



## Digital Design for English Language Learners: Symmetrical Dance

*Using their own bodies first, students will explore symmetry as a reflection over a line (also known as bilateral symmetry). They will then plan and digitally animate symmetrical dance moves using angles of rotation.*

### Learning Goals

1. Students will explore symmetry as a reflection over a line.
2. Students will design a symmetrical dance in the [Choreo Graph app](#) — incorporating angles — in which one dancer (or two dancers) move symmetrically over a line of symmetry.
3. Students will use mathematical language to describe their designs.

### Prep

The instructor should have foundational knowledge of [Choreo Graph app](#). This activity was adapted from [My Symmetrical Dance Move](#) and [Create A Synchronized Dance Troupe](#).

### Materials

- Jump ropes (or other physical markers that can represent lines of symmetry, like tape on the floor).
- A large mirror or a way to capture video for student(s) to analyze their own movement(s).
- Dance videos to show students (access to internet or pre-downloaded).
- iPads with [Choreo Graph app](#).
- [Spanish English Picture Dictionary](#).

### Key Vocabulary

- Symmetry
- Line symmetry
- Rotational symmetry
- Rotational angle
- Degree
- Reflection

## Getting Started



### Strike a pose!

Provide a mirror for students to see themselves. Have students “strike a pose” in front the mirror, pointing out how a mirror is a reflection. Using a jump rope on the floor as a line of symmetry, have students work together to create reflections along this line. For example, one person can straddle the rope on the floor and can position her/his body parts on each side of the rope so they are mirror images of each other. Alternatively, two people can stand on either side of the rope, striking symmetrical poses or enacting symmetrical movements. It may be helpful for students to take photos to analyze later.

**Tip:** A great way to start a conversation with students is to show examples of symmetry in the real world. If possible, find a way for students to use some home language with an instructor, mentor or partner to describe what they see.

### Guiding Questions:

- Is your photo symmetrical? How do you know?
- What is an example that is not symmetrical? How do you know?

## Make a Symmetry Video

Show a snippet of the [Chacha Slide video](#) to get students motivated and at the same time teach them movements that will prepare them for creating their own symmetry video. Using the jump ropes as the line of symmetry, ask students to take a video of a partner moving his or her body symmetrically over the line. Start with only one person and a simple movement.

### Guiding Questions:

- What kind of moves can we do?
- What is an example that is not symmetrical? How do you know?
- How can we move symmetrically along a line of symmetry?
- As a class or in small groups, analyze the symmetry photos and/or videos students create. Ask: Are these dance moves truly symmetrical? Why or why not? If they are not, ask students to demonstrate how to redo them so that they are symmetrical.

## Going Deeper: Math Tools and Talk

Students will build upon the symmetry activities they explored with their bodies to design a digital symmetrical move within the Choreo Graph app.

**Tip:** Ensure that multiple modalities for getting to know a concept are being offered, such as illustrations, videos, manipulatives, real-life objects, physical activities, diagrams, drawings, photographs, demonstrations and modeling. This helps learners make connections between two languages, allowing them to better understand how a process works or to acquire new knowledge.

### Questions for understanding:

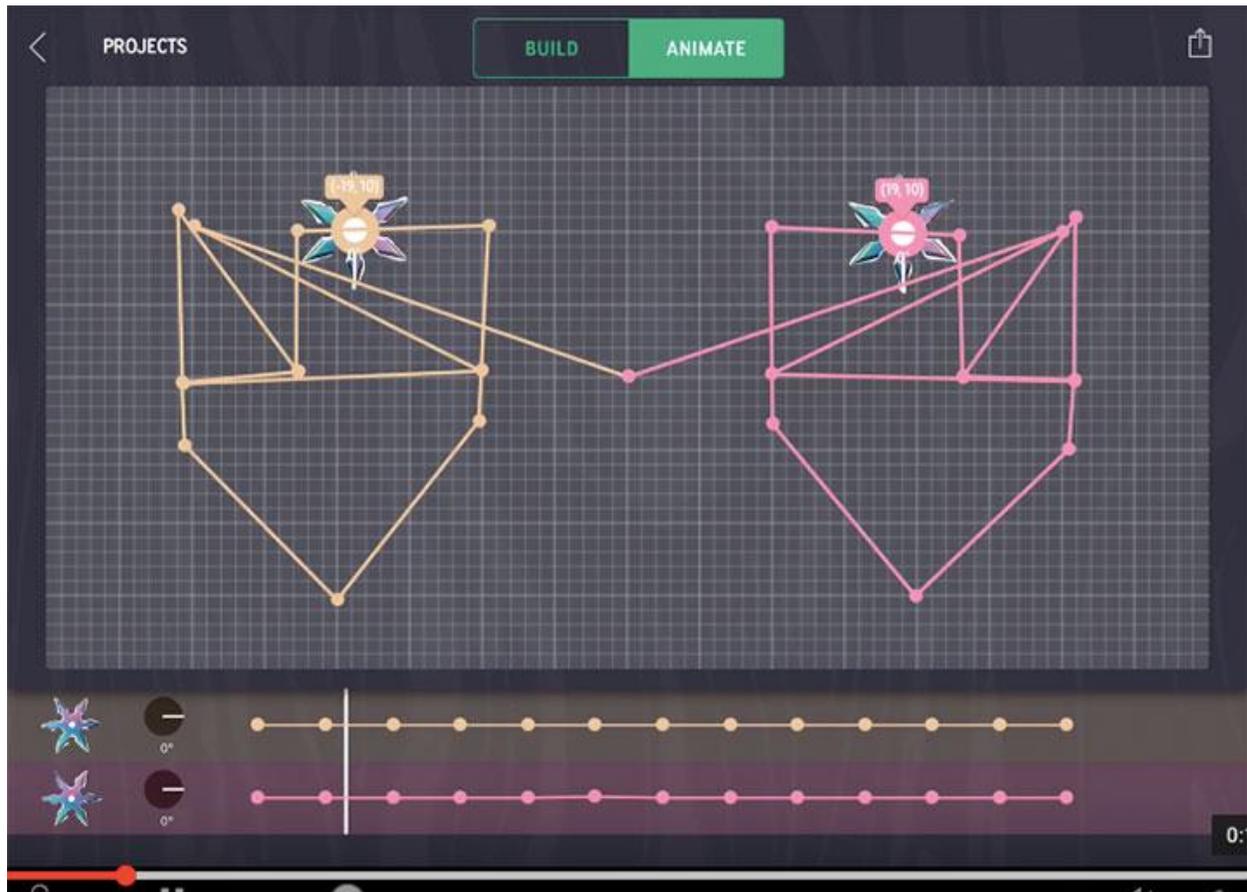
- What is symmetry?
- Where do we see symmetry right now?
- Can you use your hands to make symmetry? Arms?
- Can you draw a picture that has symmetry?
- How can you move two body parts to show symmetry?
- Sketch a person and draw the line of symmetry.
- Where are your pivot points on your body?
- In Choreo Graph, what happens to the angles of rotation you select to move the body parts symmetrically? Are they opposite or the same?
- Are there any moving parts on your dancer that are not symmetrical?
- Using the angles tool in the app, how can we make sure our moves are EXACTLY symmetrical?

**Tip:** As second language learners come to us from various places with different educational background knowledge, be prepared to either review or to teach new concepts in some instances.

## Digital Design in Choreo Graph

### Design your symmetrical dance!

Show students how to use the grid and angle features in Choreo Graph if they have not figured them out yet.



Students will often create animated moves that are translations, but not reflections. Remind them to think about the activities they did with their bodies as a point of reference. To get projects started, have students:

- Choose a symmetrical dance that they will recreate in Choreo Graph. Encourage sketching or drawing it out. Stick figures work well for this exercise!
- Take a photo of a person with the iPad, trace, and segment the photo into different body parts so that each “joint” can be a pivot point in the dance.
- Imagine that the line of symmetry is straight through the middle of the body. Refer to the rope activities done previously to help students envision what this would look like.
- Create movement around pivot points by increasing and decreasing the angle of rotation for each point.

**Tip:** To have both arms go UP symmetrically, one of the arms will be rotating counterclockwise, and the other will be rotating clockwise. The clockwise rotation is a DECREASING angle, so as the arm goes up, the graph below goes down. These patterns are things to encourage students to notice.

### Guiding Questions

- What is happening to the angles of rotation as you move body parts on opposite sides of your body up or down? Are they opposite or the same?
- What happens if you make the angles the same? Does the movement still show symmetry? Why or why not?
- Using the angles tool, how can we make sure our moves are EXACTLY symmetrical?

### Sentence Frames for Using Math Language

1. Here is an example of symmetry: (show picture or video). I know it is symmetry because \_\_\_\_\_.
2. To move my dancer's body up, I increase/decrease the angles of rotation.
3. To move my dancer's body down, I increase/decrease the angles of rotation.
4. I notice that the greater the angle, the faster/slower the body part moves.

**Tip:** Sentence Frames for Using Math Language can be useful, but be sure to use any modalities necessary to encourage different forms of expression (e.g., drawing or acting out). Remember: We are looking for mathematical understanding and language development, not just vocabulary use.

### Share and Present

Have students share their Symmetrical Dance Moves with the class, either on a projector screen or in small groups around an iPad. Encourage them to use the Sentence Frames for Using Math Language to help them explain the math they used.

**Tip:** While sharing and presenting, always be mindful that the ways in which your second language learners present their ideas will vary according to their level of language acquisition. The more English they know you may see less "Code-Switching." However, embrace students utilizing this strategy to complete his/her task. To help you facilitate sharing, you may partner newcomer students with an emergent or even an advanced student (when available) to help with the translation. No matter the setup or circumstance, allow students to express themselves the best way they are able to.

### Extend Your Learning

- Create a rotational symmetrical dance move, in which the dancer (in Choreo Graph) rotates symmetrically around a point, instead of over a line. Create a dance in which multiple dancers rotate symmetrically around a point.

- Play “Simon Says” (Simón Dice) – a well-known game – to bring home the ideas of symmetry as well as reflection. Example: Simon says, “Move your right arm to form a right angle.” Simon says, “Move your left arm so that it is symmetrical to your right arm.”
- Populate the room with books about symmetry, particularly in art. This helps students see the relevance of the concept.