TJHSST Computer Systems Lab Senior Research Project Paper
Elementary Education in a Technology Age
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Abstract

Technology becomes more advanced and more accessible with every passing day. Education should be utilizing this technology boom in teaching current students. However, this does not seem to be the case. The goal of this project is to try and implement computer programming, through Scratch, as a tool for educating students. Computer science education at a younger age becomes more and more essential as computers become more advanced and more accessible with each passing day.

1 Introduction

The main question that this research project aims to answer is, "How young is too young to start teaching children how to program?" The goal is to establish a computer science program at Cardinal Forest Elementary School through the use of the MIT developed program Scratch. Hopefully by watching how the students use the program I will be able to come up with an answer to the question. Despite the fact that I will be graduating at the end of this school year, I hope to continue my partnership with Mr. Allard and Cardinal Forest throughout my college years in order to ensure that the program continues for years to come, and to see the results of my initiative.

This paper will detail both how Mr. Allard and myself will teach the students, and how the students go about solving the problems that they are presented with. Mr. Allard and I will develop a curriculum based on the Virginia Standards of Learning (SOL) and Program of Studies (POS) standards for the students. The students will range from kindergarten to sixth grade, with each grade having a unique curriculum. Not all of the elementary school students will be participating in this project however. Mr. Allard has a list of kids that he think would do best in a program like this, and the participants in this project will be limited to the people he has selected.

2   Background

The task of educating the younger generations about programming has been attempted before. The first attempt to create a kid-friendly programming language was Logo, made by Wally Feurzeig and Seymour Papert. This programming language mainly involved telling a turtle how to move around in order to make various pictures with the turtle's "pen." Since then, multiple programming environments and languages have come about to try and engage not only youth but also girls in computer science and programming such as: Squeak, Alice, and Scratch.

Despite the bountiful number of tools that modern technology gives us for teaching students, little progress has been made for teaching computer science at the elementary school level. The necessary technology is present in the schools, but it is only being used to reinforce outdated teaching methods. Currently, computers are mainly being used as a medium to transfer information, much like a television. Computers have so much more potential than that. They should be used as a universal construction material, not as a TV screen. Programs like Scratch enable kids to create whatever they want to all by themselves. Children learn better by immersing themselves in whatever they're doing, rather than just listening to a teacher telling them what to do (Papert, 1993).

The goal for this project is to establish something akin to a Computer Clubhouse at Cardinal Forest Elementary School. The original Computer Clubhouse was started by the Massachusetts Institute of Technology in Boston in 1993 to "provide more young people with the opportunity to become digitally fluent." (Resnick, 2002) At these clubhouses, kids and older youth "become designers and creators with new digital technologies. Clubhouse

members use leading-edge software to create their own artwork, animations, simulations, multimedia presentation, musical compositions, websites, and robotic constructions." (Resnick, 2002) I want to start a computer science program at Cardinal Forest where students can think for themselves and create whatever they can imagine.

3 Development Sections

3.1 Timeline

This project will take place in two main phases: preparation, and execution. During the preparation phase I will meet with the principal, along with Mr. Allard and Mr. Latimer, in order to get my project idea approved for her school. Once this is done, permission slips and information sheets will go home to the parents of the students that have been selected for the program by Mr. Allard. Once all of the paper work has been sorted out and Mr. Allard and I have something of a curriculum together, we can begin the actual execution of the project. Hopefully this will start as early as January.

3.2 Resources

The laptop based computer lab at Cardinal Forest Elementary School will certainly be sufficient for this project. It has 20+ laptops and a teacher workstation that is connected to both a smart board and the TV monitor for presentations. Mr. Allard will install the program Scratch on the laptops at the school. Scratch will serve as the chief programming language for this project. The idea of teaching a little html has also been thrown around (for example, having the students create websites with links to their scratch projects), but nothing is really concrete yet.

3.3 Restrictions on Study

The most pressing restriction for this project is time. Seeing as how I am still a student, it is difficult for me to be at Cardinal Forest during the school day. This limits possible meeting times (when they don't conflict with either Mr. Allard's schedule or my own) to before and after school. This of course carries with it the problem of transporting kids either to or from home, seeing as how

elementary schools don't have late buses. Despite these time restrictions, I have full faith that a computer club will be possible at Cardinal Forest and that the research project will be successful.

3.4 Reporting Results

To put data into a chart or graph for this project could be difficult, unless something of an assessment is offered to the kids at one time or another. Mr. Allard and I are reluctant to give such an assessment because we're afraid it could discourage some of the kids from participating in the program. He and I will come up with a way to document the progress of the students. The data generated from this experiment will most likely be fairly subjective, based on my experiences with the elementary school students, and this would be rather difficult to simply place into a graph.

4 Results and Discussion

As mentioned before, I hope that this research project will yield good results that would encourage the implementation of a simple computer science curriculum at the elementary school level. The earlier that kids can start to program and become interested in programming, the better. The computer has the potential to start a digital revolution in learning, and I hope that I will be able to demonstrate this through my project.

5 Bibliography

Papert, Seymour. The Children's Machine: Rethinking School in the Age of the Computer.

New York: Basic Books, 1993.
- - -. Mindstorms: Children, Computers, and Powerful Ideas. New York,

Basic Book, 1980.
Resnick, Mitchel. "Rethinking Learning in the Digial Age." The Global Information Technology

Report: Readiness for the Net-worked World. By G. Kirkman. Oxford,

UK: Oxford University Press, 2002. 32-37.