

Learning to Design Computer Programs in an Elementary School Setting

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Scratch.mit.edu

Abstract

The goal of this project is to illustrate the value of designing programs and the capability of elementary school age students to articulate goals and execute them. It builds on the knowledge that elementary school students can learn to program, through work with Scratch. They can use basic programming skills to design their own projects. The students are able to develop problem solving skills and the ability to respond to feedback. This project shows that designing programs benefits a student in his or her education at the elementary level.

Development Sections

Participants

I worked very closely with Jessica Gorman and Fred Allard throughout the project. Jessica was another Senior working in the Computer Systems Laboratory. Mr. Allard is the Technology Teacher at Cardinal Forest Elementary. For some sessions with the students we also had a couple of parent volunteers. The students in the program were a mix of returning and new students from primary to 6th grade. I worked specifically with the first and second grade students.

Lessons

Scratch Sessions occurred on a weekly basis with each group in the lab for about 25 minutes. The students signed in upon entering the lab and usually picked up the rubric for the current project. I wrote clear directions on the board so that students could learn to follow step-by-step directions and get into the habit of reading instructions.

Topics

We began the school year with a basic introduction to the Scratch program. We taught basic vocabulary like sprite, stage, background, and import. We introduced the different types of scripts (commands): control, motion, and looks. After familiarizing the students with the Scratch program, we moved into the first major topic of xy-coordinates. We used Smartbook Software NoteBook to teach the students about negative numbers and the xy-grid set up.

Project One: An Application of the xy coordinate skills taught, as well as an introduction to creating a basic program that includes glide, go to, and pen methods.

make in Scratch?" They replied with computer games that they had played online, or games that they had found in the Scratch software already. We narrowed down the project field into a manageable number of projects, as opposed to each student doing a different project. The final array of projects included: a story, PacMan, Super Mario, and dodgeball. Our next challenge was to prompt the students to create a step-by-step layout of their projects. We created an activity in which we gave them a blank rubric and asked them to fill it in regarding a very simple game based on Whack-A-Mole. The activity taught them to think about a game in steps and create guidelines to follow in making it.

Below is a picture of the guidelines for the students who created stories. The students who created games were given blank rubrics to be filled in as a planning process.

Make Your Own Project!

Task	Check?
1 Sprite	
2 Backgrounds	
Change Sprite	
Costume 1 time	

Circle:

4 Control Scripts 2 Motion Scripts 1 Looks Script

Draw a rectangle around your new script.

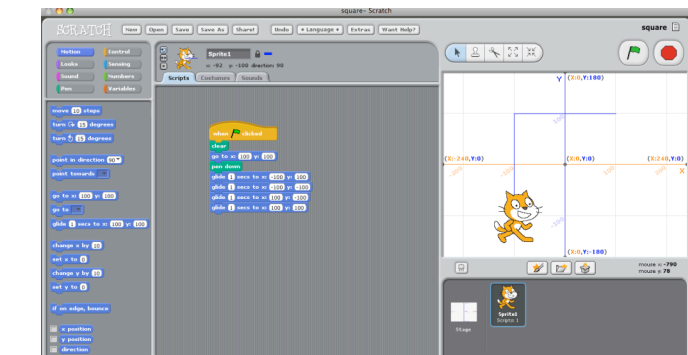
2 Scripts from: Pen, Sensing, Numbers, or Variables

- _____
- _____

Discussion

For the students who did grasp the concept of brainstorming and planning, the process of designing a computer program was very beneficial. Students were able to see what projects are attainable through Scratch and the amount of thinking and work involved in creating a project. The students were able to discover Scratch as a creative outlet; they especially enjoyed creating their own backgrounds and sprites.

My basic conclusion is that for advanced students, designing computer programs in elementary school is a valuable lesson. It exposes them to the world of computer science, so that they might have more interest in the future. Even for those students who did not benefit as much from designing projects learned many important concepts through their work in the Scratch program. In the future, I recommend that the program be continued at Cardinal Forest, as well as spread to other schools. I also recommend that students with higher skills levels be singled out and taken to the next step of designing their own programs, since it is such a beneficial process.



Designing Projects

The first graders were ready by mid-March to begin to design their own projects. We began with asking them to think of game ideas. We asked, "What kind of game do you want to