognition requires individuals to reflect on their knowledge (Bransford, Brown, & Cocking, 2000). Our design supports metacognition throughout their experience. Learners are introduced to Once-Lab and the pollution hurdles that they are experiencing. Learners are introduced to what pollution is and how it can introduce harmful effects to environments, they then are introduced to the common pollutants in this environment. In the sea-centered track users are introduced to the Seussian world and they learn that they are experiencing various environmental threats as a result of pollution. This presents users an opportunity to reflect on any past knowledge regarding the effects that unsustainable practices introduce or any past knowledge of The Lorax. Learners are then introduced to the three most severe

pollutants in environments: oil spills, sewage, and plastic. Learners are then introduced to solutions developed by Once-Lab scientists to clean up environments. If learners are unaware of some of the ways that these solutions are mitigated they are presented with the functionalities that the technology must possess. They know that this is a fantastical and exaggerated technological solution but they understand the necessary features.

Upon the completion of the ride, they hear the Narrator state that the best way to help the various environmental settings is preventing the introduction of pollutants to environments. This serves as a way for learners to reflect on what they've learned. They learned how the pollutants were introduced, how to remove the pollutant, and they learned about prevention. Learners hear an inspiring message that will prompt them to think about how what they experienced relates to the real world and how this relates to other knowledge that they have about pollution. We do not expect users to have substantial knowledge regarding sustainable practices, but the final reflection will prompt users to think about some actions that they can take to help environments.

It was essential to have a reflection statement at the end of the ride to allow riders to think about what they've experienced and to draw additional connections to the real world. Learners will explore how what they've experienced changed the way they think of environmental needs and how their thinking has changed.

4. Methods: Describe how, when, where, and with whom you tested your design.

We conducted our tests virtually using a laptop to display and experience the various stages of the attraction. From the pre-show lobby to the ride experience itself, we walked through this process and obtained feedback along the way. Before showing the videos for the ride preshow, we performed a baseline knowledge test to examine existing knowledge of ride subject material - in particular oceanborne pollution and Dr. Seuss lore to create a more cohesive experience. At each stage, we then conducted semi-structured interviews with the intent of gaining information regarding what the subjects learned about ocean pollution as well as the ride's story, pain points, and how it was reinforced. The subjects we tested the design ranged from a theme park aficionado, a grandmother, and two fellow college students studying Human-Computer Interaction. Attached is a video version of the ride experience for reference.

Preshow: HERE
Lab Tour and Instructions: HERE
Attraction ride video version: HERE

5. Findings: How did your users respond? What did they learn, and how do you know?

Across the board, our users praised the novelty of an unconventional learning experience. From our questions over the course of the ride and shooting experience, they were satisfied and thoroughly entertained by a cohesive story that also led into a teaching ride. However, there was a disconnect with instructional video and the ride interaction - particularly with cue colors that designated different types of ocean-based pollution. More information and consistency would be helpful to draw parallels. Despite this misstep with colors, our subjects reported that they had gained a better understanding and perception of

ocean pollution, and the biggest takeaway being the best solution was to prevent the spread of trash altogether.

- Forgot the point values and wanted to be reminded during the interaction so that they could formulate a strategy
- Dr. Seuss is nostalgic to parents and our interviewee wanted to ride even if her adult children or a child family accommodated her because she feels nostalgic about reading Dr.Seuss books to her kids. This reminded her of her love for her kids.
- One adult noted that she would ride without a child because she loves Dr. Seuss and it would be fun to experience the world of Seuss.
- The Loved the bubbles, very fun
- The ride is not too childish
- Riders were aware of the problems and liked that they were immersed in it as it made "sustainability personal."

6. Discussion: How does your technology support, disrupt, and/or change teaching and learning about your topic? In other words, how did you use technology to improve how this topic can be learned?

Our technology disrupts traditional digital teaching methods by making the educational experience outside the realm of screens. This unconventional teaching method combines the fun of casual learning with interaction in an immersive environment to reinforce lesson material and changes teaching and learning about sustainability in various ways. In addition, our technology takes traditional educational rides which were formerly a more passive experience and makes it more interactive.

We used technology to improve the ways in which this topic can be learned by designing and implementing full immersion. Riders are exposed to and interacting with a physical environment and physical models of trash and garbage.

7. Limitations: What learners and context is your design best suited for, and what learners and contexts would not likely be successful?

There are various limitations associated with this design.

Best

1. Individuals who can read English and understand spoken English
2. People above the age of 8
3. Best for people that have been introduced to the world of Dr. Seuss
4. Individuals that are awake and actively paying attention

Worst

1. Language Barriers as we have not developed any subtitle or alternative voice over options.
2. Increased difficulty for color blind or color vision deficient individuals. It will be more difficult for CVD individuals to identify targets
3. This interaction can be too simple for experts, there is a diminished return relating to a users expertise and familiarity with the subject matter. The interaction does not adjust the lesson to accommodate user proficiencies or background knowledge or understandings.

4. Individuals that are not interested in paying attention.

8. Conclusion and Future Work: What about your design was most promising? What are the biggest weaknesses in your design? What would you change if you were to do another round of revisions?

In conclusion our team believes that we would like to see this ride be developed. At the present we have a ride prototype, that you can be very effective in pitch meetings with theme park executives. Our project would also be effective for theme park ride user tests.

The most promising component of this attraction is how different, in-formal, and effective. Many learners recall information best when it is presented within the content of a story. Our ride presents a story, fun and educational interactions, and key lessons regarding sustainability. Also this interaction is accessible, fun, and informative to individuals of all ages. We wanted to metaphorically hide the essential vegetables in a delicious dish, by presenting important educational materials in a fun and interactive way. We want to inspire individuals of all ages to be life-long learners and to be interested in STEM fields and concerns. We believe that a key tennant in accomplishing this is to make learning fun for individuals of all ages and to spark an interest that will inspire them to do additional research or to inspire discussions about environmental concerns. We spent a significant amount of time brainstorming how to get riders to reflect and retain key lesson take-aways and messages without requiring them to memorize facts (2015, Abrahamson). We believe that we've accomplished this effectively and this is the results are incredibly promising.

The biggest weakness is simply that the experience is digital. The best way to test the effectiveness of this ride would be to actually build the ride and conduct user tests. This is effective to prototype a ride, and to articulate a concept. However; a build ride would be best. We will also need more individuals to complete user-tests so that we can identify additional pain points to make the ride accessible and enjoyable by all.

If our team were to revise the design we would add more tracks to the ride. We would like users to experience the impacts that pollution has on environments in many different contexts. Next we would like to explore air pollutants and the harmful impacts that it has on the environment.

References

Abrahamson, D. (2015). The Monster in the Machine, Or Why Educational Technology Needs Embodied Design.

Bransford, J. D., Brown, A. L., & Cocking, R. R. (2000). How people learn: Brain, mind, experience, and school. Washington: National Academy Press.

Khanapour, P. R., DesPortes, K., Cochran, Z., & DiSalvo, B. (2017). Framing Makerspace Communities. Framing Makerspace Communities. doi:https://doi.org/10.1145/3141798.3141814

Paul, K. A. (2016). Stop propagating the learning styles myth. 106. doi:https://doi.org/10.1016/j.compedu.2016.12.006.

Roberts, J., Lyons, L., Cafaro, F., & Eydt, R. (2014). Interpreting data from within: Supporting humandata interaction in museum exhibits through perspective taking. Proceedings of the 2014 Conference on Interaction Design and Children - IDC '14. doi:10.1145/2593968.2593974