Teaching Algorithms and Growing STEM with Sphero

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Introduction

The media presents the idea of a programmer as a speed typing super genius who learned how to code when they spoke their first words. In reality, the average coder learns the basic concepts of coding in their late high school to early college years. When people think of IT jobs, they think of monotonous cubicle jobs. However, IT jobs vary in concept, enjoyment, and environment. In order to break this misconception, we will be demonstrating in this workshop how programming doesn't have to necessarily be data analytics and cubicle work.

The Information Technology field offers more fulfilling careers such as: penetration testing, game development, or app development. The Technology Ambassador Program, TAP, strives to break this misconception by providing resources for IT students. TAP students use their programming knowledge and provided resources to create enjoyable, interactive workshops for K-12 or beginning college students [2]. Some TAP workshops include basic game development using Scratch, programming robots like Cosmo, or creating unique 3D models using TinkerCad. In this study, students will have the opportunity to play with a robot while learning the basics of coding which has produced good results in previous workshops as shown by the reactions of those students such as "I am severely allergic to technology, so I was uncomfortable at first. I warmed up a bit during the first activity (playing around with BOLT)....Students could benefit from Sphero Activities… [1]"

Methods

We will be using the pedagogy of integrative approach to teach the students throughout this workshop. In order to demonstrate this idea, we will be using Sphero to educate students in the concept of algorithms.

Sphero EDU [3] uses block coding, so we will be able to teach both basic and beginner level concepts of coding such as: algorithms, while-loops, if-statements, and methods. Our presentation will consist of a demonstration of the capabilities of Sphero and block coding, and then the workshop will transition to an interactive guided maze route that the students will program Sphero through.

Our goal within this portion of the workshop is to educate students on beginner-level programming concepts. In order to pique their interest in STEM programs and careers, we will conclude our presentation with an interactive demonstration of Sphero paired with Leap Motion and a WiiMote. The participants will be provided the opportunity to operate Sphero using the motion capture capabilities of Leap Motion and the infrared sensors of the WiiMote.

Results

We are currently in the process of finalizing our project design and implementation. Using this project, we plan to perform outreach at several venues: a TAP Expo event at our college, where the audience will be college students, a Super Saturday Series (S3) event, where the audience will be mostly middle schoolers, and 3 classroom workshops at GGC, where the audience will be students enrolled in General Education courses who are new to technology.

The participants of each of our workshops will take a pre-survey asking the participants questions relating to this misconception and previous IT experiences or knowledge. After the workshop, they will be given a post-survey asking whether they have gained a new viewpoint or interests within the field. The survey will also ask if the workshop was adequate in educating them on various coding concepts. We plan to analyze these pre and post surveys and study the effectiveness of our workshops. We will present our findings on the poster.

References:

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2. Daniel Redder, Joel Garcia, Nikki Mehdikhani, Patrick Page, Anca Doloc-Mihu, Cindy Robertson (2019). "Applying an interactive learning style to teach Programming Fundamentals through a familiar activity". Proceeding publication at CCSC:SE meeting, Oct 24-26, 2019, Auburn, AL. http://www.ccscse.org/research_contest/Addendum2019.pdf
3. Sphero Edu website, Sphero Inc., accessed 22 September 2023, <https://edu.sphero.com/sphero/home>