Scratching the Surface: Third Grade Programming
TJHSST Senior Research Project
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Nick Grippin

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Abstract

The goal of this project is to successfully mentor elementary school students in the use of various techniques that Scratch programming allows. These techniques can be as relevant as technology and math, or go as far as teaching literary topics. This project/mentorship will involve traveling to Cardinal Forest Elementary School for an hour every Thursday to help teach kids in the basics of using Scratch.

Keywords: elementary school, Scratch

1 Introduction

Programming involves several concepts that most high school students take for granted, such as certain math skills and a background in problem solving. In order to successfully teach the Scratch language to students in third grade, they must first learn basics in logic, as well as understanding the coordinate plane, negative numbers, and algebra. After these skills are developed, students may then begin to piece together programs that will be fun, educational, and easy to learn. Through this mentorship, I will be designing lesson plans, to figure out which is the best way to present information to the students.

2 Background

In the previous two years, students have already done several research projects in this area. Jessica and Crystal worked at Cardinal Forest last year, and helped students learn the mathematical techniques that the students will need to know. This will mainly include the coordinate plane, which will require us to first demonstrate the use of negative numbers. The previous students spent the first two months teaching these topics in order for the students to appropriately use the Scratch program. After this, they spent several months working on a basic program involving a snowman in order to practically apply these skills in the Scratch program. The last part of the class was devoted to individual games of the student's choice, with the help of Jessica and Crystal to mentor the students in any other aspects of the language they needed to know.

3 Theory

Scratch is a visually based programming application developed by MIT that allows users to click and drag simple, color-coded sections of code into the script area. Through the use of these codes and "sprites", the visual aspect of the program, a user may make simple games, stories, and other programs. Scratch is different from Alice in one major, easily noticeable aspect: Alice is a 3D-based program, requiring students to not only understand a coordinate plane, but also the third, or z, dimension. This is normally not introduced to students until eighth or ninth grade. Scratch is only in two dimensions, and will therefore be much easier to teach kindergarten through third grade students.

4 Tests or Analysis

Currently, Amanda Gilbert and I are traveling to Cardinal Forest Elementary every Thursday in order to teach or assist the class. Due to difficulties in scheduling, I am only able to be at the school for the first half of the third grade Scratch class. While this does allow me to introduce myself to the students and get a lesson started, I can never see it through to the end, which causes some difficulties in discovering the results. The results I have seen from my first two trips have had both expected and surprising results.

5 Expected Results

If all goes well, the project will end at the end of the year with the students completing a relatively complex final project. The students will have an advanced understanding of the coordinate plan, as well as a more complete sense of the SOL topics we focus on throughout the year. The students will also have an outlet for creativity and restlessness, since the class requires a lot of innovation and outside-the-box thinking. Since programming is not often taught to elementary students, this project will hopefully spread to other schools as well, allowing students to have a broader base in programming before they reach high school. Students with an introduction into technology early on will probably develop more interest in the area, and hopefully pursue this interest in their high school career.