

Undergraduate Thesis Prospectus

Improving Accessibility to the AmazonAid Educational Platform

(technical research project in Computer Science)

Examining how Environmental Activists advance their agenda

(STS research project)

by

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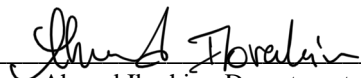
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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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General Research Problem

How can the Amazon rainforest be best protected from human threats? In a landmark report from the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), it was concluded that the rate at which nature is declining is “unprecedented in human history” (IPBES, 2019). This fact is evident in the Amazon rainforest, which has been put under increasing pressure from deforestation. It is crucial that this threat is dealt with, as the consequences are severe. In an interview with The World Bank, renowned ecologist Thomas Lovejoy remarked on how important the biodiversity of the Amazon is: “Every species in this incredibly biodiverse system represents solutions to a set of biological challenges -- any one of which has transformative potential and could generate global human benefits” (“Why the Amazon’s Biodiversity is Critical”, 2019).

Raising Deforestation Awareness through Online Education

DuPont and the rest of Amazon Aid aims to put pressure on politically and economically powerful organizations because many continue to operate without any environmental accountability. E. Pereira, Ferreira, Ribeiro, Carvalho, and H. Pereira, experts in resource conservation and computational modeling, recorded the series of anti-environmentalist policies enacted by Brazilian politicians linked to the country’s agribusiness since 2016. President Michel Temer eliminated multiple construction licenses previously required for companies cutting down the rainforest, and enacted other policies reducing the public’s ability to oversee those construction projects. After deforestation rates increased in 2016, Temer’s administration cut the Brazilian Ministry of Environment’s budget in half, then froze the budget at that level for a twenty-year period beginning in 2018. His successor Jair Bolsonaro promised to continue

increasing access to the Amazon's resources (p. 8, 2019). Though not elected, consumer facing companies depend equally on their buyers' sentiments, and in some cases their buyer's ignorance toward irresponsible environmental practices. Because illegal gold mining motivates much of the Amazon's deforestation, New Yorker writer Stephanie Boyd wrote that members of the jewelry industry created the Responsible Jewelry Council in 2012, promising to trace gold from its customers to its original origins. Within a year, Peruvian reporters caught a council member buying illegal Peruvian gold. Yet, with no punishments set in place by the voluntary council, that company, PAMP, continued its business and still successfully operates today (para. 20, 2012).

With an improved design, Amazon Aid's learning modules could begin educating the next generation of environmentalists to boycott politicians and companies who choose to ignore the deforestation problem. In the two-semester capstone course led by Computer Science professor Ahmed Ibrahim, undergraduate Computer Scientists Trevor Bedsaul, Henry Clabby, Ryan Coulter, Sam Hecht, Dylan Peters, Rob Wallace, and Teddy Vallar will work with Amazon Aid Communications Specialist Ben Eppard to make the website's necessary changes. Within the first semester, the capstone team will solve the accessibility and navigational problems.

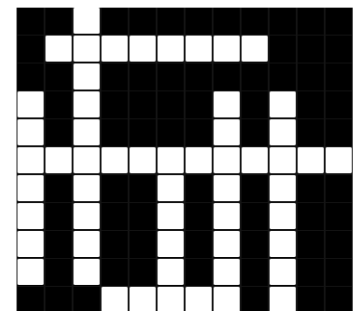
Though targeted toward middle school classrooms, the learning modules currently require a password protected account to track progress between logins. Public middle school teachers require special administrative permission to use any sites which require student passwords. To eliminate this barrier to entry, the capstone team will restructure the student login process to use a class wide code, distributed by the teacher, followed by a personalized four-digit code so that each student may track their progress without the need for a password. Once inside the site, users currently have no way of returning to previously completed "levels" within the learning progression, shown in Figure 1 as different strata of each tree, making class wide

discussion about specific aspects of the curriculum unnecessarily difficult. Simply making those previous levels clickable will allow intuitive backwards navigation for students and teachers, and this user experience will be tested with real students to ensure ease of use.

In the second semester of the course, the capstone team will make the learning activities more engaging through improved gamification of the material. While the site currently features small games throughout the curriculum, an example of which is shown in Figure 2, they display multiple common pitfalls of serious games, games designed for something other than pure entertainment, explained by Wim Westera, an expert in learning media. Emphasis on rote memorization without contextual framing, such as a crossword with eight discrete questions and answers, aid in knowledge reproduction but fail to support deeper comprehension and general content understanding. Apparently, games employing only extrinsic motivators like rewards or certificates suffer the same disadvantage when compared to games using intrinsic motivators, such as enjoyment of the game itself (pp. 61-64, 2019). Though moderately enjoyable, the crossword shown in Figure 2 simply uses the password to the following level as an incentive. By installing games that require deeper understanding, such as designing hypothetical ecosystems of plants and animals, the capstone team



Figure 1: The silhouette of a Ficus tree shows the progress of a particular learning module in the Amazon Aid site, but features no navigation functionality and fails to make clear the user's current level. (Adapted by Ryan Coulter from "My Trees" 2019)



ACROSS

2. A majority of the water in the Amazonia Rivers is attributed to rains created by the great missing of trees and melt from:

DOWN

1. What butterfly's wings are so iridescent that they can be viewed up to one-half mile away?
3. Each species no matter how large

Figure 2: One mini game embedded in the learning modules features an eight-question crossword puzzle (Adapted by Ryan Coulter from "Fiscus Tree" 2019)

will make the learning modules more effective as well as engaging. These improvements to the system are summarized as follows:

Minimum Requirements

- As a USER I should be able to go back to previously completed levels within each “tree” when using the online learning platform.
- As a USER I should be able to enter the learning platform through a single teacher login.
- As a USER I should be able to enter the learning platform using a teacher’s login information as well as a personal avatar, so that each student doesn’t have to create an account.

Desired Requirements

- As an ADMIN I should be able to add images that are persisted in a database, so that content can be added and served reliably.
- As a USER I should be able to bypass the integrated minigames in order to move onto more content.

Optional Requirements

- As a USER I should be able to access and play a variety of minigames which are native to the web app while progressing through learning content.

The new and improved learning modules on Amazon Aid’s website will be publicly released for use in middle schools and for independent learners who come across it online. Along with the site gaining popularity, Amazon Aid’s ideals will begin spreading throughout the world, promoting concern for the Amazon and encouraging citizens and consumers to pressure politicians and businesses to adopt practices protecting the rainforest.

Examining how Environmental Activists advance their agenda

How do environmental activists seek to protect the Amazon rainforest? Hungerford and Volk (1990) found that merely raising awareness about an environmental issue seldom succeeds. In order to further advance their agenda, environmental activists are always searching for new strategies to help them spread their values and ideals.

The advent of mobile technology and personal computing has created a new set of methods that activists can use. In a 2009 study, it was recommended that “Mobile technologies should be used to increase environmental awareness of students” (Cavus, Ercag, & Uzunboylu). This sentiment has been reflected in the actions of many activist organizations, who are working to augment their online presence. The proliferation of cheaper and more available computing power has also given activists new ways to protect the Amazon. Satellite technology is becoming increasingly available, and is now used to help document the Amazon rainforest. This technology gives researchers a way to “convey useful information to a broader, non-expert audience” (Baker & Williamson, 2006). Both of these examples help achieve a common goal to make material about environmental issues available to a broader audience. This strategy was highlighted in a 2015 study, which asserted that one way to describe the evolving response of environmental organizations is a “broadening of missions and reach” (Perez, et al. 2015).

The Amazon Aid Foundation is a nonprofit organization that uses media to publicize threats to the Amazon. Sarah duPont, the organizations founder, states their goal to “create scientifically impeccable multi-media to educate global audiences about the importance of the Amazon” (DuPont, n.d.). Other organizations work more directly to combat the root causes deforestation in the Amazon, such as Amazon Watch. Their mission is to “partner with indigenous and environmental organizations in campaigns for human rights, corporate accountability, and the preservation of the Amazon’s ecological system” (“The Amazon: A Global Treasure”, n.d.). About one million indigenous people inhabit the Amazon and depend on it for their survival. In an interview with CNN, one chief of the Waiapi tribe laments “We did not know we would have many invaders, loggers, and prospectors in the future. Many talk about our land today, they say that they want to take our land” (Charner et al., 2019).

Large agricultural enterprises stand to profit at the expense of the environment, seeking to clear large patches of the Amazon to grow their crops (Andreoni & Londoño, 2019). In an investigation done by The Bureau of Investigative Journalism, it was found that there was still ranching happening in areas embargoed by Brazil's environmental agency. The cattle being raised in these areas are being supplied to JBS, the single biggest supplier of beef and chicken globally (Wasley, et al., 2019). It stands to show the role of the Amazon in the global market, and how many suppliers are able to bypass protective regulations that are not stringently enforced.

The Brazilian Institute of the Environment and Natural Renewable Resources, or the IBAMA, acts as the administrative arm for Brazil's Ministry of Environment, fighting against threats to the Amazon. However, its effectiveness is in doubt under President Jair Bolsonaro. He chided members of the IBAMA imposing "astronomical fines", claiming in response "We put an end to that" (Simões, 2019).

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