Dance - Lesson 2 - Coordinate Symmetry - TD

Lesson Overview
In this lesson students will explore the concept of coordinate symmetry by designing two symmetrical dancers in Choreo Graph. This lesson is designed to start simple with a low barrier of entry, but can easily be scaled up for more complexity.

Pictured is a snapshot of a moment in a Choreo Graph “symmetry dance”. Notice the coordinates and their relationship to each other.
Dance and Symmetry

Dance is a beautiful art form full of motion that can be analyzed in mathematical terms. Dancers glide across space, spin in place, and fly through the air. Symmetry is often utilized in dance. Two dancers appearing as mirror images of each other requires a great deal of practice and precision.

In this lesson, students practice modeling reflective symmetry and using coordinate notation to describe symmetry in action. This self-driven activity provides students of all levels with the opportunity to observe symmetry using Choreo Graph. Student questions are ordered from basic to challenging to help facilitate differentiated instruction.

Learning Objectives:
SWBAT
- Investigate the concept of symmetry on coordinate axes
- Use coordinate notation for describing translations

What you need to get started
A set of iPads with the Choreo Graph app

Time Needed
Depending on how much time you want to spend on this project, anywhere from 1 class period (if students are already familiar with Choreo Graph) to 3 class periods.

Collaboration and Group Work
These lessons are designed for students to work individually, in pairs, or in groups. Each student should do all the work on their own sheets, and the iPad should be shared across group members as equally as possible.

We suggest that groups be no larger than four students. Four or more students in a group will require extra attention to make sure that every group member is contributing equally.
Lesson Plan

Introduction
1) Discuss and/or review the concept of symmetry, and how it appears in dance. You could show a video and also incorporate an actual mirror to help illustrate symmetry.

To do
1) Students will follow the instructions on their sheets.
2) The lesson guides students through creating a simple “symmetry dance.”
3) They are directed to keep track of the coordinates and angles at each keyframe.
4) In Part 2 students create their own dance, for which at least half should be symmetrical.
5) There are questions at the ends of parts 1 and 2, also shown below.
6) Feel free to edit questions and charts.
7) Circulate the room and check for understanding, help students as needed.

Sharing
1) Spend some time allowing the students to share their work with the class. In this lesson, students can share difficulties they might be having as well as successes in creating symmetry.
2) They can save their dances and email them to you.
3) You might also invite students to start noticing symmetry outside the classroom.

Wrapup
1) If necessary, have students label their iPads so they will be able to return to them for the next lessons.

Questions on student sheets
Part 1
1) Across which axis are the dancers symmetrical?
2) From keyframe to keyframe, how are the angle measurements related between the two dancers?
3) Why are the dancers closer to each other at some points than others?
4) Tap the “translation” tool and look at the lines of your dancers. Choose two of the longer lines and find the equations for those lines in the form y = mx + b.
5) What do you notice about the slopes and y-intercepts for the lines?
6) Are the lines symmetrical about the y-axis? Why or why not?

Part 2
1) How much of your dance would you estimate to be symmetrical?
2) Symmetry is a fascinating concept that we also see in nature. Having played with and examined symmetry, what are some things that you find interesting about symmetry? Why do you think symmetry exists in nature?
3) As you look at the translation lines of your dancers, what do you notice about the lines that are symmetrical as compared to those that aren’t?