EVOICES: A WEBSITE SUPPORTING OUTREACH BY ATTRACTING TARGET GROUPS TO COMPUTER SCIENCE THROUGH CULTURALLY RELEVANT THEMES*

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ABSTRACT

A popular approach to introducing students to computer science is to engage middle-school students in fun programming activities. One challenge in such a program is attracting students who are not already positively predisposed to computing. In order to attract a wider audience, we designed and implemented a website that integrates culturally relevant activities to appeal to parents and children of target groups.

1. INTRODUCTION

Designing successful outreach activities is especially challenging in computer science for several reasons. Unlike many other fields, we have no "popsicle-stick bridge," an activity that teaches many of the principles of our field while requiring only the skills of a third grade student. One challenge we do share, however, is that the students we target are not those in our field, making it less likely that the designers and facilitators will be able to choose activities that appeal to the parents and children of the target groups.

There has been a wealth of development of outreach activities designed to give students a taste of computer science without months of training. These range from simple programming with new programming languages like Scratch [1] and Alice [2], to learning

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about machine instructions by building LEGOs with instructions [3], to learning about different CS concepts through non-computer-based activities in CS Unplugged [4], to using Scratch to teach higher-level concepts such as program composition [5].

There has been less attention to how to attract students to such outreach events. Outreach events targeting females abound, possibly because females make up over 50% of college students [6], and female-targeted organizations (i.e. Girl Scouts) are popular. It is much more difficult to figure out how to attract ethnic minority students who are not as likely to attend college and are less likely to have a computer in the home, though UC Irvine's program[7] does just that for Native Americans.

Our goal is to design a framework for programs aimed at particular target groups that can be retargeted easily. Our particular program has two target groups: Latina/os and females. We will integrate activities that range from introductory programming to program design, and students will be able to show their work to their families.

Our website, eVoices (electronic voices), is designed for Animal Tlatoque, a program that combines themes of Mesoamerican culture and endangered species in order to attract parents of Latina/o and female children and the children themselves. In Section 2, we give the background that led to our design. Section 3 describes the website framework, and how it can be extended to other contexts. Finally, Section 4 gives a self-evaluation.

2. BACKGROUND

Our website has two distinct goals. First, attract the target audience with a culturally relevant theme [8, 9, 10] that appeals to both parents and children. Second, design activities that allow participants to experience a range of facets of computer science. We have integrated two themes that are intended to appeal to Latina/o and female children and their parents: Mesoamerican cultural history and conservation of endangered species. Mesoamerica extends from Central Mexico to parts of Honduras, including Olmec, Teotihuacan, Maya, and Aztec cultures.

Attracting Parents: Studies have found that foreign-born parents are concerned that their children will lose their ethnic identity and culture [10, 11, 12]. In the outreach programs we have been associated with, we have found this sentiment to be corroborated anecdotally. At family events sponsored by UCSB outreach programs, parents often voice their gratitude for programs that teach their children about their home countries in ways that are not taught in public schools. For these parents in particular, an academic program tied to cultural activities will be very attractive.

Santa Barbara is also an ideal test-bed for attracting parental interest based on conservation. Some in Santa Barbara consider their community as the "birthplace of the environmental movement", which gathered steam after a devastating oil disaster caused by an offshore drilling accident in January 1969 [14]. Three million gallons of crude oil leaked from the ocean floor, killing upwards of 10,000 birds and unknown numbers of dolphins [13]. It was the worst oil spill in national history [14], and it was widely televised. Recent state legislation has reopened new drilling off the coast of Santa Barbara for the first time since the disaster. Due to the current federal administration's

emphasis on the environment, programs that combine conversation with Computing may be attractive not only in Santa Barbara, but also in other communities.

Attracting Students: A 1996 national study on Latino Youth found that YLA (Young Latino Americans) are "extremely interested in maintaining a connection with their culture; 67% agree that this is something that is important to them and nearly half of YLA have the desire to form a stronger connection to their Latino culture." [15] Again, such opinions are borne out by current outreach programs sponsored by UCSB in local junior high schools. One program in particular combines modern chemistry with Mayan artifact creation. It was introduced at Santa Barbara Junior High School during the fall semester of 2008. By the end of the calendar year, the voluntary, not-for-credit class grew from 18 students to 35.

The theme of endangered species was chosen to tap into two interests of young females - having a positive impact on the world and working with animals. Females tend to choose majors that have a positive impact [16, 17, 18], and we want to attract those females in order to show them how computing can be used to help solve problems with high social impact. In addition, young females have a strong attraction to animals. In Canada and the United States, women constitute approximately 80% of the veterinary college student population [19]. In fact, our theme was inspired by a current stuffed animal-based web phenomenon called WebkinzTM, and interactive web environment tied to small stuffed animals that experienced 1.9 million unique visitors in December 2006 [20].

Experience Goals

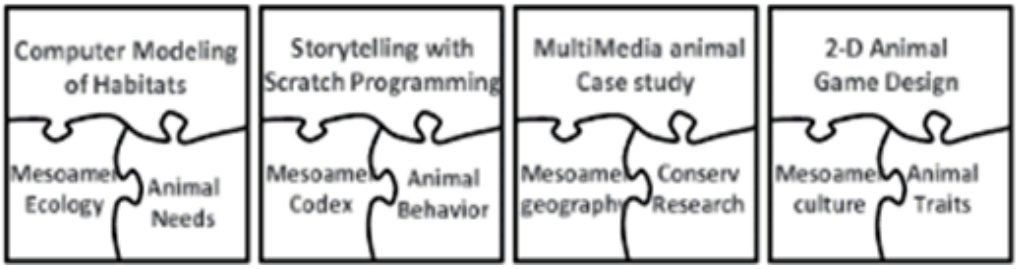

Figure 1: Integration of Mesoamerican culture and conservation themes with computing

The activities we have designed provide a careful progression from computer literacy, followed by simple programming with Scratch [1], and culminating in program design. In addition, they utilize creative skills, allowing students to draw or write stories if they so desire. Each student pair will choose an endangered species from Mesoamerica. Figure 1 shows the integration of the computing activities to our themes.

- Computer literacy - Draw or download several pictures of the animal and upload them into the website, allowing the picture to be used as their symbol and in a variety of games.
- Computer literacy, Programming - Research aspects of the species such as habitat, eating habits, migratory behavior, etc., and produce a simple informational Scratch animation telling about their animal.
- Programming - Animate a story, either their own or a fable, involving their animal.

- Program Design - Design a game to be implemented by undergraduate CS majors.

3. EVOICES WEBSITE

In order to facilitate our activities, and provide students with the opportunity to publish their work, our project includes the eVoices website, the online home of Animal Tlatoque. The eVoices site provides students with the opportunity to share their creativity by posting their accomplished projects as well as viewing each others'.

eVoices joins the themes of Mesoamerican culture and endangered species with an introduction to programming. The visual presentation of the site follows the Mesoamerican theme with landscape pictures of the Mayan site Tikal in Guatemala. The eVoices navigation map includes links to five different areas of exploration: the sundial, schoolhouse, habitat game, library, and Mayan ball game field. The sundial is the symbol for a page on Habitat Modeling; students will be able to see the estimated changes of a habitat over a period time by using a sliding bar to watch the changes from year to year. The schoolhouse features resources for the students (Scratch tutorials) as well as a book of the students' first project, Scratch animations showing animal information. The Habitat Game involves the animal avatar and different habitats. Student-programmed Scratch stories and resources for endangered species research can be found in the library. The Mayan ball game field is the home for several smaller modern games also involving the student's avatar.

Figure 2: Main eVoices website featuring Mayan ruins in Tikal

Permissions eVoices has three types of users - the public, middle school participants, and undergraduate programmers (administrators). The permissions were set up to facilitate these three levels of involvement. The majority of the eVoices site is open to the public to allow the students' peers to investigate eVoices and to give this project greater visibility. Only content that has been approved by an administrator will be viewable to the public, allowing the students' best work to be shared. Games and

educational resources will also be easily accessible. Students enrolled in the Animal Tlatoque program will create an account for the eVoices site, Students can upload their creations, making the content immediately viewable to themselves, as well as play games involving their avatar. Undergraduate programmers and the advising faculty have an additional user interface that allows for easy viewing and approving of student registrations and uploads. Other features include adding animals, pictures, and student work.

Scratch Tutorials To allow students to learn and independently explore programming, we created a couple tutorials to introduce the students to Scratch. Currently, there are three tutorials which provide step by step instructions to create an interactive page that presents information about the student's avatar, program animated stories, and building simple interactive games, as well as to teach basic Scratch functions and programming structures. These tutorials are posted on the eVoices site so they will be easy accessible resources during the program and after.

Habitat Game One of the five places for students to visit on the eVoices navigation map is the Habitat Game. This portion of the program seeks to expose students to the software engineering process by giving students the opportunity to contribute to the game design. The Habitat Game is a 2-D scrolling game with the student's avatar traversing to the right through a habitat that scrolls across the background. Points will be rewarded for successfully collecting animal avatar-relevant items and the avatar will receive a penalty when unable to avoid threatening predators. The students will contribute to the design expansion of the Habitat Game by using a graphics program to draw the terrain that scrolls across the screen for additional levels. Additionally, the student participants will provide ideas and graphics for reward items and predators. Undergraduate assistants will incorporate these design decisions into the game, and the students will have the opportunity to test their own designs.

Mayan Ball Game Field To offer students another opportunity to be introduced to software engineering while avoiding the skill level overhead that is necessary for a large project, the Mayan Ball Game Field will hold several other games designed by students and implemented by undergraduate assistants. The students and undergraduate assistants will work in groups to provide ideas and input, the undergraduate assistants will produce the game as designed, and students will then provide feedback.

The first game is the Memory Game. Modeling the childhood game, this game uses the whole classes' avatars as the items to match. Other examples of simple games that students may choose to help design include checkers, chess, Connect Four, Tic-Tac-Toe, and a racing game. The racing game could input the avatar's picture and characteristics (speed, acceleration, etc).

3.7 Extensibility

One goal of our design of the eVoices website is to keep the concepts within the site easily transferable to other themes. In order to switch themes, the graphics design of the website as well as the inputs to the games would have to change; a new category of avatars need to be chosen, their pictures need to be drawn, and new projects for the tutorials would be necessary. The framework of the site, however, could remain the same.

Since the games rely on student contribution and most of the detail is constructed during the program, modifying the games would require little work prior to the program's start. Other features like the books of Scratch projects would not need to be modified.

4. DISCUSSION AND SELF-EVALUATION

We have been successful in our goal of designing and implementing a website that combines Mesoamerican culture and endangered species. In addition to the described activities, students will watch a video on Mesoamerican artwork, and guest speakers will talk about Mesoamerican culture, how technology is used in conservation, and computer science in general. The website is the key to combining the two themes, seamlessly combining activities in computing, Mesoamerican artwork, storytelling, and endangered species. In addition, the website was specifically designed to be useful for any number of scenes, because students provide much of the theme-specific content. The ideas of games, storytelling, and research would be applicable to many themes.

The greatest challenge lies ahead. A program of this nature is highly dependent on marketing. When writing a single paragraph describing the program for marketing purposes, the combined theme poses a challenge. In addition, the lowest-overhead way to start a summer program is to piggy-back on an existing program, but existing programs typically target a single group, not two groups. We experienced this challenge last summer, when we piggybacked on a pilot Mesoamerican STEM summer program. We had two main challenges. First, the program conflicted with another campus program targeting Latina/o students. Second, the marketing and contacts did not emphasize the two themes. We look forward to trying again with what we learned.

Our next step is to run a summer program and evaluate the success of our new marketing strategies, progression of activities, and special events.

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