RAISING DEFORESTATION AWARENESS THROUGH ONLINE EDUCATION

CONTEXTUAL ANALYSIS OF TECHNOLOGY USE IN RESOURCE-CHALLENGED SCHOOLS

An Undergraduate Thesis Portfolio Presented to the Faculty of the School of Engineering and Applied Science In Partial Fulfillment of the Requirements for the Degree Bachelor of Science in Computer Science

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SOCIOTECHNICAL SYNTHESIS

It is often said that the Internet is an information goldmine. If used correctly, the Internet can be one of the most valuable educational tools for connecting students at a global level, and for spreading awareness on important world issues. One such world issue that is more salient than ever concerns the Amazon Rainforest. The Amazon produces more than 20% of the planet's oxygen, is home to at least 10% of Earth's biodiversity, and is the world's largest carbon sink, however in the last half century close to a quarter of the Amazon Rainforest has been destroyed by humans, and this number is on the rise. The technical project outlines the development of an educational, gamified web application, hosted by a local nonprofit, the Amazon Aid Foundation, to generate awareness of and interest in this Amazonian deforestation crisis among middle school students. The STS analytical research paper that follows is motivated by the tendency for valuable natural resources, including the Amazon rainforest, to be located in countries that are rife with political corruption and bad environmental policy. The STS research therefore conducts a sociotechnical analysis to determine how educational technologies can be more effectively integrated into the schools of developing countries. Conclusions drawn from such research will help online materials like the technical project reach the hands of students in developing countries where the material can have the biggest long-term impact.

As mentioned, the technical project involves software development work for the Amazon Aid Foundation. The core mission of Amazon Aid is to both spread awareness on deforestation and to garner support to protect and restore the Amazon Rainforest using artwork, film, and other multimedia projects. One such project is an online educational game intended to educate middle school students on the importance of the rainforest. This learning module, called the "Grow A Tree Game", was previously unable to reach its intended audience because of several fundamental issues with site navigation and account creation. Thus, the technical team chose to work for the Amazon Aid Foundation, employing agile software development methods over the course of two semesters, in order to solve these technical issues and make the "Grow A Tree" game viable for use in any middle school classroom.

The technical team first implemented navigational functionality throughout the learning module. Most notably, the tree game was redesigned to allow for intuitive backward and forward navigation through completed levels of the game, making guided classroom discussion possible. In addition, the login process was restructured so that students can participate and track their progress without the need to create a standalone account. All in all, the technical team's work with Amazon Aid resulted in a product with the potential to spread awareness about the Amazon, and the implications of its destruction, throughout both public and private middle schools across America.

The goal of the analytical STS research paper is to determine how holistic STS principles can be used to inform the design of more effective learning environments that blend online learning with face-to-face instruction for resource-challenged schools. First, a Technology and Social Relations model is developed and applied to various case studies in developing countries to identify the common roadblocks that inhibit the effective integration of technology in developing school systems. The blended learning approach is then introduced and used in conjunction with the Pacey's Triangle model to demonstrate how the unique cultural, organizational, and technical contexts of different resource-challenged schools can be leveraged to guide research and design for more effective learning environments.

The aim of this research was not to define any fine-grained design guidelines for a classroom environment in any specific resource-challenged school. Rather, the goal was to

demonstrate the efficacy of using Pacey's Triangle to design learning environments that dynamically integrate technology in light of available, or unavailable resources. To this end, the Pacey's Triangle model showed promise in its ability to contextualize and compare existing case studies of blended learning environments in both developed and resource-challenged communities in a way that previous research could not.

In summary, the technical project presents a long-term solution to the Amazonian deforestation crisis. By redesigning Amazon Aid's online educational game, the technical team was able to produce a web application that can now be used in classrooms in America and across the world. The STS research paper demonstrated the efficacy of using Pacey's Triangle to contextualize the cultural, technical and organizational aspects of a resource-challenged community in order to guide future research into the design of blended learning environments for developing schools. Hopefully, if future research using Pacey's Triangle is successful, then novel technical solutions like the educational game described above can be implemented into the curriculums of developing schools across the world where they can inspire the most change.

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