



## **Digital Design for English Language Learners: Mariana Case Study**

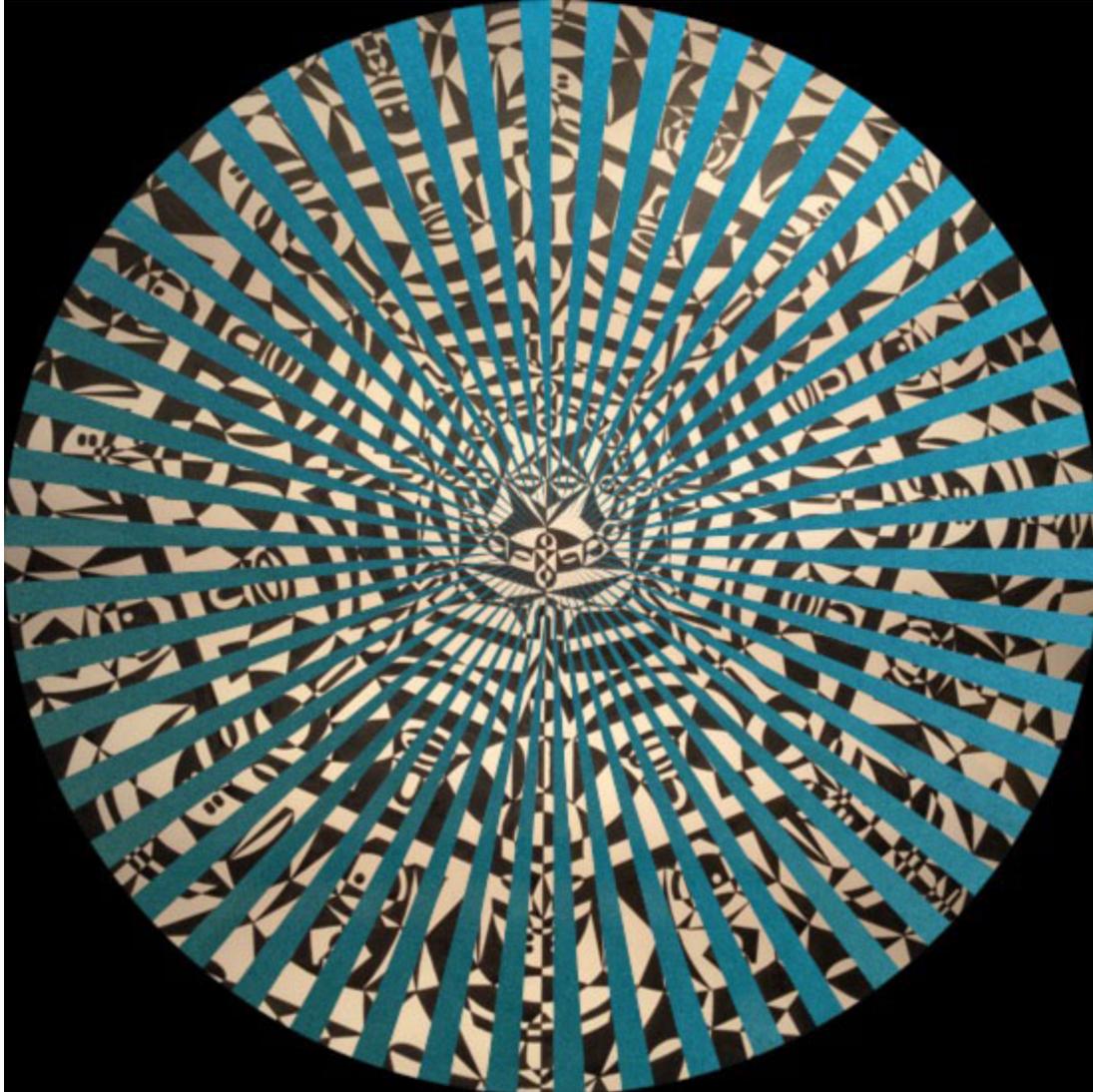
*Documenting the diverse stories of English Language Learners was an important part of the Digital Design for ELLs project. Students came in with a variety of backgrounds in mathematical knowledge and in English language proficiency. Some self-identified as persons who enjoyed math and others voiced 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.*

*Mariana came to the Digital Design Workshop after having moved to the United States from Mexico three months prior. When beginning the workshop, she primarily spoke Spanish, which would later be translated by a bilingual instructor for English-speakers.*

### **Providing Spanish-speakers with opportunities to excel.**

Mariana was very shy about speaking English, and in her classes, she had struggled to understand the lessons because students and teachers could not take time to explain to her a second time or translate for her.

Mariana had previously learned much of the math in this workshop in Spanish while she still lived in Mexico, and had a firm grasp of the concepts. Before the workshop, she had liked math, but thought the way it was taught was boring. She did not sign up for the workshop herself, instead attended when her mother enrolled her in the workshop.



*Example 1: A dual-figure symmetrical animation in Choreo Graph formed using translations and the coordinate grid.*

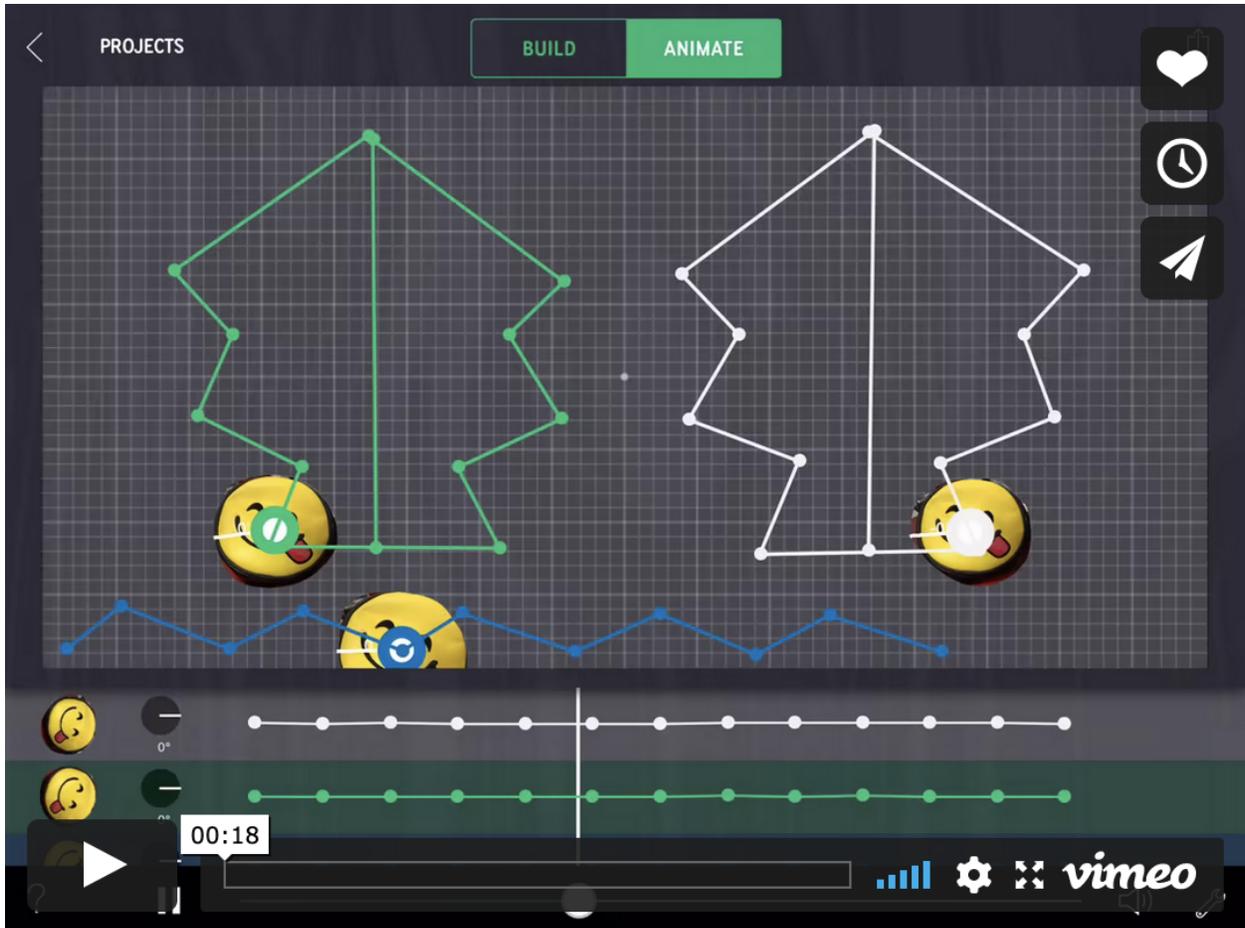
Her designs were driven by the math she had learned prior to the workshop and refined in the workshop, and the planning involved was clear. In the translation portion of the workshop, Mariana used the coordinate grid and translation visualizations to create a dual-figure symmetrical animation (Example 1) that formed two trees with the translation paths. To complete this, she planned out one figure's translation path and recorded the coordinates for each point it traveled to, later plotting the other figure with the opposite coordinates on the grid. The visual medium of [Choreo Graph](#) provided Mariana with the opportunity to show her knowledge of coordinates, translation and symmetry, even though she could not yet express these ideas in English.

Over the course of the workshop, Mariana took challenges in creating her projects and gained confidence in speaking in front of the class in Spanish about her group's creations, as well as

writing out her presentations in English. Within her trio of students that worked together on iPads, Mariana gained authority for her math knowledge, and the other two girls often came to her for help. Soon, Mariana began teaching other students in the class that did not speak Spanish, relying on Explainers to provide her with any missing English vocabulary, while she put together her own sentences and explained the operation of the apps.

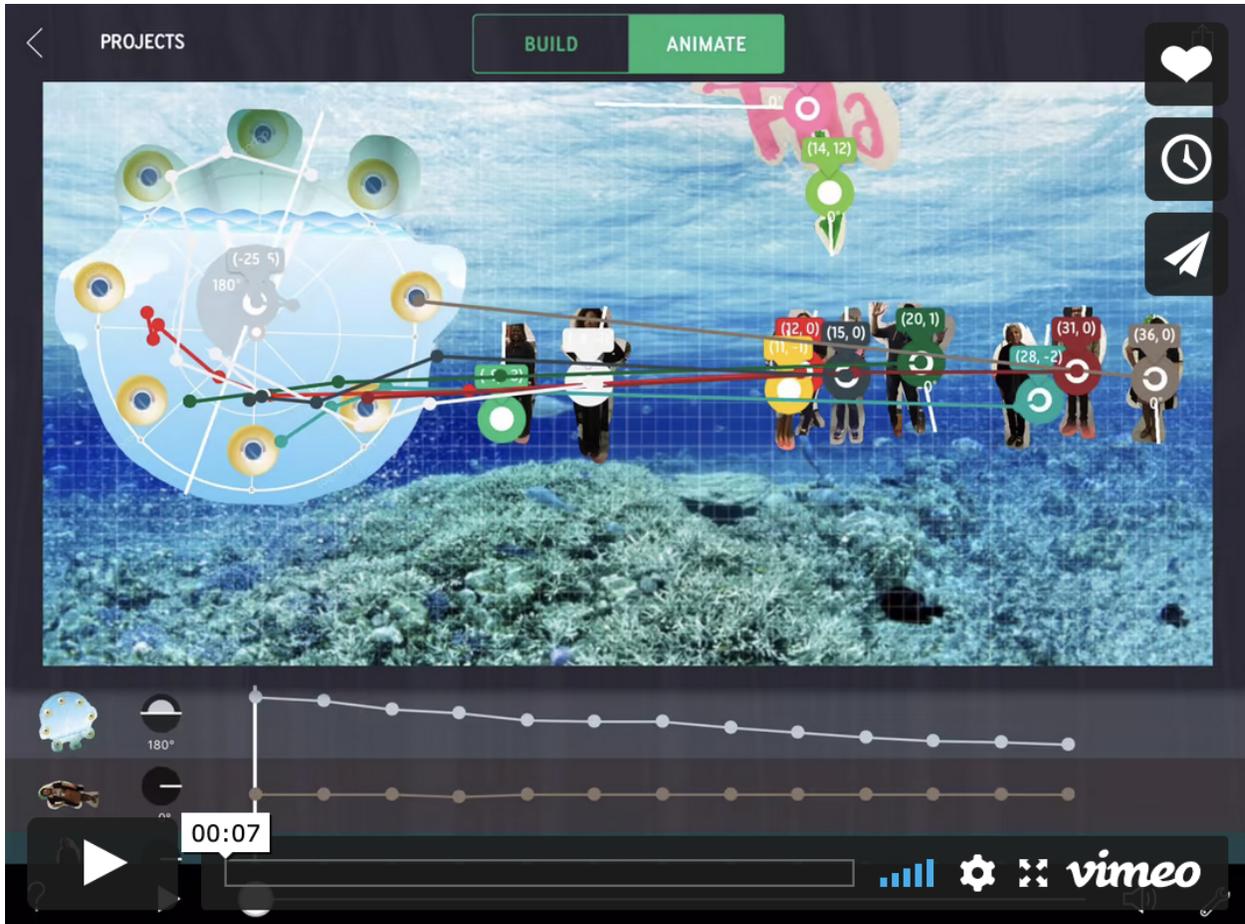


*Example 2: Mariana's first piece of a three-part amusement park in Choreo Graph. Mariana took on complex portion of her group's final project, creating a Ferris wheel, using angles of rotation and coordinates to get the figures to get on the Ferris wheel and then ride it.*



*Example 3: Mariana used Fraction Mash to create a mashup of a Ferris wheel to potentially use in her final animation project.*

For her final project (Example 2), she created one piece of a three-part amusement park animation set. Her portion of the project was complex, requiring the creation of a ferris wheel and animating figures boarding and then riding on the ferris wheel. When Mariana first began work on mashing up two images into the ferris wheel, she worked with only nine total fractional pieces. She commented to herself that she needed more pieces and should make the denominator bigger, and whisked her finger over the denominator, making it as big as it would go, which was 100 pieces. Then she carefully chose every other slice of one picture and mashed them together (Example 3). Later due to her own personal taste, she settled on a premade ferris wheel image, since it had the seats already in place. She also struggled, and eventually succeeded with making the ferris wheel rotate in place (Example 4), separating the rotation of the figure from the translation of it.



*Example 4: Mariana's final animation of the amusement park. She made the Ferris wheel rotate in place, separated the rotation of the figure from the translation of it to make it look like the figures are boarding in the Ferris wheel.*

After the workshop, Mariana confessed that she found math more enjoyable and would prefer to attend the workshop instead of her everyday school:

*"Well, I think that math is very good. Before, I thought math was very boring because they taught us in a normal way. But here they teach us in a very different way. I said it's very fun, and if they asked me to choose to go to school there or come all the days to school here, I would choose the school here."*

She and other students felt more supported by the Spanish-speaking instructors and staff, and were able to express the math knowledge they already had in a safe place that treated them with patience. Mariana gained confidence in her ability to practice English, approaching the Explainers involved with the workshop to practice speaking it. She mentioned that the type of instruction and the use of the [Noticing Tools™](#) allowed her to relate math to her everyday life and better understand it in a short period of time.