

Learning to Design Simple Computer Programming Projects

in an Elementary School Setting

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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.

Introduction:

For the duration of the 2007-2008 school year, students at Cardinal Forest Elementary came to the computer lab during their recess time to attend a computer programming class designed and executed by Gregory Gates (Thomas Jefferson High School) and Fred Allard (Cardinal Forest Elementary). The study showed that students from kindergarten to sixth grade were able to learn the vocabulary, concepts, and skills associated with basic computer programming. Scratch is designed to facilitate this process by providing a way to avoid debugging processes and syntax errors. The software is easy to understand and use; large amounts of code do not need to be memorized in order to make use of it.

Once the basic vocabulary like a coordinate system and a continuous loop were solidified, students were able to work on basic level projects designed by one of the teachers (Gates or Allard).

In my study I found that students who have successfully completed the projects are able

to move on to designing their own projects. Designing projects (e.g. a video game) teaches students the skills required to build an idea from the ground up and go through the work leading up to a finished product. It teaches problem solving skills and the ability to work with feedback to develop a project further.

While the work done by students in learning basic programming skills is valuable, the more advanced students can be taken to the next level. Students are ready to excel beyond the basic goals of learning programming language and becoming comfortable with using a computer as a tool. The computer can be a tool for personal expression through the design and execution of creative coding projects. Students can design simple games in groups or individually. My study with the students at Cardinal Forest Elementary gave the advanced level students the opportunity to express their creativity in building their own computer science projects.

Background:

There has been previous discussion about the use of video games as learning tools. Peppler and Kafai, in their article [What Video Game Making Can Teach Us About Literacy and Learning: Alternative Pathways into Participatory Culture](#), explore the learning value of actually designing the games. Their study proved that students were able to participate in today's media culture through their collaboration at computer communities, much like the one at Cardinal Forest Elementary.

Through the use of design technology, students are also able to learn about setting goals and problem solving to reach those goals. They are able to go through the entire work

process of a project that they created. (Sylvan) Problem-solving skills are valuable in school; the skills are important in math especially, which is the basis of many other subjects. Students also learn to articulate their goals, a skill that is important when learning basic writing skills. Building a foundation in project work is helpful when students move away from elementary level work and into the group work required in higher levels of education.

Designing projects is also a chance for students to express their creativity. The arts are an integral part of elementary education, and media art is a growing part of today's culture. The design of computer programming projects allows students to express themselves in a medium that is up-to-date with current technology.

Scratch is a software program that was created in the MIT Media Lab. It provides an online community to share student work. The program makes it easy for students to learn basic programming skills because of the absence of syntax errors. The library of available bits of code, sorted by their purpose, eliminates the problem of memorizing code. The community atmosphere provides the opportunity for students to be inspired by other students' work and receive feedback on their own.

Gates and Allard succeeded in setting up the *Scratch* based program at Cardinal Forest Elementary. They proved that students as young as kindergarten could learn to program. The students that participated in the program developed an appreciation for computer science and now understand basic programming vocabulary like loop and variable. Some of the students excelled over the others; these are the students that were involved in my

study. The students were looking for challenges beyond the simple exercises provided to the students, which I gave to them by guiding them through the process of creating their own projects.