

Studying the Effectiveness of Storytelling Alice
in Teaching Programming Concepts to
Elementary School Children
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Amanda Gilbert

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Abstract

I will be working with students at Cardinal Forest (mostly girls in the 4th grade) to observe how well young children are able to grasp basic programming concepts presented in Storytelling Alice. I will be presenting the concepts through material that corresponds with the English and Mathematical standards as determined by the Virginia Standards of Learning. The end goal will be to measure the success of students in attempting Python after a successful Storytelling Alice background. This will show whether or not the students are developing a strong foundation in computer science from Alice.

1 Introduction

Though many people have studied drag-and-drop programming environments like Alice and Scratch, none have looked at the transition from this child-friendly environment to one that requires the user to type in their own code. Another problem this brings forth is the transition from a graphical environment (in this case Alice) to one like python that is not centered on

graphics. Transitioning to Python will require a high ability of individual thinking from the students that must be acquired both from their work with Storytelling Alice and with the work done in the classroom. The transition to Python will not begin until the fourth quarter. Until then, I will be assessing their capabilities and their understanding of concepts to separate those who will be ready for python and those who will not be. At the same time, it is important to remember that Storytelling Alice and English concepts are very compatible. Therefore, I will be emphasizing the Standards of Learning for English in class.

2 Background

Storytelling Alice was created by a student at Carnegie Mellon University named Caitlin Kelleher. Last year, two girls did a research project at Cardinal Forest Elementary but focused on Scratch programming. This year, Mr. Allard decided to add Storytelling Alice as another language for students to study and I have been put in charge of the mentoring program for this language. This is the first year we will be testing Storytelling Alice at Cardinal Forest Elementary. However, it is not the first time Storytelling Alice has been used to teach young children to program.

Kelleher was interested in developing Storytelling Alice for many reasons. In her PhD dissertation, she recognized how important diversity is in the field of computer science. She felt storytelling Alice could help attract middle school girls to computer science and geared her language toward that group. Kelleher mentioned a study that found that boys' and girls' ideal technologies were significantly different. Because of this, having a more equal ratio of girls and boys in the field could drastically change the course of technological development.

One article I read about Alice programming dealt with girls and their ability to use a variation of Alice- Storytelling Alice- to learn programming. The article stated that girls have the same ability as boys do to program. This was encouraging for my project because not only am I a girl interested in programming as a career, I hope to spark an interest in programming in the girls I mentor. These researchers also stated that there were many reasons why girls were less likely to choose to pursue a career in programming. Not only are there social norms that encourage boys to program and not girls, at the middle school level, girls confidence in their abilities relating to math and

science becomes deflated. This is actually a very promising fact for our study. Because we are working with Elementary School students, not only are we able to encourage programming for girls before they reach middle school level and lose confidence in science-related subjects, we are also working with them at an age when they are unlikely to know about social norms in programming. Hopefully, Alices easily understood set up will help give girls confidence and Alices storytelling nature will be attractive to girls.

Another article I read simply studied Storytelling Alice and game making. Both articles mentioned that Alice is very successful in teaching algorithmic thinking and basic programming language and syntax to children. A third article I read discussed the difference between teaching programming with Storytelling Alice and other gaming centered programming languages. Because the gaming community is predominately male, a programming language with a gaming nature would be more attractive to males than females. Storytelling, however, is attractive to both males and females and, if taught at an early age, could help equalize the number of boys and girls interested in programming.

There are other benefits to using Storytelling Alice. Concepts that are hard for first-time programmers to understand like variables, parameters, and loops have to be introduced through assignments in other languages. In Alice, however, they are incorporated into the foundations of the language. This could save time in introduction to programming and could help beginners learn more advanced programming techniques at a younger age. Another great thing about Storytelling Alice is that due to its visual nature, parents and peers that do not know how to program can truly appreciate the codes created because they can watch the success through a video-like presentation.

3 Procedure

Due to its appealing 3D graphics and ability to create games and stories easily, Storytelling Alice is an attractive language for teaching young children. Like Scratch, the only coding involved is dragging methods from a list of methods already given in the program. Alice will be reserved for the older and more experienced students because it is harder than Scratch due to the 3D nature. Alice is a very visual programming language. Therefore, the users testing will simply be watching their program run and observing it to make sure it worked as intended. Currently, I have been interacting one

on one every Tuesday with the children. Some of the children have problems writing or tend to misbehave in other classes. These children were targeted for Alice so we could help them become better writers and students. So far this year, we have worked on three major projects that each target different programming concepts. The first taught the children how to create a world. In Storytelling Alice, creating scenes for which your characters to interact in is an imperative skill to learn. Next, we created a simple method that involved two control statements– 'do in order' and 'do together'. After this project, the class took a quiz that combined what they had learned and expected them to write out the code on a piece of paper, further testing their ability to write code and visualize outcome without the drag-and-drop environment. Many of the children were able to successfully complete this quiz. I explained values to the children next. In Alice, the four values include Numbers, Booleans, Strings and Objects. To my surprise, after using examples from previous projects, the children were able to understand the concept of values very well and were able to continue using and understanding values throughout future classes. The current project we are working on involves the while loop and is proving to be rather difficult. The students were able to use their knowledge of other control statements and methods to transition from a story to a program. We began with a simple story and determined the setting and the list of characters. This allowed us to create our scene and add objects. Finally, we used the written story as a guideline for our program. During the third quarter, we will continue doing small and big projects alike. There will also be quizzes to test their understanding of concepts. The pace will continue to be very fast because of our eventual goal to teach those who are ready to program basics in Python.

4 Expected Results

I expect that at the end of the year, I will have been able to provide the students in my class a clear understanding of Storytelling Alice. I hope that I will be able to encourage girls to continue a career or at least continue classes in programming. I hope that I will be able to spread my love and knowledge of programming to young girls and help break the stereotypes of men in technology. My biggest hope is that the students leave the class with a deep understanding of algorithmic thinking and problem solving through Alice and that the students are proud of their accomplishments and projects.

I hope they also leave with an enhanced love of programming. The major goal for the year is to work with those students who grasp Alice well and teach them python. Studying their success will tell us a lot about the effectiveness of Alice in preparing children for a career in computer science.

References

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