



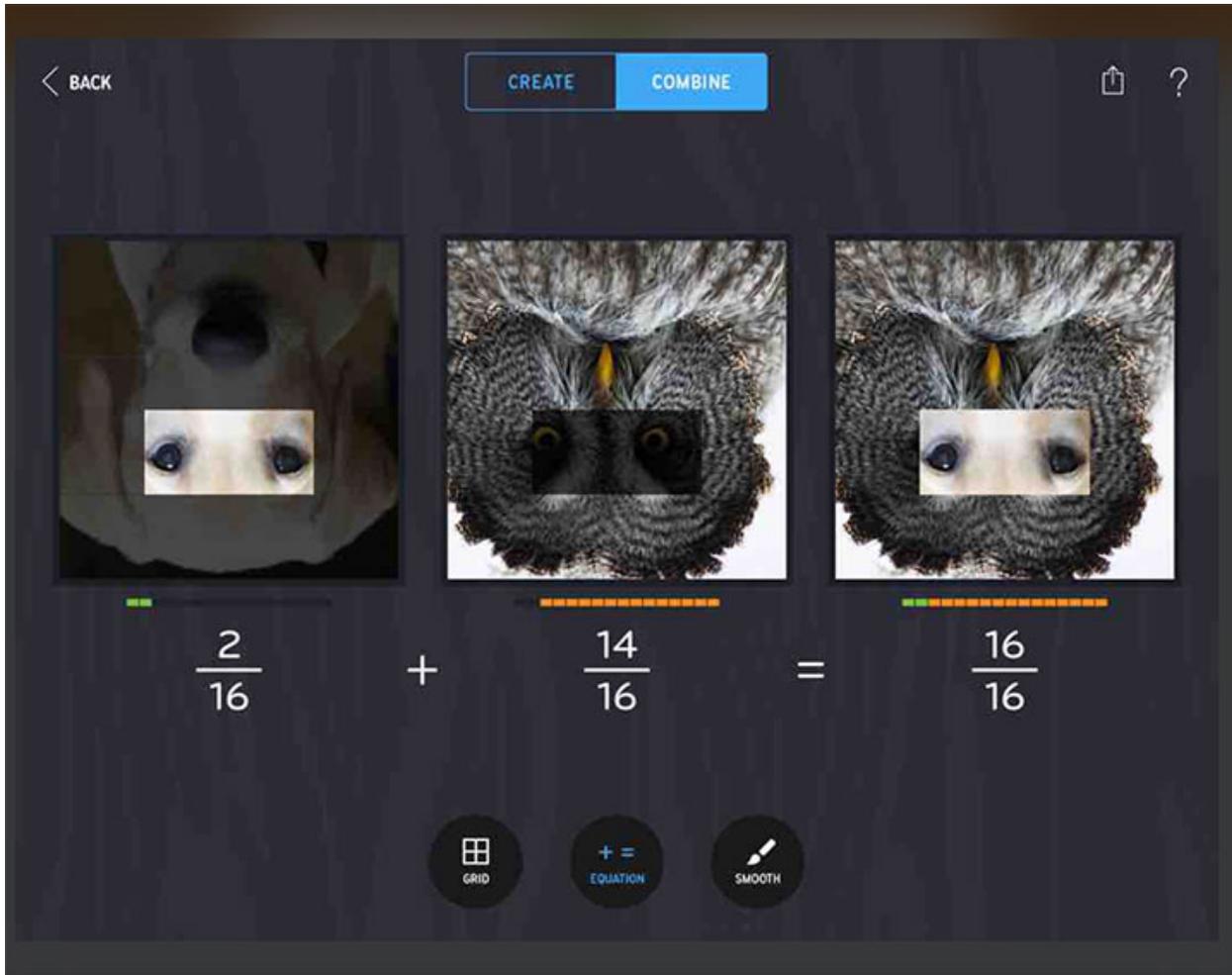
Digital Design for English Language Learners: Alejandro Case Study

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.

Alejandro was born in the United States and then moved back to Mexico, where he lived for five years until 2016. He traveled back to the United States by himself, joining his family in New York. Alejandro was starting his first full school year in the fall of 2017 as a sixth grader.

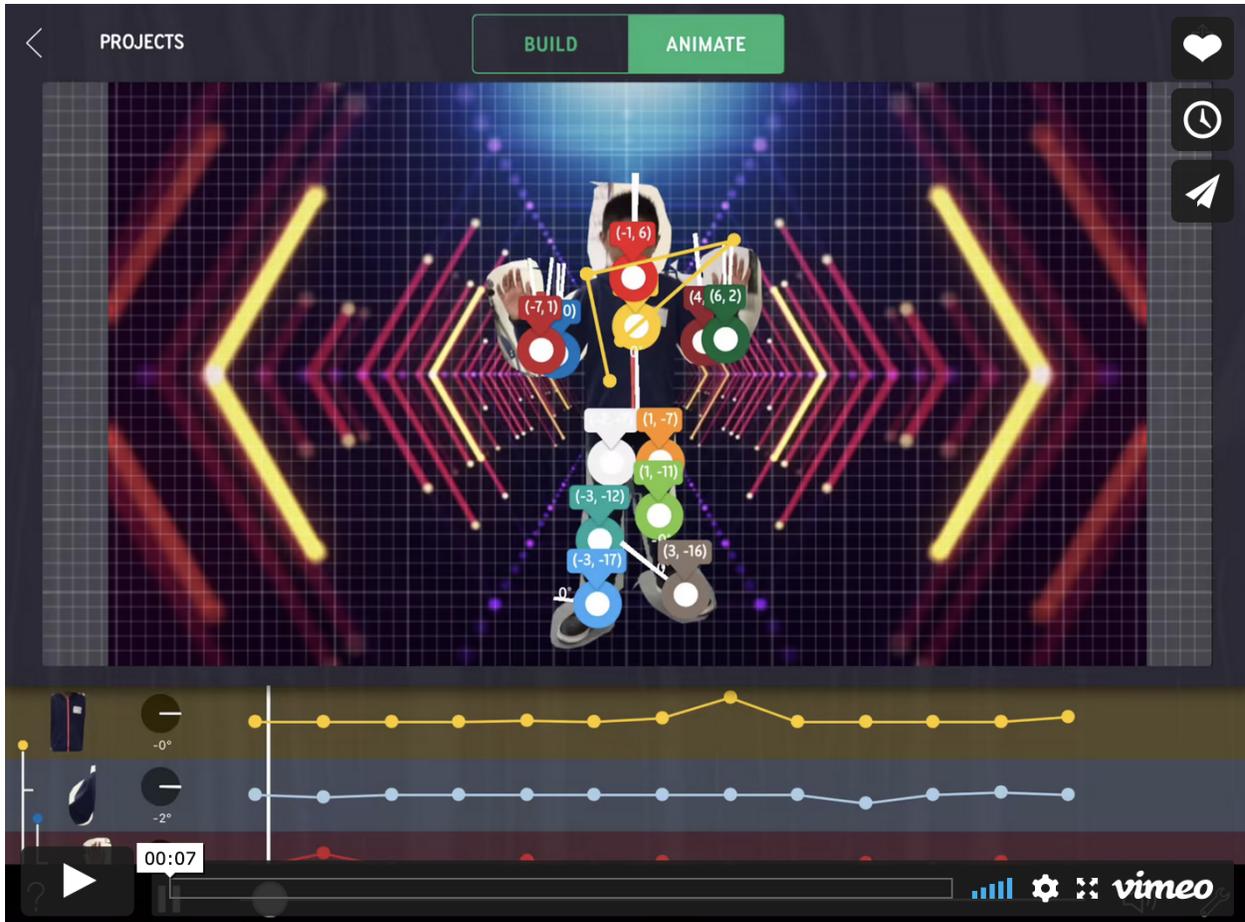
Finding confidence and a voice in a supportive environment.

Alejandro was overwhelmed by the Digital Design Workshop on the first day and left his pre-assessment form mostly blank, likely as a result of not being able to settle into the task and workshop environment. He rarely spoke, preferring instead to nod or shake his head if the question allowed it. On the first day, the physical activities and open-ended project work were more effective in easing him into the workshop than direct questioning or pressing him for conversation. When engaged in these activities, Alejandro opened up and talked about his projects and personal interests, and smiled and laughed on occasion.



Example 1: A dog and owl merged together using the fraction mash app during Fraction Mash exploration.

Using the [Fraction Mash app](#), Alejandro created interesting images, rotating both images upside down and merging them (Example 1), or placing his face on a dollar bill. Like Andrea, Alejandro struggled with placing fractions on the number line in relation to $\frac{1}{2}$. An instructor walked him through the process of finding where his particular fractional mashup belonged on the number line, and even though he did not talk through the process, her persistent questions and his physical exploration of the number line resulted in a greater understanding of placing fractional parts of a whole on a number line. For the final challenge, Alejandro chose a new mashup with a different fraction and was able to place it on the number line without assistance. In addition, another student was assigned to teach Alejandro about finding the half of an odd number in Spanish after just having learned the concept, providing Alejandro with a male peer to teach him a difficult idea.

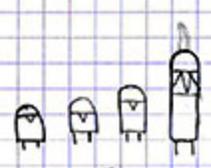


Example 2: Alejandro exploring dances with mood in Choreo Graph — a multiple joint animation with vertices in each joint of the limbs.

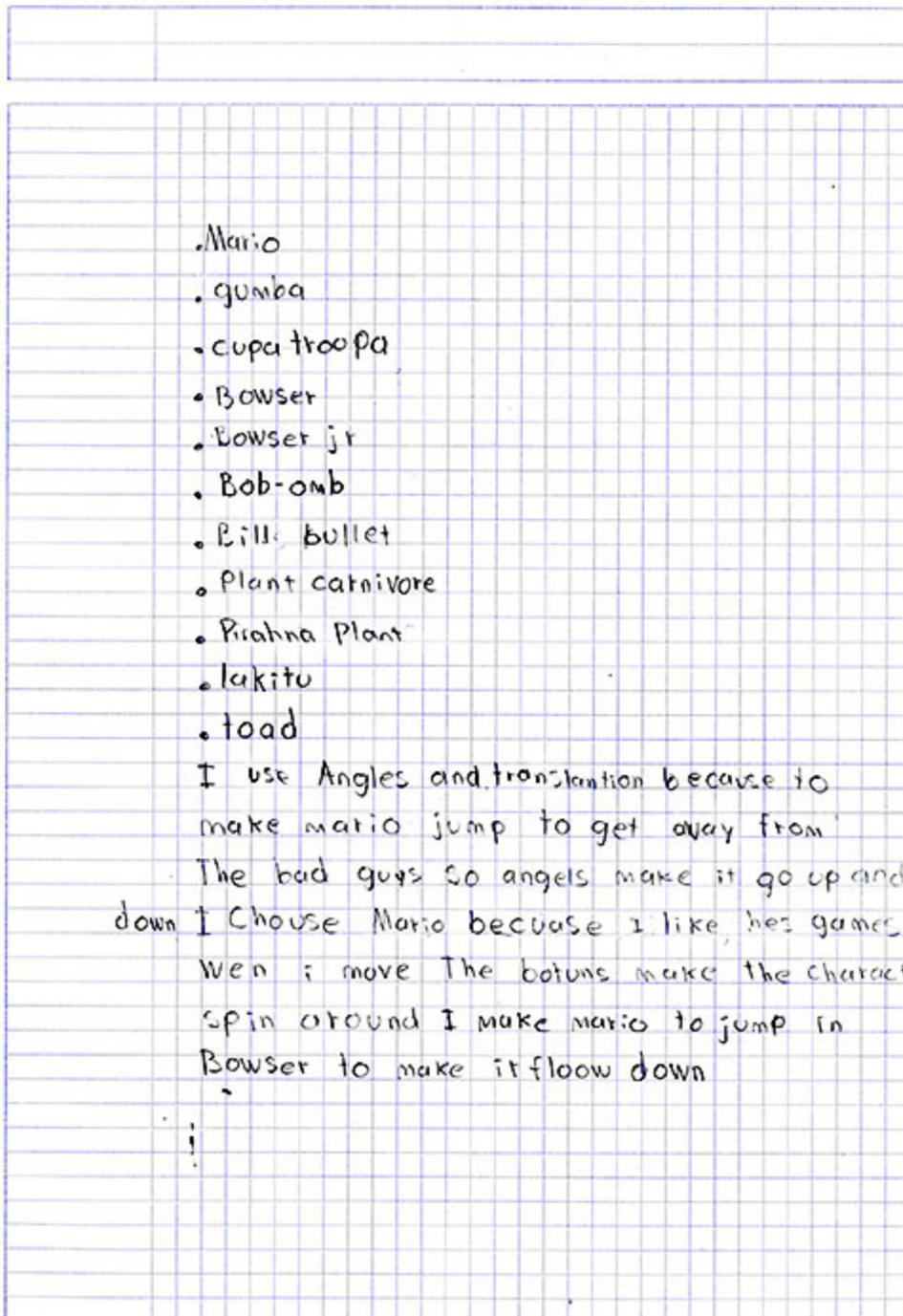
Exploring dances with *mood* in [Choreo Graph](#), Alejandro focused on multiple-jointed animations (Example 2), putting vertices in each joint of the limbs of his character to create realistic movement. His intense focus on the task at hand helped him work through the difficulty of the multiple-jointed figure, attempting to match the angles at each of the ten joints on his character's body. With his brother, he took some of the most challenging "symmetry or no symmetry" photos for the class to decipher, creating parallel poses (Example 3) that encouraged the entire class to debate their symmetry.



Example 3: Alejandro and his brother engage in a debate about whether this image is symmetrical.

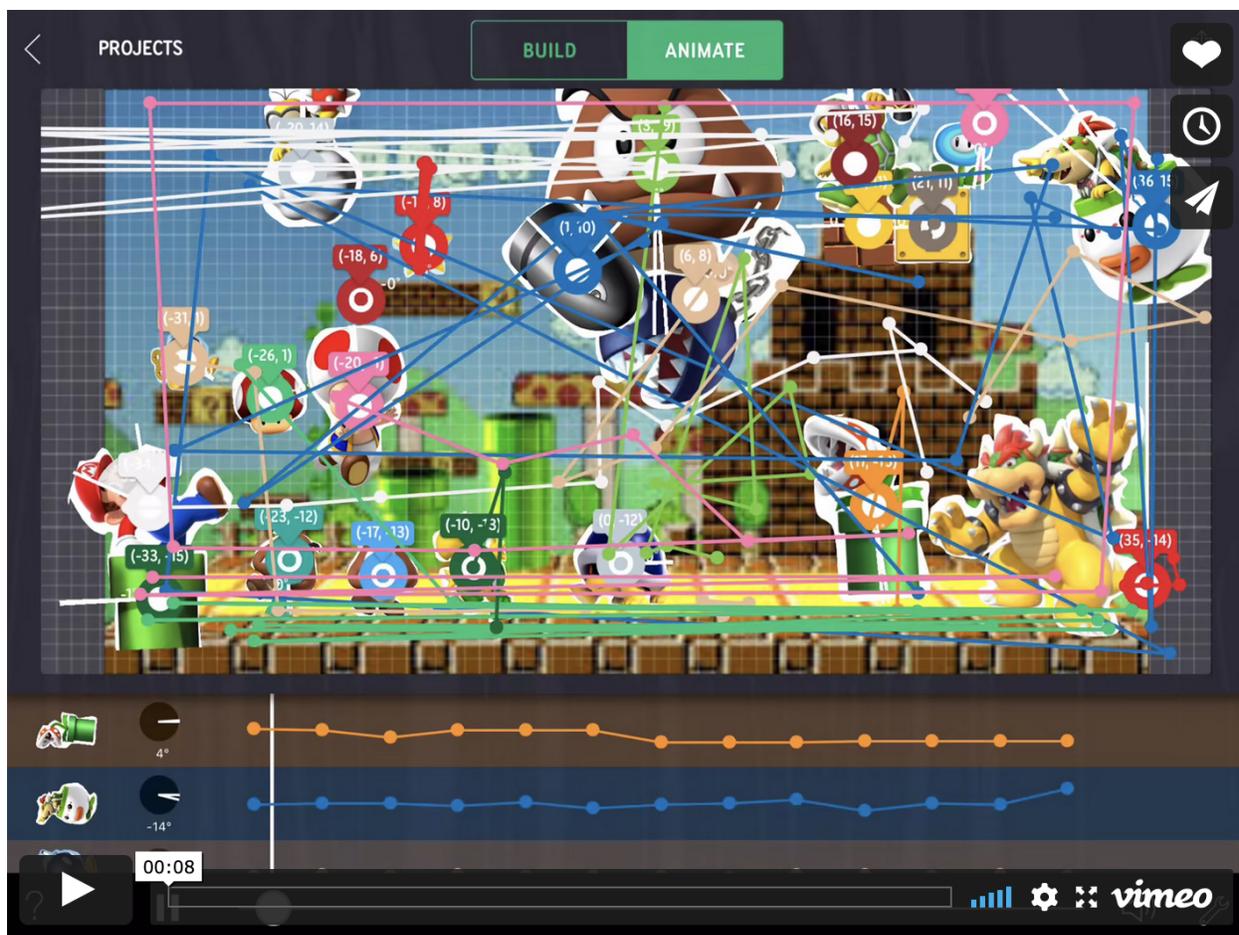
<p style="text-align: center;">Stoic bird</p>  <p style="text-align: center;">$\frac{12}{36}$</p>	<p style="text-align: center;">Water Dropper</p>  <p style="text-align: center;">$\frac{6}{36}$</p>
<p>StoWad</p>  <p style="text-align: center;">$\frac{6}{36} = \frac{12}{36} = \frac{18}{36}$</p>	
<p>There are 36 Squares in the whole grid My first animal The Water Dropper is on 6 Squares This fraction is $\frac{6}{36}$ My second animal The Stoic bird is on 12 Squares this fraction is $\frac{12}{36}$</p>	

Example 4: A sketch from Alejandro's notebook describing the "new whole" or creature he created out of combining pictures of two fictional creatures from a museum exhibit — a stoic bird and water dropper.



Example 5: An early entry in English from Alejandro's journal. Inspired to create a Mario-like game, he describes the characters he thought about using and how angles were used to "move" each character.

As the week progressed, Alejandro attempted more full presentations in front of the class. Visibly nervous, he often would stand in front of the class while an instructor described what he



Example 7: Alejandro's final project with the translations feature turned on in Choreo Graph. A complex set of translations was evident in his creation of this Mario game.

Alejandro completed his entire post-test, leaving nothing blank and using fractional terms accurately to describe his fraction models. He was far more comfortable in the environment of the workshop and visibly more confident. After the Family Celebration, his mother came forward to thank the workshop and its facilitators:

"I want to thank all the teachers that have taught new things to my boys and had patience, more than anything, with [Alejandro]. Because he arrived six months ago and it's really difficult for him ... the language more than anything. Thank you very, very, very much for the support ... and the confidence that you all gave to him."