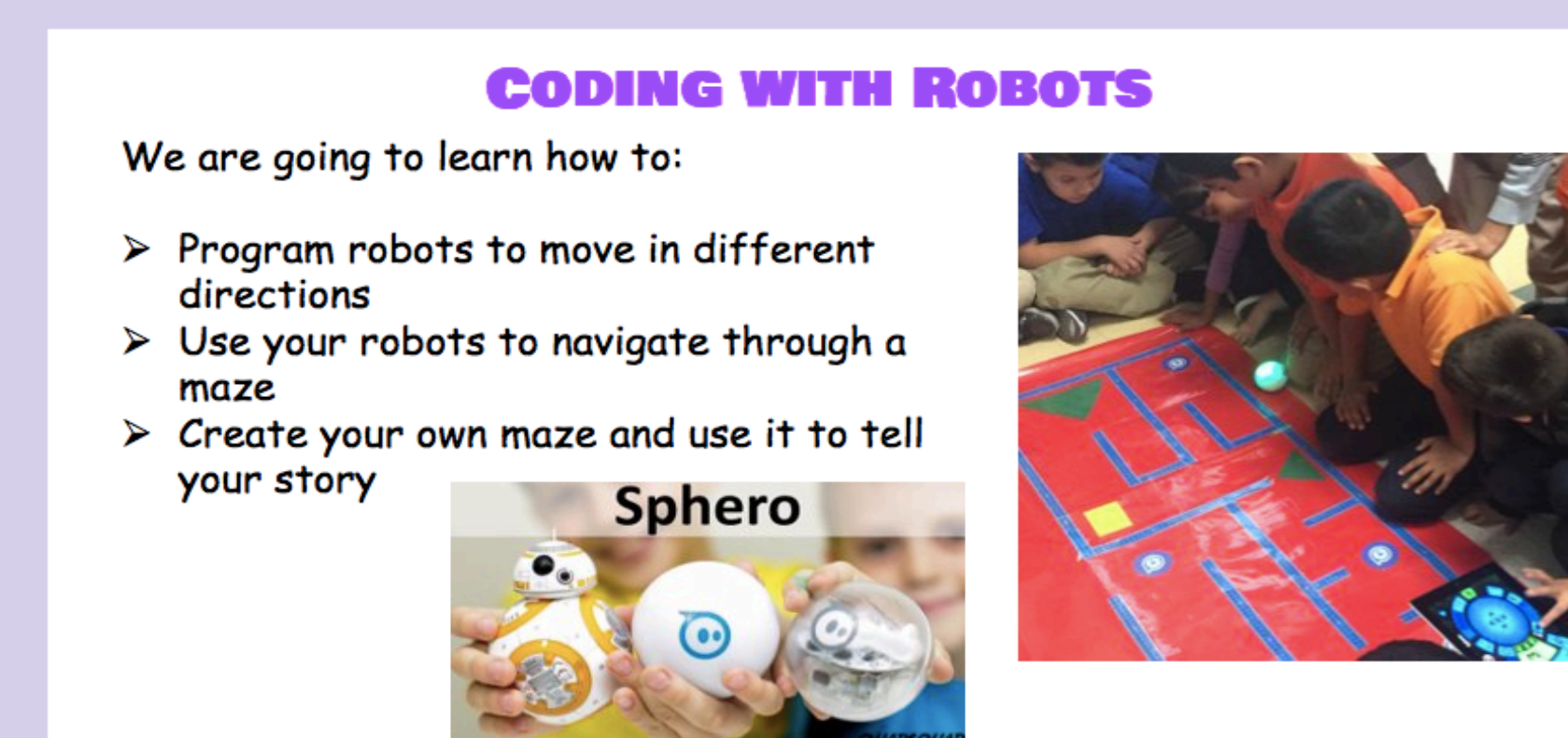


## BACKGROUND

- ❖ The research team decided to use informal learning spaces, such as the STEAM camp to provide access to learning STEM curricular content in an environment that is more inclusive and welcoming of students' culture and background.
- ❖ Informal learning spaces create an environment where students are able to "participate in learning under their own terms [and] allows for the mitigation of oppressive conditions found in formal school experiences" (Aghasaleh et al., 2019, p. 34).
- ❖ Informal learning can be described as "self-motivated, voluntary and guided by learner's needs and interests" (Dierking et al., 2003, p. 109).
- ❖ Informal learning environments can allow students to integrate their cultural experiences within their learning.

## EXAMPLES OF STEAM CAMP CURRICULUM



**CODING WITH ROBOTS**

We are going to learn how to:

- Program robots to move in different directions
- Use your robots to navigate through a maze
- Create your own maze and use it to tell your story

**Sphero**

Fig 1. Students were tasked with designing their own maze and programming the Sphero robot to navigate their maze.

## Dream Place with 3D Objects

Include specific items, objects or symbols that reflect your background and culture.



Fig 2. In Cospaces Edu (digital animation software), students were asked to create their dream place using virtual technology. They were encouraged to create this space by incorporating elements of their culture and background.

## INTRODUCTION

This research study was designed to focus on what factors can contribute to the successful integration of STEAM (Science, Technology, Engineering, Arts, Mathematics) education programs for BIPOC (Black, Indigenous, People of Colour) students within the community. Due to many barriers, there are disproportionate amounts of BIPOC students who are choosing careers outside of STEM fields (Quattrini, 2021). Adapting the way in which STEAM education is taught to BIPOC students is critical in not only encouraging participation among these students but increasing educational outcomes. The goal of this study is to determine which factors are contributing to the lack of engagement among BIPOC students in STEAM education and how educators can mitigate these factors. Students learning can be enhanced significantly through the incorporation of prior knowledge (Howard, 2021). Cultural experiences are fundamental in the development of a student's prior knowledge which can ultimately assist in encouraging students to participate and have positive learning experiences (Howard, 2021). Gay (2018) argued that culturally responsive pedagogy is crucial in creating effective learning environments. Recognizing students' cultural experiences as a necessary part of learning can ultimately create learning spaces which are more effective. The STEAM camp curriculum was designed to incorporate student culture within the educational content. Students were encouraged to utilize their cultural experiences as a framework for creating and designing different physical and digital artifacts (see Figures 3, 4 and 5).

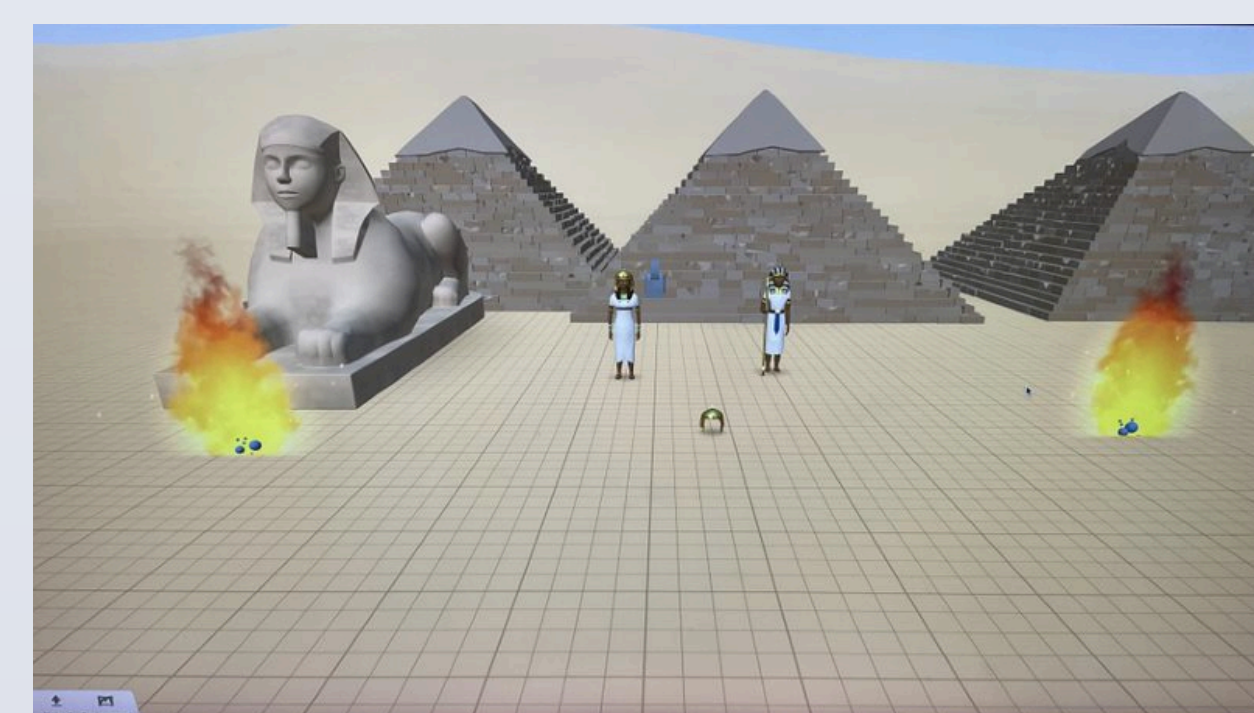


Fig 3. In Cospaces Edu, students created a virtual space where they were able to use cultural influences within their unique designs.

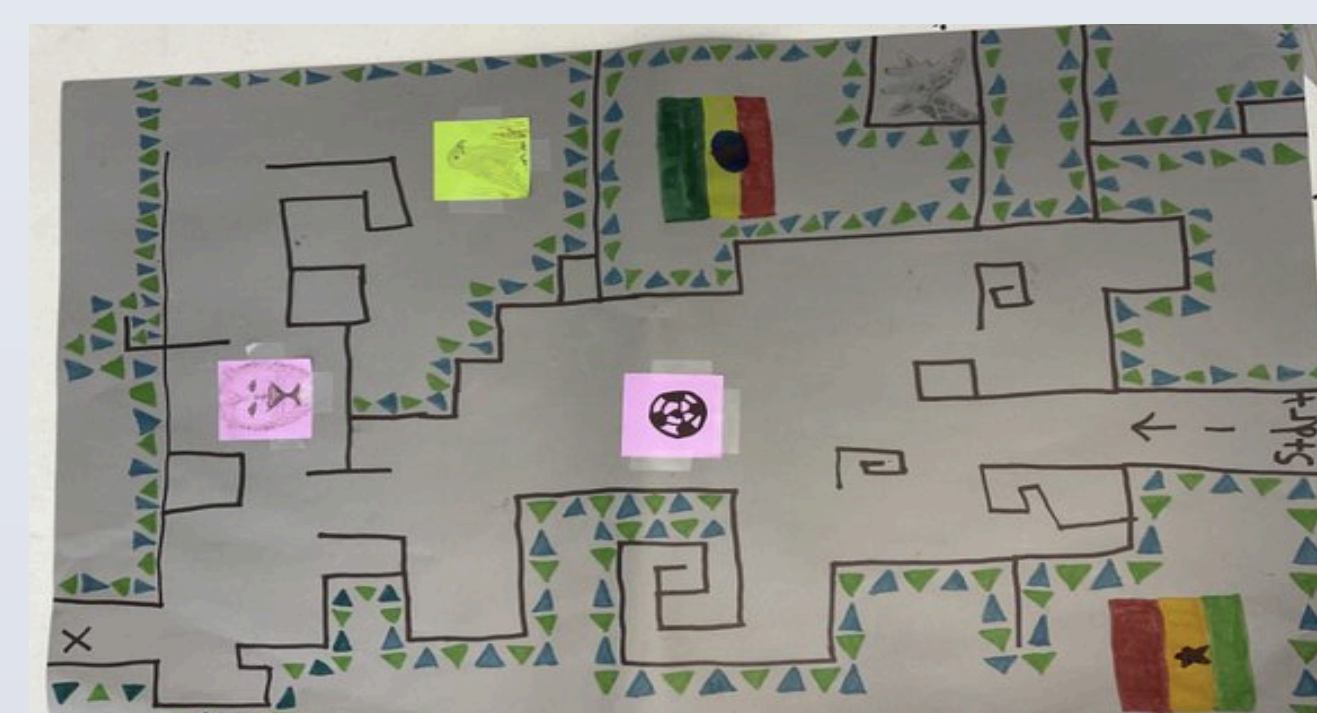


Fig 4. Students were tasked with designing their own maze which was reflective of their own culture and identity. Then, they programmed Sphero robots to navigate their maze.

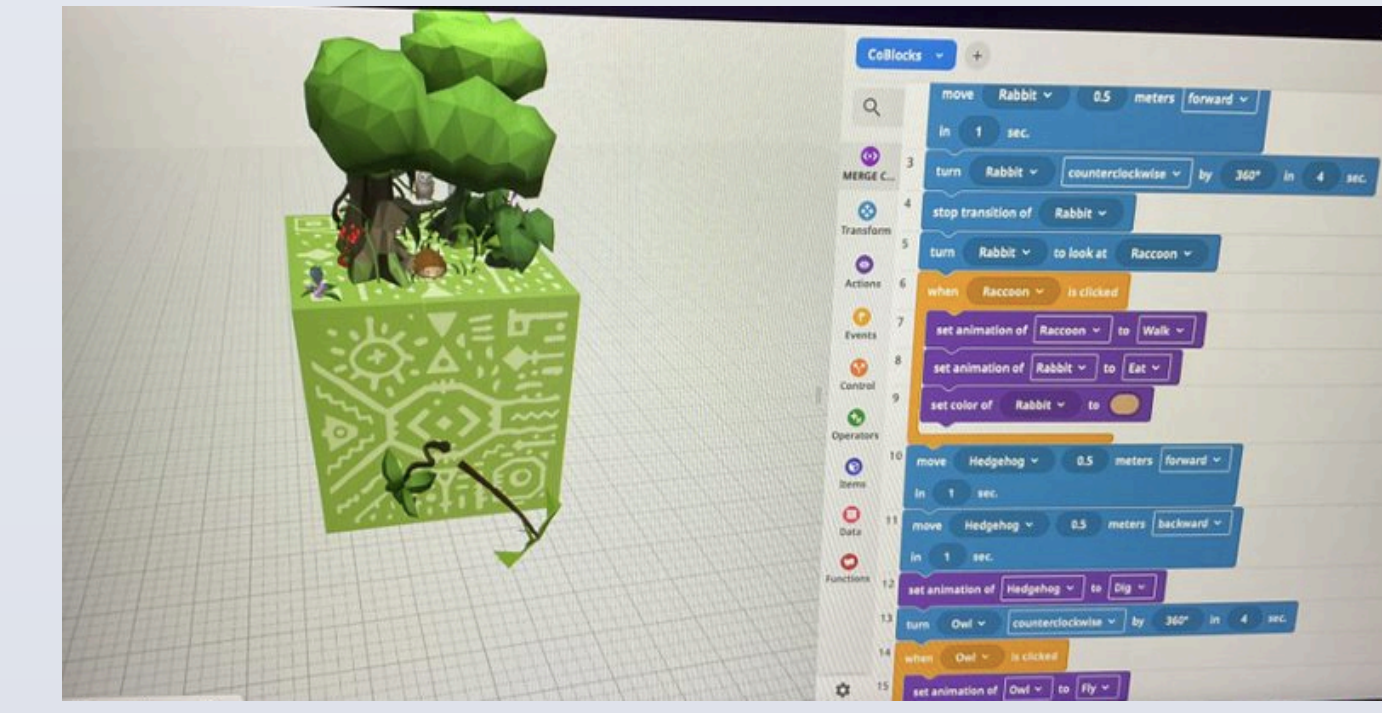


Fig 5. In Cospaces Edu, students digitally created designs to project onto a Merge Cube. They coded animations for the objects they used within their design.

## CONTRIBUTION TO RESEARCH STUDY

- ❖ I was involved in the preparation and facilitation of two STEAM camps in August 2022. One camp was for BIPOC students and the other camp was for all students.
- ❖ I had the opportunity to participate in the development and design of camp curriculum. We determined which digital technologies would be a part of the camp activities and how we could create culturally responsive activities to complement the use of this technology.
- ❖ I contributed to active observations of students while they participated in the camp. I observed students' behaviour, attitudes, and engagement with the technology and recorded these observations.
- ❖ I assisted in capturing photos to be used as part of the evaluation for the camp for BIPOC students and part of the research analysis for the camp for all students. I took photos of lessons, student participation, and student creations.
- ❖ I helped teach the material to the students and assisted them with a variety of tasks.

## OBJECTIVE

The purpose of this study is to help mitigate the effects of systemic barriers to science, technology, engineering, arts, and mathematics learning. Through after school programs and summer camps, we are trying to reduce these barriers and provide access to BIPOC students.

## RESEARCH QUESTIONS

1. What are the factors contributing to disproportionate advancement of BIPOC students in STEM fields?
2. How can educators mitigate the factors associated with lack of student engagement in STEM education for BIPOC students?
3. How can educators design curriculum to enhance student participation and achievement for marginalized students?

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