5E Integrated STEM Lesson Plan – Template

This template serves as a guide for developing a lesson that integrates across subject areas and includes the components of a quality STEM lesson. Please use it to support your work and engage in discussions with your instructors and peers when you have questions.

Lesson Title: *P5.JS: Transformations*

Author: *Clara Ngo*

Topic: students will learn about rotation, translations, and scale in the P5.SJ environment.

Targeted Grade Level: 7-8

Time Needed: *two one hour classes to go through the slides and 1 class period for students to create on their own.*

Subject Integration: math, engineering, technology and art

Justification:

Engineering- P5.Js is a creative coding platform that lives on the web. In previous lessons, students have already learned the basics of coding, how to make shapes, fill things with color, create variables, etc. as students create code, they are able to test to see if it works immediately by pressing play.

Math- it is an 8th grade CCSS standard to learn about transformations. While learning about rotations, students go deeper in the understanding of radians vs degrees. Learning about radians is generally a topic for an Algebra 2 course but it easily applies here and when students can see the work in action, they are able to learn it better.

Art- Students are able to make any shapes and fill them with any color that meets their eye, but more importantly their audiences eye.

Standards: *NGSS, Common Core, or related State standards. Write out (or copy and paste) standards completely. Please identify the point when each standard is addressed in the 5E template below. Each standard should be explicitly*

addressed within the lesson if it is to be included. Example: Reading aloud a non-fiction text does not solely qualify for ELA integration. Making a graph does not solely qualify for math integration. What concept is explicitly being taught?

NGSS Performance Expectations *If you state does not use NGSS, use your state standards. Identify the state and link to the standards page. You are encouraged to list both the NGSS and your state standards.*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts:
Asking Questions and Defining Problems *Developing and Using Models* *Planning and Carrying Out Investigations* *Using Mathematics and Computational Thinking*	*Engineering Design: ETS1.B: Developing Possible Solutions*	*Patterns, similarity, and diversity;* *Cause and effect;* *Scale, proportion and quantity;* *Structure and function;*

Common Core State Standards: *Use your state standards if Common Core is not applicable in your state. You are encouraged to list the CCSS and your state standards.*

Math:

CCSS.MATH.CONTENT.8.G.A.3

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

CCSS.MATH.CONTENT.8.G.A.4

Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

ITEEA Standards *(If applicable)*
Other Standards *(as needed)*

Measurable Student Learning Objectives: Students will be able to write code that shows that they understand rotation in degrees and radians, scale, and translations.

Nature of STEM: *Summarize how your lesson addresses the "nature of" science, technology, engineering, math, etc. as discussed in the Methods of STEM course.*

Engaging Context/Phenomena:

When you think of a shape, how does it move? How can you keep the same shape but make it different? How are the different ways bodies move? How can we relate movement of a 3d object and translate it to a 2D one?

Data Integration: *What data is being used in this lesson? Are students analyzing or collecting data? What are they doing with the data? This would be a great place to include all the different NASA data made available to you. If NASA data is not appropriate for your lesson, speak to your course instructor to identify another source of data that is appropriate. It may be publicly available, collected by students, or accessible to you with permission through other projects.*

Students will be learning by trial and error. They will not be recording any data, but they will be thinking about it in their head and adjusting accordingly to meet what their mind has predicted.

Differentiation of Instruction:

Every student will have a laptop. As we go through the lesson, the teacher may need to understand that some students will work faster than others because of but not limited to processing speed, typing speed, prior content knowledge, or distractions in the classroom. The slides are provided to the students for reference in Google Classroom just in case the teacher moves faster than the pace that the student needs. Extra room is also considered for students who are slower to catch up while the students who are faster are able to extend their knowledge to go deeper into their program.

Real-life Connection:

In December, the students at my school hold a winter concert. As students are singing on stage, the students in my class have created the visual backdrop that accompanies the music. It is a form of artistic expression that uses a lot of math in the making.

Possible Misconceptions:

Since the class will be composed of 7th and 8th graders, all taking a variety of math classes (7 integrated, Algebra, or Geometry), their understanding and exposure to the material will be varied, though the teacher is able to use knowledge from 5th and 6th grade to pull their understanding to the concept of transformations.

Lesson Procedure: *This is where you include each phase of the 5E. They should be extremely clear, well organized, and ready to be used by another educator. Be sure that each learning experience meets the guidelines for each "E". The template below will help you.*

5E Model	5E Objectives
Engage *Introduce the lesson with an anchoring phenomenon. Facilitate*	**Procedure:** **Teacher asks:** *What are different ways to move a shape while keeping the same shape?*

student questions, discussion, etc. as appropriate. Learn about what students already know and want to know.	*Students think and respond: Move it left and right, spin it, make it bigger or smaller aka translate, rotate, and scale respectively*
	Modifications *They need to be able to see the board as the teacher will right the responses that the students will share*
	Standards Addressed
	CCSS.MATH.CONTENT.8.G.A.3
	Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
	CCSS.MATH.CONTENT.8.G.A.4
	Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.
	Formative/Summative Assessments *Students will raise their hand and share their thoughts to the questions above.*
Explore **Explain** **Elaborate**	**The teacher will present the slides on the projector. With each slide, there is room for explore, explain, and elaborate.** **Each one is explained more in detail in the speaker notes.** **https://docs.google.com/presentation/d/1cj2D9fNBFGaq1IC9h0R9QvzTYnpjwW5SN7g1tJMG W5g/edit#slide=id.g101c5109488_0_28**

Evaluate *Assess students knowledge, skills and abilities.*	**For the final project, students will draw out an idea that they plan to code in visual form, not code form.** **Students will submit this drawing on Google Classroom.** **Students will then translate the drawing into code on p5js.org. The goal is that they are producing what they think intentionally rather than accidentally.** **The beauty of creative coding is that you can accidentally arrive at something beautiful, but understanding the content means that you have created what you've intended.** **Students will submit their final sketch on Google Classroom.** **Students are able to make it as easy or complicated as they would like as long as they include two of the 3 transformations.**

Teacher Background:

The teacher will need to know how to do some basic computer coding in p5.js. This is a great resource to learn.

- The Coding Train (Youtube Channel): https://www.youtube.com/watch?v=HerCR8bw_GE&list=PLRqwX-V7Uu6Zy51Q-x9tMWIv9cueOFTFA

I've adapted one of the videos to make this Google Slide presentation below.

- https://docs.google.com/presentation/d/1cj2D9fNBFGaq1IC9h0R9QvzTYnpjwW5SN7g1tJMGW5g/edit?usp=sharing