

Integrating App Inventor into a Middle School Cross-Disciplinary Project

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Abstract

This paper will present preliminary data from a five month long study with 158 eighth grade students in a rural middle school. The aim of the project was to provide resources for students and teachers to integrate mobile app design into the middle school curriculum. This project was a cross-disciplinary collaboration between an 8th history course and an 8th grade technology course where students were tasked with creating a historical mobile application. The students learned basic computer science concepts and computational thinking principles through designing and creating apps with MIT App Inventor. In this presentation, we will discuss an overview of the curriculum, the types and examples of mobile apps the students created, range of app inventor features included in the app and the impact of app creation on students' interests in computing. Results from this study suggest that MIT App Inventor can be used to support a cross-disciplinary project in middle schools.

Introduction

A team of computer science and education professors and students from a southern university partnered with a local rural middle school to explore the use of supporting mobile app development to facilitate a cross-disciplinary project. The middle school partner encouraged technology usage in the classroom by students and teachers as part of their charter as a "bring your own technology school." The principal and teachers

were very receptive to integrating computer science into their core curriculum and saw this as an opportunity to promote technology creation rather than consumption. The goals of this project were two-fold for students. First we wanted students to explore the Reconstruction Period in their history class using historical thinking principles. Second, we wanted students to explore basic computer science concepts and computational thinking principles to construct mobile apps that engage a wider audience in the diverse perspectives of this historical period. As such, this project was a collaboration between two 8th grade history teachers and the four technology teachers. One of the primary objectives of this project was to measure the extent to which we could support students in creating their own apps by creating three flexible app templates and a series of video tutorials. As such, we focused on measuring the impacts of our resources on student app creation and the use of a cross-disciplinary project on students' interest in computer science.

1. App Inventor Curriculum

The curriculum was taught by four technology teachers who were trained by the university team. The technology classes were offered on alternating “A” and “B” day schedules where students had class either two or three days a week for fifty minutes. The unit took place over 4 weeks in the history classroom which overlapped with a 16 week curriculum in the technology classroom. The students began the unit by working on apps that were available from MIT App Inventor, for the first two weeks of the program, to learn the basics of App Inventor. They worked through the Hello Purr App, the Animal App (our multiple animal variation of Hello Purr), and the Magic 8-Ball App. In weeks 3-6 students completed interactive video tutorials focused on helping them to design apps through learning to use basic MIT App Inventor components (e.g., buttons, images, sound) and computer science concepts (e.g., variables and if-then conditionals). In addition, we created videos tutorials to help students learn about app navigation using sequential pages, toggling and new screen programming. Weeks 7-10 focused on helping students to engage students in computational thinking while designing their apps. We create a custom Computational Thinking Idea and Design Mat (CT Mat) to help students apply computational thinking to designing their own apps. The CT Mat focused students on the four following computational thinking principles: problem decomposition, pattern recognition, pattern generalization, abstraction and algorithm design. During weeks 11-15 the students used content from their history class on the Reconstruction Period, CT Mat, and three app templates to create their historical app. Weeks 16-17, the last two weeks of the unit, students uploaded their apps to the App Gallery and presented their historical apps in both their technology and history classes.

2. The Creation of an Historical App

The students were tasked with creating a historical app based on a topic of their interest within the Reconstruction Period of US History (the unit they were studying in their history class during the app inventor project). Students had to identify key issue/topic(s) of Reconstruction that they wanted to explore in their app and select an app template that would best allow app users to explore the topic(s). The students had a choice between three templates: a slide show app, a coin toss app, and a debate app. The slide show app template, allowed students to focus on a major issue and identified key

aspects of the issue to construct a narrative from a particular stakeholder's point of view. The app used “screens” or programmed component blocks to swap out content when navigational buttons were pressed. The coin toss app template allowed students to pick key events related to the main issue they were investigating and presented the events from multiple perspectives. The events had to build upon one another and the app had to explain why a particular group of people thought the way they did about an issue. For the coin toss app, students used “screens” and buttons programmed to toggle between images and label content on each page. The debate app template allowed the students to pick a key topic to debate and selected two figure-heads to represent each side of the debate. This app allowed students to use images, video, text-to-voice, text to simulate turns in a debate and to practice building arguments. This app was based on the “I have a dream” app for App Inventor 2 and was customized based on students skill and interest level.

The students used various aids to help them complete the app: they were given a historical app workbook that outlined the pages/screens needed for each type of app; resources from their history teachers to research and generate the historical content; they referred back to tutorials from App Inventor and video tutorials created to teach the CS and the App Navigation concepts to help them program their apps; they had the computational thinking mat which helped them focus on problem solving process techniques and code blocks for the slide show app; and a cheat sheet that given with condensed instructions (distributed at the discretion of the teacher). They also received guidance, assistance from their teachers, peers, and the project investigator.

3. Data Collection

A total of 158 students participated in the project across 8 classes, 4 technology, teachers, and 2 history teachers. We collected data through video and audio recordings, direct observations, student and teacher pre and post surveys, interviews, and student artifacts. The questions on the surveys focused on students' confidence in programming, the usefulness of the tutorials and aids, and students' perceptions of computer science and App Inventor. Eighteen students were strategically selected to participate in an interview about their app in detail.

6. Results and overall experiences

Analysis of in-class discussions and student interviews revealed that 58% of students thought creating app was fun. 56% of students indicated that programming with App Inventor made learning about the Reconstruction Period more interesting. One student said, “My favorite part of designing my app was getting to be creative with it and have fun, while learning at the same time.” While creating their final historical apps, all the students referred to the video tutorials to help them program in MIT App Inventor. 68% of students chose the slide show app template. 23% of students chose the coin toss app. 9% used the debate app. Most students used the CT Mat while creating their final historical apps because it specifically guided them through creating the slide show app.

After the program, the students were surveyed to better understand their opinions on programming and the use of App Inventor. 47% of students said their interest in computer science increased. 45% said that App Inventor has increased their desire to take a programming class in high school and 47% said App Inventor has increased their desire to pursue an undergraduate degree in Computer Science.