Digital Design for English Language Learners: Lucia 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.

Lucia was born in the United States to a Puerto Rican mother. Coming into the first session, she had previously learned fractions, angles and the coordinate grid in her current sixth-grade class.

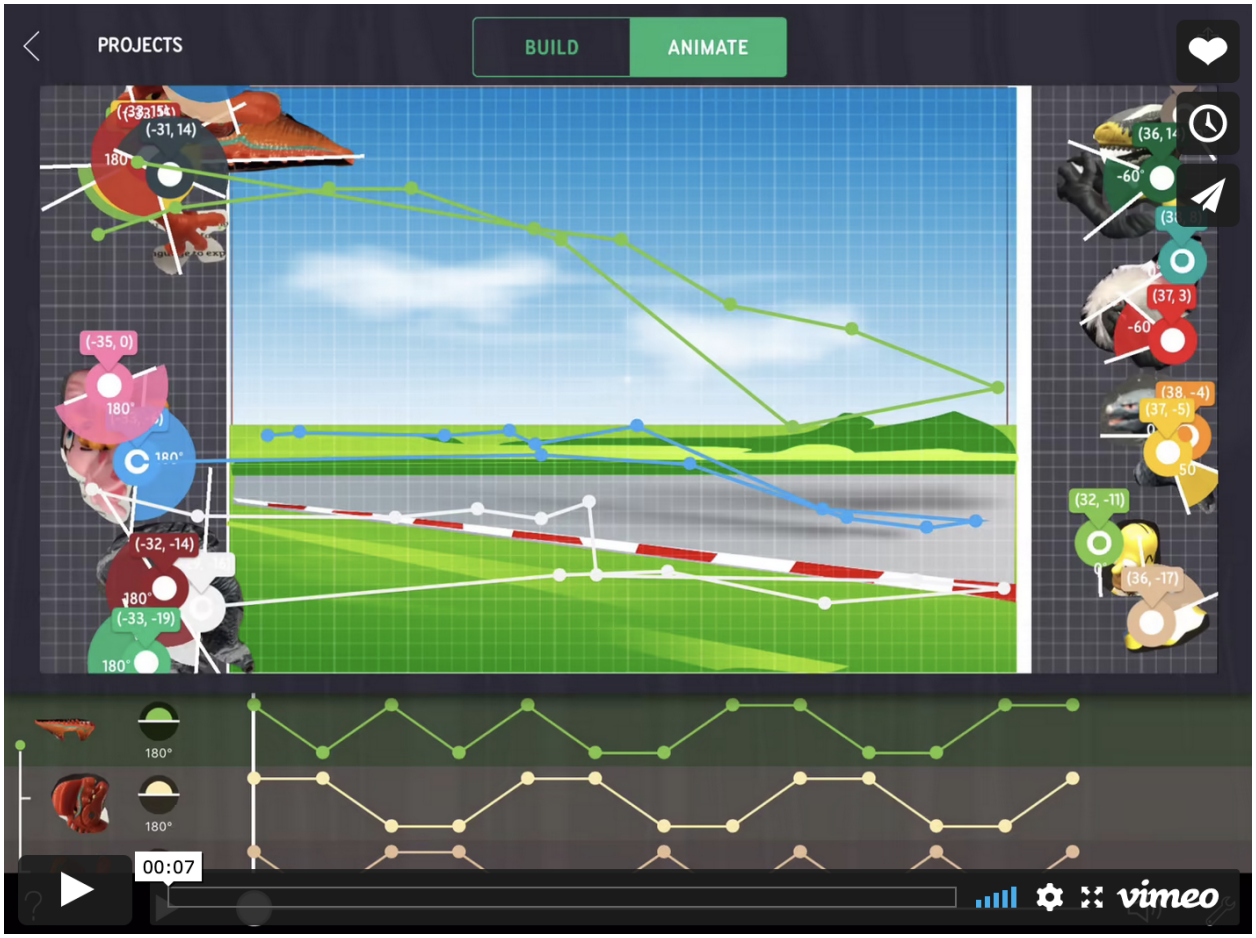
Building off of children's passions.

Lucia liked math but found parts of it difficult, not specifying which portions of math most challenged her. Her mother hoped the workshop would prove to be a positive socialization experience for Lucia, and that it would open up previously difficult communication with her peers. Lucia arrived with figurines of her favorite cartoon characters that she was intensely fascinated with, and the characters accompanied her wherever she went in the workshop.

At the beginning of the workshop, Lucia was paired up with another student to share an iPad. They had dynamic discussions, with Lucia at one point explaining and writing her rationale behind where they had placed ⅕ versus ⅘ on the number line:

We're trying to figure out where [to place] ⅘ and ⅕ – converted to decimals – ⅕ closer to 0, because it's less than 2/5th, and 4/5th closer to 1, because it's more than ½.

The visual nature of the Noticing Tools™ apps, particularly Choreo Graph, appealed to Lucia, allowing her to use drawings of her favorite characters in her animations for the workshop. Her ability to create scenes with these characters she was interested in was an easy way to invite her into the math the workshop focused on. Rather than convincing Lucia to put aside her passions to practice math, Noticing Tools™ allowed her to bring her passions into the apps and therefore into her math projects.



Example 1: For her final project, Lucia used the coordinate grid, translation lines, and the graphs to show how each of her favorite characters performed in the Great Race, including who one. Her love of the characters led her to focus in on the patterns in the graphs that dictated each character's path.

She quickly grasped the idea of using coordinates to precisely direct the movement of figures in Choreo Graph. In her final project (Example 1), she used a combination of the coordinate grid, translation lines and the graphs showing each of her character's rotation to put together a race and define the winner. Her project was inspired by one created by a classmate earlier in the workshop.

> *Instructor: "What about the math?"*
>
> *Lucia: "I'm going to use the coordinates. The coordinates actually help me develop the idea of making the race and how I will set it up. Dancing by using the angles like acute, right and obtuse, makes me develop what kind of crazy dance I'll do like spinning around in circles. That's why the math is so important."*

During her presentation, the instructors requested she explains her math thinking behind the race she put together. Lucia did not answer these questions directly, but when the instructors

and facilitators instead focused on asking questions about the outcome of the race and how the audience could tell who won, she made impressive mathematical connections. She explained how the distance between two points of a translation would define the speed of her figure, and used this mechanic to create periods of different speed in her figures in her race:

> *"The translation is bigger. The bigger goes more faster, depending on how much time it has. And if the line or translation gets more smaller, the time, it's going to go slower. So basically the blue translation – where the middle character is – the lines are much smaller, so it will slow down."*

By focusing on the engaging portions of the app for students, in this case, the characters Lucia loved and the narrative of her race, instructors were able to delve into the mathematical thinking students were engaging in.

At the end of the workshop, Lucia was glad she had attended and thought that the experience would assist her in her future career of being a video game designer. She felt that she now understood coordinate grids more deeply than she had before the workshop. Her parents attended the Family Celebration and were overjoyed as much by the work she had produced, as the positive socialization she had done while working in teams with other students.