**Using Technology to Create Synthetic Instruments and Engage Students While Teaching Algorithmic Skills**

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Our team, in conjunction with the Technology Ambassadors Program (TAP), have been researching ways to improve technological literacy and comfort with computer code. By adopting Makey-Makey and Godot Technologies, we hope to create an interactive project that engages and teaches students. TAP is a school program that was created with the intention to provide students with a better understanding of technology and software. By showing students that programming can be practical and logical, we will encourage more people to strive for an IT major. As the mystery of programming and the links between the physical and computational realms shrink, we here at TAP aim to encourage interest in numerous technological fields.

Despite students in the world becoming more dependent on technology, there is a majority view on programming as intimidating and too difficult to understand. However, movements such as Hour of Code, which is still ongoing and has great outreach to teach students the basics of logical flow in coding, have proven that by exposing students to programming concepts through simple and engaging projects, they can let go of these misconceptions and open themselves to the world of programming and technology.

Our Synthetic Instrument project was created with a similar approach in mind while being far more interactive. A common issue when teaching students about programming is that programming doesn’t feel practical or tactile; an easy way to improve the learning experience is to bring it into the physical world. Makey Makey, a simple circuit completing device which allows everyday objects to replace keyboard keys, allows students to interact with programs in basic but engaging ways. By allowing students to physically build an instrument using the kit and various conductive materials, they will have the creative freedom to design and play these instruments in whichever manner they choose. Each group of students will get a Makey Makey board, which has electrical inputs for wires. Copper wires, aluminum foil, coins, and metal pieces will be used to conduct the input from the students to the program in Godot which we developed to play sounds.

The Godot game engine, which uses GDScript- a programming language similar to Python- is what we will use to accept inputs from the synthetically created instruments then play sounds to the user. The engine is lightweight and will allow us to present easily to students how to manipulate the code and how to run it. By using simple visual elements to represent the movement of each note, the player will feel more in control of the sound. The Theremin is an instrument that was created relatively recently (1928); it is an odd instrument that uses the distance of the player's hand to the antennas to produce sound in an analog way. We want to inspire students to think in creative ways of playing instruments, and producing sounds.

With the Makey Makey, our team aspires to bring the appeal of tech to be applicable to any individual. Students will learn how to utilize GDScript instructions by directly interacting with the code. This project is designed to teach algorithm skills to non-tech students in an engaging and interactive format. The main goal is to easily attract students to the wonders of technology. The Makey Makey allows for students to have a variety of choices in terms of keyboard inputs for the six sounds they choose to use. Each sound comes from prerecorded and prepared audio clips from different base instruments; students will have the ability to creatively mix and match these sounds to create their own unique instrument. They will also be able to increase and decrease the pitch of their chosen sounds.

Using an understanding of basic music theory and instrumentation we want students to create new and interesting ways to play instruments, working with shifting pitches and speeds using devices that have limited input capabilities. Students will be paired in groups of two or three and given a laptop, a makey-makey board, and a set of materials to create and wire a synthetic instrument. Students will receive a demonstration and instructions, which will guide them through the process of coding and building their instruments. We will guide students to programming and playing their own synthetic instrument, exposing them to how game engines run, and simple electrical engineering principles.