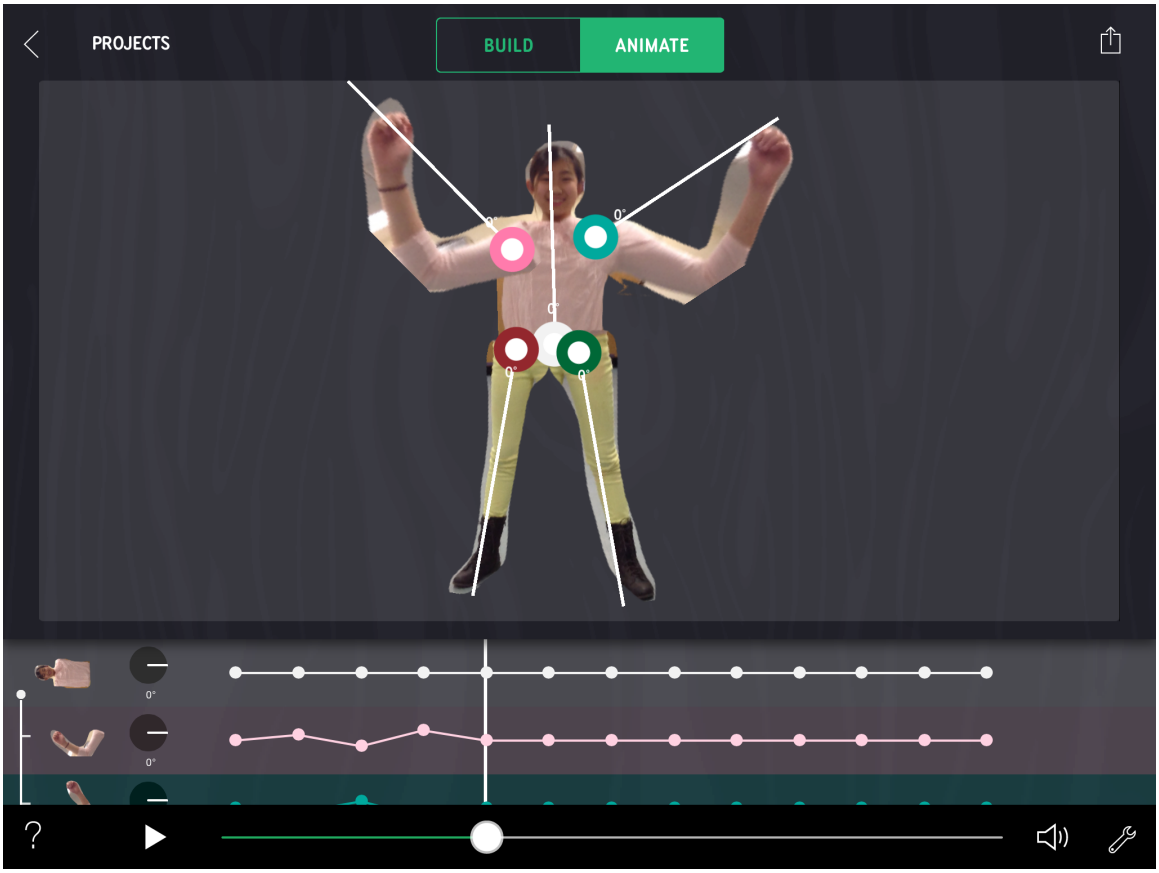
Choreo Graph Activity 2: My Symmetrical Dance Move

Symmetry, Angles of Rotation, and Translation

Overview

Students will plan and then animate a symmetrical dance move, using angles of rotation and translations.



Big Idea

In this activity, students will plan out a symmetrical dance move first on paper and then in the Choreo Graph app. Students take a personal photo or of a friend and then animate the parts to make a symmetrical image. They will think through what is needed on opposite sides of the line of symmetry dividing their subject and will explore the kinds of angles of rotation and translation that result in pleasing or fun symmetries. In the process, they will also discover how to interpret graphical representations of these rotations and how translations guide animated figures. While exploring the graphs of the rotations, they will address a common misconception of graphs—that the graph of an event is the same as a picture of the event.

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Learning Objectives

- Students will explore concepts of angle rotation and angle measurement.
- Students will investigate the concept of symmetry.
- Students will use coordinate notation for describing translations.

Vocabulary

- Symmetry
- Translations
- Pivot point

Grades

Middle School, 6-8

Standards Addressed

Common Core State Standards-Math

Geometry

8.G.A.2. Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. Given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

8.GA.3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

Common Core State Standards-Math

Mathematical practices.

MP2: Reason abstractly and quantitatively.

Students create a dance visually and then have to determine the quantitative moves before making it virtual.

MP4: Model with mathematics.

Students outline their dance using the angles of rotation and the coordinate notation for the translation.

Classroom Strategies

Single-device implementation

Ask a volunteer to be photographed or use the prefabricated robot parts available in the app to create a creature to make dance. On the smart board or projector, invite students to suggest each new move, using mathematical language.

Multiple-device implementation

This activity works when classrooms have 1:1 devices but it is also great for groups of 2 to 4 per iPad. Assign students different roles. Have the group consider what moves they would like to create by acting it out first, sketching it, then animating their friend or object to make a move.

Tips and Tricks

Acting out symmetry: To get started, have students think about and act out symmetrical moves. What does it mean to achieve symmetry in a move – opposite, the same, or a mirror image? Encourage a range of movements – from waving a hand to full-body movements. The students can hone in on the different kinds of symmetries they can achieve with their bodies. For more on dance and symmetry, see this link: www.mathdance.org

Graphing: While creating symmetrical movements with the graph lines, students will address a common misconception of graphing—which is that the graph of an event is the same as a picture of the event. 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 goes DOWN. It can be useful to talk through this with students.

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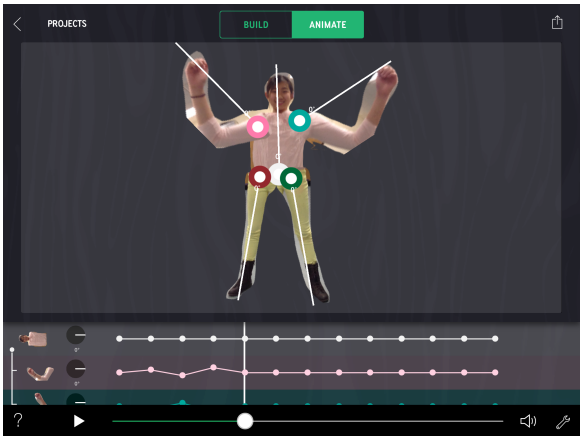
App Features

Begin by entering Make Some Moves. In **Build** mode, students will:

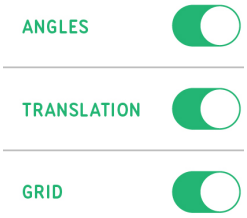
- Take pictures
- Trace and cut out parts of your photo that you want to animate
- Add graphic or musical elements below:

In **Animate** mode, students will use the:

Graph Controller. Choreo Graph uses keyframes much like other movie editing software. At each point in the keyframe, the student can manipulate how each part of the animation rotates. Each point represents the position of that part at a specific time. Stretch the points up and down to set the degrees of rotation. The steeper the line on the graph, the faster the part moves.



Toggle on math tools to notice:



-Degrees each part has rotated

-Path the main part travels

-The location of each part and coordinates

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Expected Activity Time

Part 1: My Symmetrical Dance Move (40 minutes)
Part 2: My Symmetrical Dance Duo (40 minutes)

Materials and Prep

- My Symmetrical Dance Move Student Sheets
- iPad with Choreo Graph app
- Wifi access for sharing to other iPads or online project space
- Graph paper
- Pre-requisites: line of symmetry between two objects; coordinate notation for describing translations and transformations

Introducing the Activity

Symmetry can be cool, especially in a dance move. Take a picture of your classmate, teacher, or family member or use a prefabricated robot and trace the parts that you want to animate. As you piece your parts together, plan out the symmetry you will be incorporating into your dance move.

To Do

Part 1: My Symmetrical Dance Move (40 minutes)

Have students:

- Sketch out the symmetrical dance moves they would like to create.
- Take a picture of their classmate, teacher, family member, or of themself and trace the parts that they want to animate.
- Piece their parts together on the stage; have them think about the symmetry that they will be incorporating into their dances.
- As they start to choose rotation angle measurements for each body part, make sure that students are maintaining symmetry in their dancer.
- When they are done, have students share their creations with classmates. Ask students: How did you achieve symmetry?

Part 2: My Symmetrical Dance Move Duo (40 minutes)

Have students:

- Plan and think about what differences and similarities it will take to make a symmetrical dance duo (two dancers on the stage). Encourage students make sketches of their plans.
- Consider the rotation angle measurements, and incorporate the translations.
- Select the pictures they want to use, and trace and create all the parts they will need.
- Create the virtual dance and share with their classmates.

Discussion

While students are creating their symmetrical dance moves, it's important to prompt their thinking around the following areas:

- How to define symmetry
- What kind of math it takes to make their dancers symmetrical
- Graphs of symmetrical shapes may be surprising. Compare the graphs of the parts that are moving in symmetry. Are the graphs the same or different? Why?

Extensions and Inquiring Further

To look at different types of symmetry, students can add more people or objects to the mix. Have students consider what they need to focus on to ensure symmetrical motions among the dancers.

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Name: _____ Date: _____

Part 1: My Symmetrical Dance Move

- Take a picture of your classmate, teacher, family member, or yourself, and trace the parts that you want to animate.
- As you piece your parts together on the stage, think about the symmetry that you will be incorporating into your dance.
- As you start to choose rotation angle measurements for each body part, make sure that you are maintaining symmetry in your dancer. Sketch out the dance moves.
- When you're done, share with your classmates and look at their symmetrical dancers.

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Name: _____ Date: _____

Part 1: My Symmetrical Dance Move

- Sketch your symmetrical dancer in the space provided (make sure to draw the line of symmetry!)
- Plan out the steps to make a symmetrical dance move!

Step	Pivot Point 1	Angle of Rotation	Translation (x,y)	Pivot Point 2	Angle of Rotation	Translation (x,y)
1						
2						
3						

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Name: _____ Date: _____

Part 1: My Symmetrical Dance Move Reflection Questions:

1. How would you define symmetry?

2. What did it take to make your dancer symmetrical?

3. Are there any moving parts on your dancer that are not symmetrical?

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Name: _____ Date: _____

Part 2: My Symmetrical Dance Duo

- Plan and think about the possible differences and similarities in creating a symmetrical dance duo. Make some sketches of your plan.
- Find the pictures you want to use, and trace to create all the parts you will need.
- Set the rotation angle measurements and incorporate the translations for your two dancers.
- Create the virtual dance and share with your classmates.

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Name: _____ Date: _____

Part 2: My Symmetrical Dance Duo

- Sketch your symmetrical dance duo in the space provided (make sure to draw the line of symmetry!)
- Plan out the steps to make a symmetrical dance duo.

Step	Pivot Point 1	Angle of Rotation	Translation (x,y)	Pivot Point 2	Angle of Rotation	Translation (x,y)
1						
2						
3						

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Name: _____ Date: _____

Part 2: My Symmetrical Dance Duo Reflection Questions:

1. If one dancer slides in one direction, what will the other one have to do?

2. How did you create two dancers that were symmetrical to each other?

3. How did making two dancers appear symmetrical differ from making one dancer symmetrical?

4. Identify differences and similarities in the angle rotations on the two different dancers.

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