



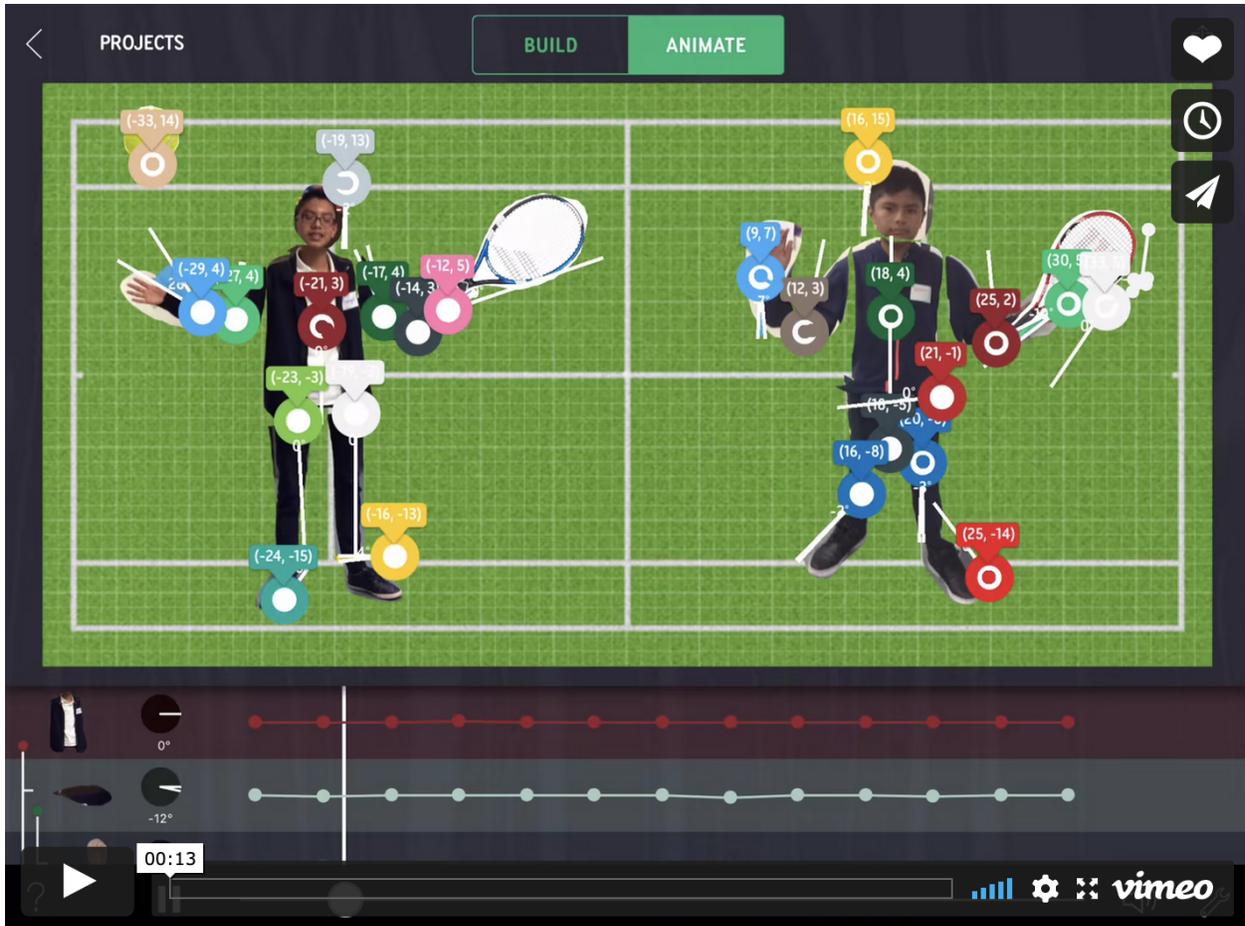
Digital Design for English Language Learners: Andre Case Study

Documenting the diverse stories of English Language Learners was an important part of the Digital Design for ELLs project. Students came in with a variety of backgrounds in mathematical knowledge and in English language proficiency. Some self-identified as persons who enjoyed math and others voiced their everyday struggles in the classroom. These case studies show the possibilities for English Language Learners when using NYSCI's Noticing Tools™ alongside multimodal learning experiences that were developed and tested in NYSCI workshops.

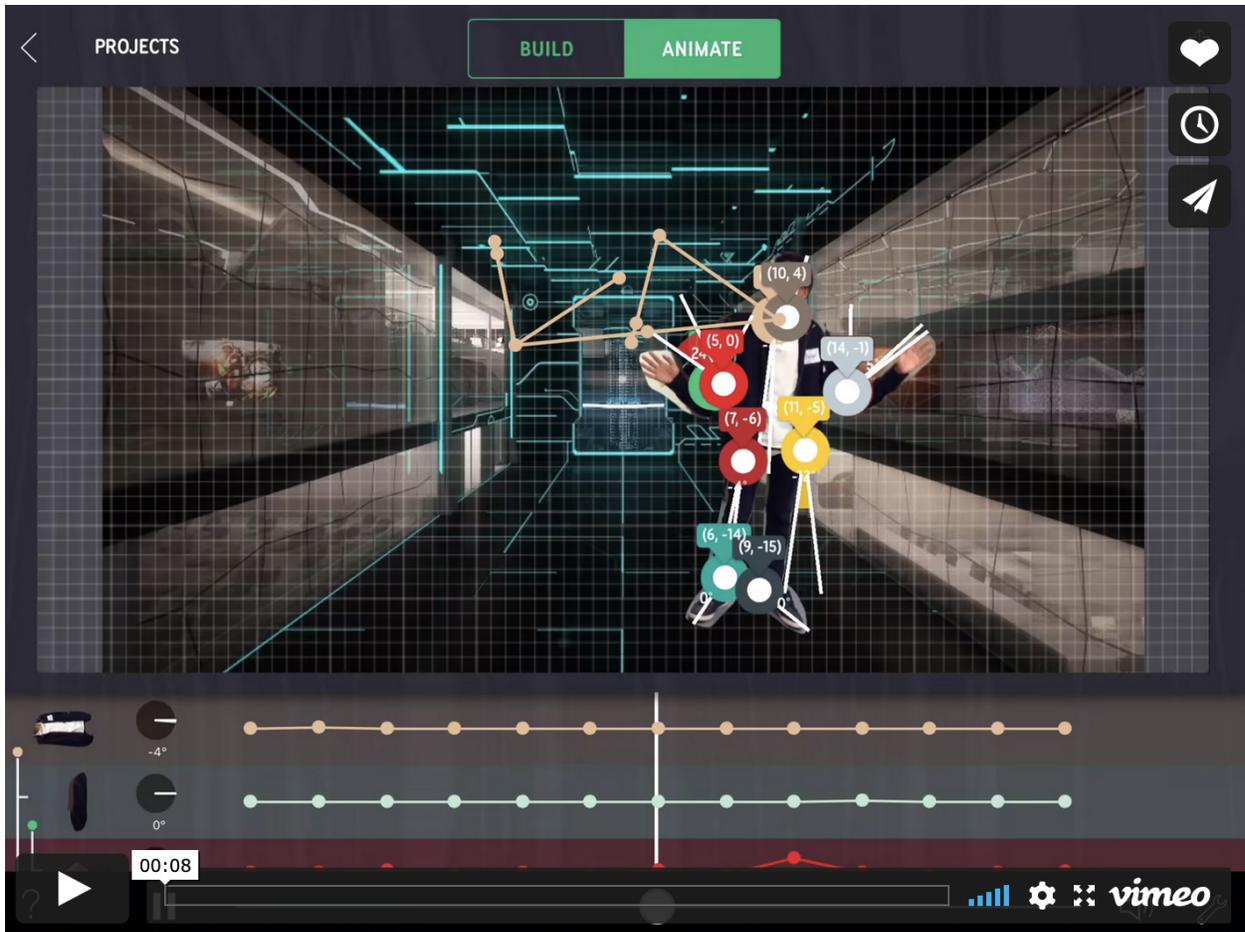
Andre was born in the United States and taken back to Mexico for three years, two of which he spent going to school. He came back to the United States before his younger brother returned, and lives with his mother, younger brother, and younger sister. Andre was older than the majority of the workshop participants, entering 9th grade in the fall of 2017.

Technology as an agent for deeper learning.

Andre liked math before entering this workshop, and it was his favorite subject since he started 6th grade. He did not see himself as a creative person, thinking that his difficulty drawing did not make him good at art. His younger brother, Alejandro, brought him into the workshop on the second day. Initially, facilitators were concerned the material would be too easy or familiar to him and would leave him bored and disengaged. Throughout the week, however, Andre remained engaged and enthusiastic about the workshop activities.

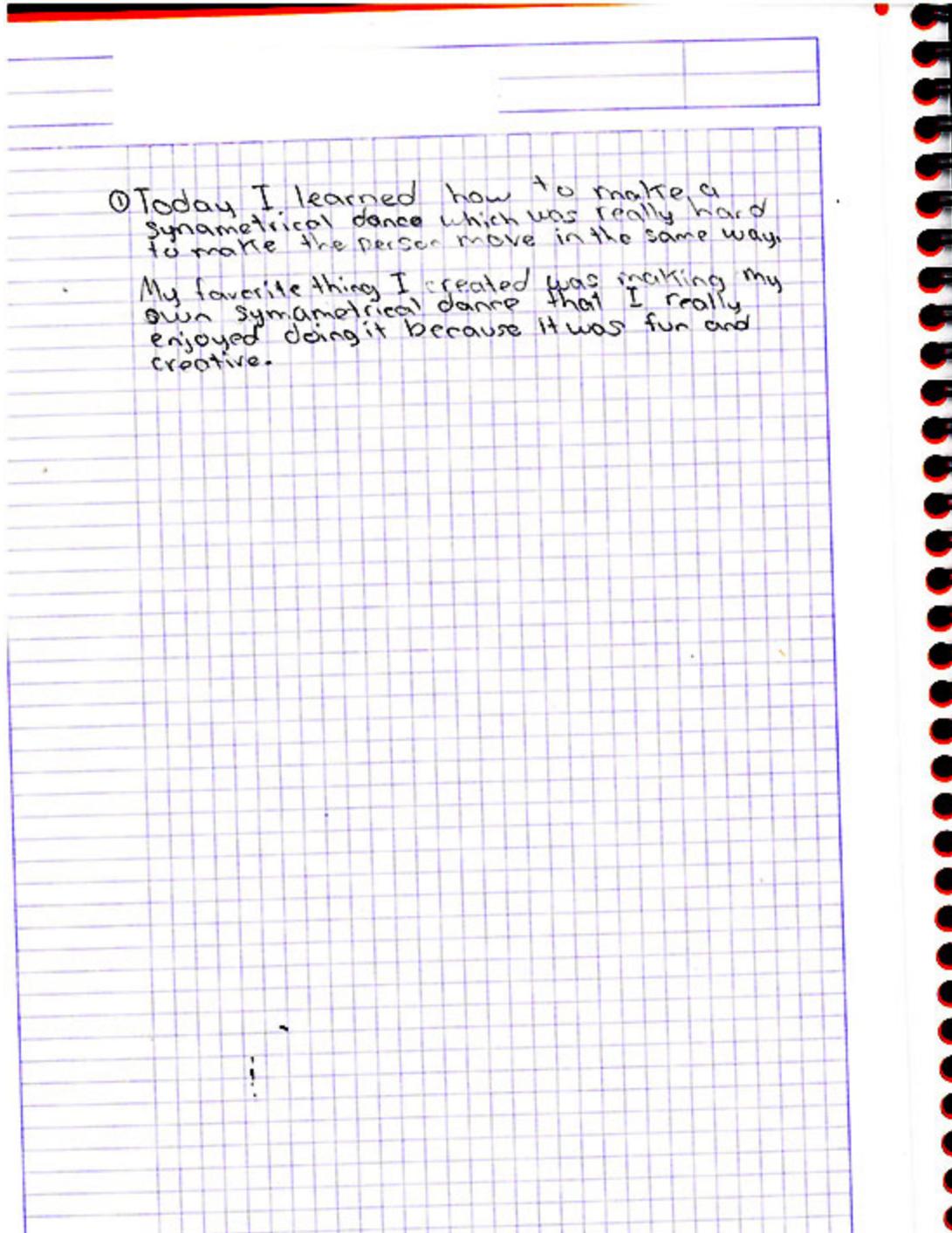


Example 1: For the Mood Dance activity, Andre created a scene of himself and his brother playing tennis with multiple jointed arms and limbs, using the Choreo Graph app. Getting slow movements required thinking about how large or small an angle of rotation they should use for the different parts.



Example 2: For Andre's symmetry dance, like his Mood Dance, he used a multiple-jointed figure, striving to create equivalent angles of rotation on different sides of the body as it moves across the screen.

In his [Choreo Graph](#) work, Andre endeavored to create multiple-jointed figures with realistic movements. He worked to create a scene of himself and his brother playing tennis (Example 1) for the Mood Dance activity and wanted to create realistic movement speeds, which is a challenge with the Choreo Graph app. After cutting out every small portion of their bodies, he attempted to first animate the figures with their tennis rackets before including the ball movement in the animation as well. In a similar vein, he worked with a multiple-jointed figure for his symmetry dance (Example 2), working to keep each portion of the body making the same angles. These projects proved challenging and occasionally frustrating for him, yet he stuck with them and presented on each of them to the class while they were still in progress. In his notebook (Example 3), Andre wrote that the ability to animate himself in an app was something he had never done before, and was his favorite part of the day.



① Today I learned how to make a symmetrical dance which was really hard to make the person move in the same way.

My favorite thing I created was making my own symmetrical dance that I really enjoyed doing it because it was fun and creative.

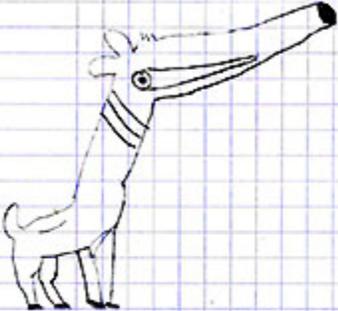
Example 3: Andre mentions that his favorite part of the day was “making [his] own symmetrical dance” in his journal.

When the class returned to [Fraction Mash](#) for the he [crazy animal mashup](#), it was Andre’s first time using the app. The students were encouraged to first sketch their mashed-up creature, and this proved difficult for Andre. He carefully drew each creature, but when it

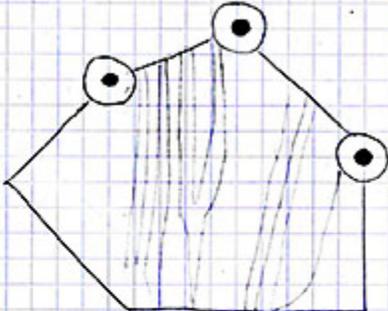
came to drawing their combined form, it was too challenging to try to picture it and draw it out. Using Fraction Mash, Andre went through several iterative designs of the mashed-up creature (Example 4) until he created one that appealed to him. He found the ability to combine photos in Fraction Mash amazing, and it allowed him to have a creative outlet without having to draw.

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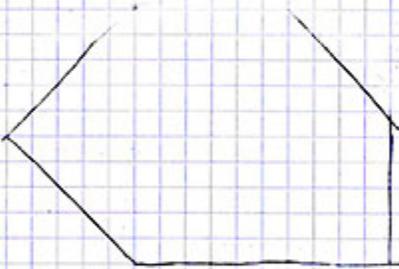
Ante Pony



Rock Roller

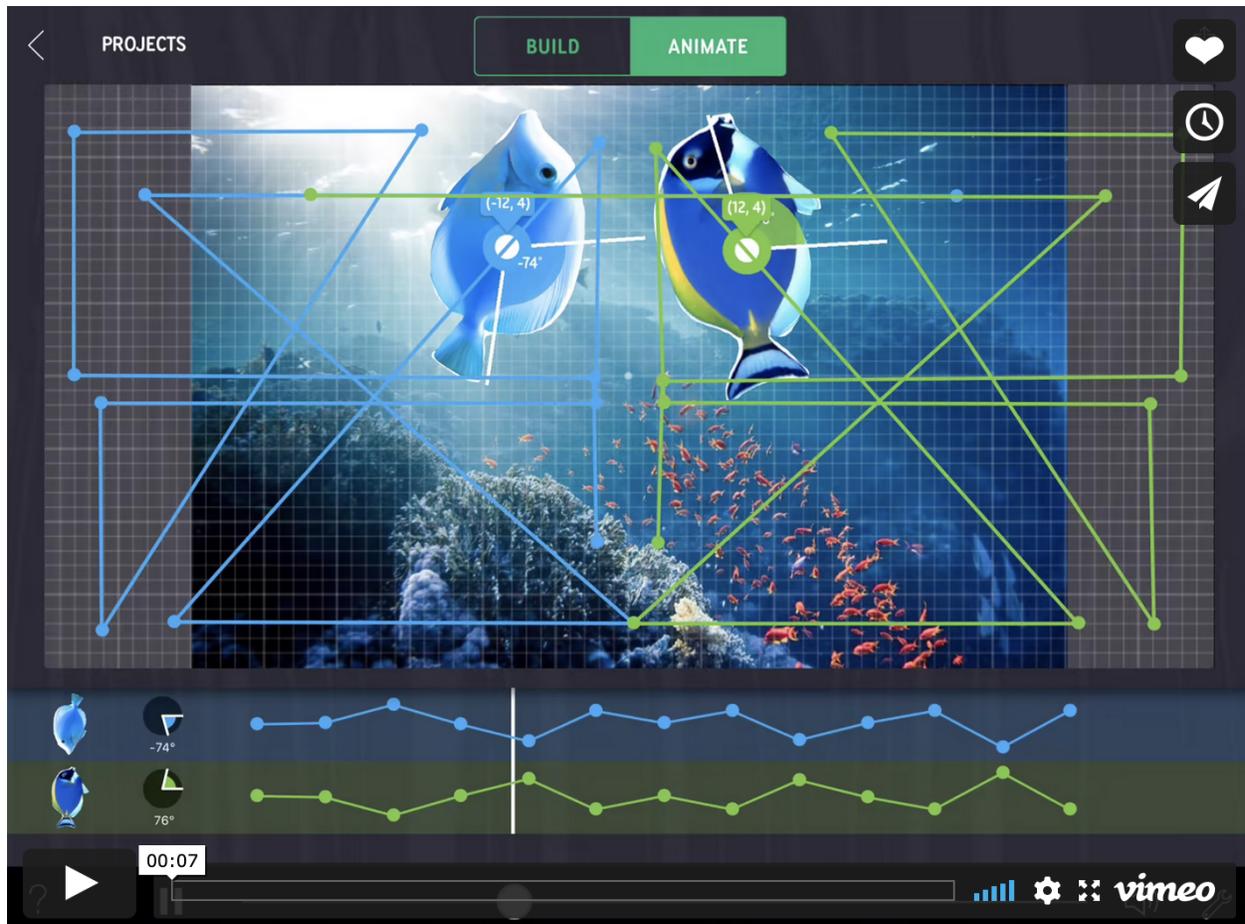


Antroller



There are 100 squares in the whole grid.
My first animal the Ante pony, is on 48 squares.
This fraction is $\frac{48}{100}$ or $\frac{12}{25}$. My second animal
the Rock Roller, is on 52 squares. The fraction is
 $\frac{52}{100}$ or $\frac{13}{25}$.

Example 4: Andre focused on drawing each creature individually and trying to figure out how many parts each creature was made of. It was a challenge for him to draw the creatures as one and to determine the new whole.



Example 5: Andre's symmetrical dance between two fish in an underwater scene using Choreo Graph. Using translations as a tool, he systematically created a pattern, deepening his understanding of symmetry.

For his final project, Andre combined his precise and careful work in Choreo Graph with a sense of creativity he had experienced with Fraction Mash. He created a symmetrical dance between two fish in an underwater scene (Example 5), and their translation paths made a pattern as they moved. He first showed this project without the angles or translations showing, then switched on angles, then translations, to describe the full mathematical thinking behind his work. In his presentation, he described how the coordinate plane worked, as well as specific examples of how he created symmetrical rotations between the fish (Example 6).

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What I'm about to show you are two fish
who have never moved like any other before.
They follow on a symmetrical way, as in they
move correspondingly at an opposite direction.
(Show the video)

As you can see, I used the coordinate plane
to help me place the points at the same
number, but in a opposite place.

Also I used angles to help me rotate the
way the fish is going for example, I would
rotate the fish in more than 90° or less than
 90° . That gives an acute or obtuse angle, depending
on how I turn the object.

!

Example 6: For his final presentation, Andre described in his journal how the coordinate plane “helped [him] place ... points [of] the same number but in an opposite place.” He also included specific examples of how he created symmetrical rotations between the fish.

In a post-interview, Andre said that he was never the sort of kid who presented in front of the class and that the experience of going up and presenting his work every day was

frustrating. Overall, however, he thought the workshop was a good one that kids could learn a lot from. Even though he had learned angles in fourth grade and had continued to use them, the connection of angles to the human body and the outside world was new to him:

“I was kind of proud of ... our projects and everything we’ve done. It feels like ... I know more about angles and everything that we did this week ... I mean you can make a movement with the angles, even a dance or anything.”