

STEM OF THE ARTS: INCORPORATING ART INTO STEM FIELDS

by

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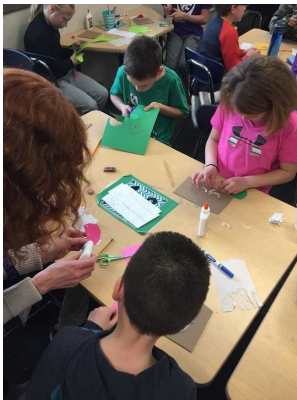
## **Abstract**

Throughout this research project, we explored how arts can be intertwined into the STEM field. Collectively, we planned, created and facilitated three activities that centered around different styles of art-specifically the areas of art, music and dance. Our goal was to express to students how art and STEM can be used together and prove STEM is needed in areas of art.

We conducted this research at Woodrow Wilson Elementary and various STEAM nights throughout the USD 383 school district. At the beginning of each activity, students were given a survey asking, “What is STEM?” and “Could art be a part of Stem?” Students recorded their responses before beginning the activities. The first activity we facilitated focused on incorporating art into STEM. Fourth-grade students were given the opportunity to let their imaginations run wild by using static electricity to make their creations come to life. Students were given a variety of materials (cardboard, tissue paper, markers and glue) to construct a “movable” project. After they finished, they were given balloons to explore how static electricity could make their art alive. The second activity we implemented centered around integrating music into STEM. Fifth-grade students used iPads to explore the Tynker App and create choreographed dances. Students activated their prior knowledge of coding to design a character and code it to create a dance. The third activity we conducted focused on incorporating music into STEM. Sixth-grade students were given a Makey Makey and asked to create a song utilizing their understanding of circuits. Using alligator clips, students were able to connect to a conductive material (bananas) and control their circuit boards. They were able to investigate how closed circuits worked in order to appropriately make the Makey Makey work. After each activity, we gave the students another short survey with the following two questions, “Could art be a part of STEM?” and “If so, how?” Before the activities, 80% of students stated that they could see art being a part of STEM. After facilitating each activity 90% of the students said they thought art was a part of STEM.

## Overview

As members of the University Honors Program and Secondary Mathematics Education, we (Rachael Duden, Kaylee Gunzelman, and Robin Daniels) teamed up to study how the arts are incorporated into the STEM fields. We previously participated in USD 383 Family STEAM Night and watched the events evolve from a focus on science, to STEM, and now STEAM. We wanted to step into the classroom to see firsthand how students view STEM in the classroom and in the world around them. We chose to each focus on either music, dance, or art and created and facilitated an interdisciplinary activity to join STEM with art in a unique way. Activities were conducted in a STEM classroom at Woodrow Wilson Elementary school with 4<sup>th</sup>-6<sup>th</sup> grade students as well as at Family STEAM Night at Northview Elementary with 3<sup>rd</sup>-6<sup>th</sup> grade students.



### Static Electricity Art

Fourth-grade students let their imagination run wild while learning the science behind static electricity in this activity. Students shared their experiences with static electricity, watched animated protons and electrons interact, then chose a "movable" project to create. After cutting, gluing, and decorating, projects came to life. Students charged balloons by rubbing them in their hair, then hovered the charged balloon over their project as the tissue paper lifted to touch the balloon and restore electron balance.

### Tynker Choreography

Fifth-grade students used the Tynker App on iPads to choreograph a dance for the characters in the app to make. Students were given the opportunity to collaborate with a partner or work individually to code a program that would allow their character to do the dance of the students' choice. Choreographed dances ranged from the moonwalk, Michael Jackson's "Thriller," dabbing, and more!

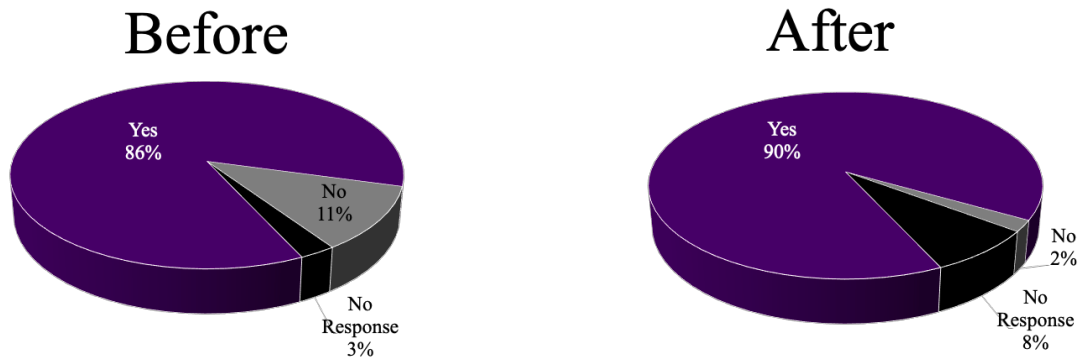


### Makey Makey Music

Sixth-grade students explored electrical circuits by utilizing a Makey Makey. Students worked in groups of six to seven to create music via the piano Makey Makey website on a computer. Using the alligator clips students were able to connect to a conductive material (bananas) and control the circuit board. Their final products ranged from creating scales to recreating the tune "Baby Shark."

## Research Results

We used a survey with students to record their thoughts about art as a part of STEM both before and after participating in our activities. For qualitative feedback, we asked students to define STEM, encouraging them to think beyond science, technology, engineering and mathematics. For quantitative responses, we asked students, “Could art be a part of STEM?” We broadly defined art as anything from music, dance, painting, or drawing.



## Student Responses

The following are student responses that we gathered from the survey results:

“STEM is not something that you can figure out super fast.”

“STEM is a subject that teaches you science, technology, engineering, and math. It will be an important skill to have in life.”

"Art is something beautiful, and STEM is beautiful.”

“It is something that you have to keep persevering and having ideas!”

“STEM is a type of program where you use technology and ideas to build structures, robots, or some things from your imagination and make the world a better place.”

“STEM is using your imagination to be able to create something. A kid’s mind can create things that adults can’t.”

## Modifications

After facilitating the three activities at Woodrow Wilson Elementary, we attended three different Family STEAM nights in the Manhattan community and led some, if not all, of our activities at these. However, leading these at STEAM nights compared to in the classroom created some modifications. In order to make these activities flow smoothly at the STEAM

nights we had to facilitate the activities in 20-minute periods (open-house format). Another modification that we implemented was we included additional resources to help students better understand the STEM behind each activity. We also utilized more individualized instruction during the STEAM nights as students worked at their own space. In order to allow each student to be able to interact with all of the activities, we also created the activities to be less structured and more exploratory in nature. Based off of our experiences, the modifications worked well in creating a space for all kids to be able to learn how art is incorporated into STEM.

## **Looking Towards the Future**

The following are ideas that we hope to implement:

### 1) Woodrow Wilson

Ms. Asbury, Woodrow Wilson STEM teacher, plans to continue implementing these activities in her classroom in further years. She has never used the Makey Makeys nor done the static electricity art. And even though students in the STEM class have utilized Tynker, she found the Tynker Choreography to be a fun activity for students to work on.

### 2) Manhattan STEAM Nights

These activities will be used in STEAM nights when possible. However, we hope that with these activities, people are more aware of Art in STEM and will continue to support activities that implement the arts.

### 3) Our Future Classrooms

Through this project, we have found many ways to incorporate STEAM into our classrooms. We see the benefits of providing students the opportunities to explore STEAM.

## **Final Analysis**

Rachael Duden

“I was very excited to continue working in the STEAM field for this project. I have loved helping to coordinate Family STEAM Nights with the Manhattan elementary schools for the last few years. This was the perfect opportunity to develop new activities focused on incorporating art into the STEM field. I wasn’t sure how students would respond in transitioning from STEM to STEAM, especially since many of the students have a STEM elective class at school. However, the students blew me away with their creativity and willingness to share. It was fun to hear them tell stories of where they have experienced static electricity and also help them brainstorm what to make for their project. I had sample projects made, but they stepped way out of the box, making fantasy characters such as three-eyed- hot dog monsters, and avocados with legs, to majestic animals such as jellyfish and crocodiles. I hope to incorporate interdisciplinary activities into my future math classroom. Projects like these help students to learn in a more authentic real-world way. I am thankful for this fun learning opportunity, and I hope STEAM activities continue to flourish in classrooms throughout Manhattan.”

Robin Daniels

“I chose this activity because I have seen a spike of interest in creating and analyzing music. Many students do not realize how much STEM goes into producing music. Thus, I was excited to see how the students would react when they realized what they were learning in school could be applied to their lives in a unique way. I was interested to see how the students would interact with the Makey Makeys. I expected them to have heard of electrical circuits but was unsure how in-depth their knowledge was. During the activity, I was surprised by how much they knew and how creative they were with their responses and conversations with others. The music that they created was extraordinary. Students were helping other students to understand the concept by explaining why the Makey Makey would not work if they were not grounded or did not have a closed circuit. It was encouraging to see the students engaged and interested throughout the entirety of the activity. In our after-discussion, many students came up with amazing ways that they see STEM being integrated with music. A few responses included plugging in an electric guitar, producing music in a studio, movies, radio, etc. Based off of the results and responses, I will definitely be utilizing some of these ideas in my future classroom. Allowing students to see how different disciplines are connected gives students the opportunity to make sense of the subjects more. Activities like this one allow students to engage with the material in a real-world manner and I will be implementing these types of activities as much as possible in my up-coming classroom.”

Kaylee Gunzelman

“I participated in Family STEM/STEAM nights in the Manhattan community the past couple years. I had a great time, and learned a lot, and I knew I wanted to conduct my honors project with some aspect of STEM. Being an education and math major, I have always been intrigued by the STEM field and was hoping to relay this to younger students. I became aware that many elementary schools are creating a STEM classroom that allows elementary students to develop an understanding of STEM at an early age.

I had the area of dance for my activity. I was really excited because I did dance for many years growing up. However, I had a little difficulty crafting an activity for elementary students that was feasible to do in a 45-minute period. After speaking to some fifth-grade teachers, they mentioned the Tynker App on iPads in which allows users to code different characters. I realized I could have students program their characters into dancing. Although I was unsure how this activity would go, I was absolutely amazed by the creativity these students possessed. I personally never had coding experience until college and so seeing elementary students making programs and deciphering codes, etc. was inspiring. Having the opportunity to spend a day a STEM classroom was great and it made me realize how much education is evolving. Keeping this in mind, I know in my future classroom I want to incorporate as much STEM into my lessons as possible. Not only are students more engaged with this, but also it helps students be prepared for the evolving society.”

## **Acknowledgements**

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