Symmetry and Identity: An Exploration of the Progress Flag

Grades: 3rd to 5th
Periods: 3
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Materials

- "What's in a Symbol?" slides
- Initial Investigations handout
- Color-Preserving Symmetry and Symmetry of the Outline handout
- My Identity Flag handout
- Identity Flag Gallery Walk handout

Instructional Plan

This lesson is based on the MTLT article, "Supporting LGBTQ+ Students in K-12 Mathematics" by Brandie E. Waid. In this lesson, students identify lines of symmetry for various symbols, create line-symmetrical figures and examples and non examples of images that have lines of symmetry, and analyze and discuss similarities and differences between their identity and that of their classmates.

Note about student's prior knowledge: This lesson assumes that students already possess prior knowledge of how to find a line of symmetry for common polygons such as squares, rectangles, triangles, and so on with a lesson similar to that of Maggie William's Finding Lines of Symmetry. The lesson also assumes that students' understanding of a line symmetry has been developed using the following definition: A line of symmetry for a two-dimensional figure is "a line across the figure such that the figure can be folded along the line into matching parts" (language from CCSS.Math.Content.4.G.A.3, NGA Center and CCSSO 2010).

Note about teacher's prior knowledge: This lesson assumes that teachers have read Brandie E. Waid's November 2020 *MTLT* article "Supporting LGBTQ+ Students in K-12 Mathematics" and have familiarized themselves with the materials in the appendix that accompanies the article. Teachers should also familiarize themselves with the LGBTQ+ terms and history of LGBTQ+ flags used in the lesson. Terms are defined in The Acronym and Beyond section of the Learning for Justice publication *Best Practices for Serving LGBTQ Students Guide* (Collins and Ehrenhalt, n.d.). The "What's in a Symbol?" slides have an introduction to the history of the LGBTQ+ flags.

Day 1
Begin the lesson with the first slide of the "What's in a Symbol?" presentation. While the title slide is up, ask students what the word *symbol* means. Come up with a class definition that recognizes that symbols represent or stand for something (i.e., they hold meaning) and that symbols can represent objects, groups of people, concepts, places, and so on. They can also communicate values and beliefs.

Move on to the second slide, What do these symbols represent? Invite students to share what they know about each of the symbols and their significance. Once the symbols have all been identified and discussed, ask students to work with a partner to notice any mathematical properties of the symbols (e.g., "What shapes are involved?" "Are there any lines of symmetry?")

Move on to the Symbols and Identity slide and use the questions to facilitate a class discussion on the importance of symbols and how, for some people, symbols are seen as a connection to an individual's identity. For the question that refers to the previous slide, make sure to go back to that slide so students can consider the symbols in relation to that question. Time permitting, the teacher can again invite students to notice, with a partner, the mathematical properties of the symbols that students offered for the last question.

Following this discussion, show students the image of the Progress flag from the next slide (Can You Name This Flag?) and see if anyone knows what it represents.

"Progress" Pride Flag by Daniel Quasar 2018 (quasar.digital LLC)

The Progress flag combines elements of three distinct flags used within the LGBTQ+ community: the Rainbow flag, Transgender flag, and Philadelphia Pride flag. Discuss the meaning and history of these three flags (using the videos on the slide The Merging of Three Flags), as well as the meaning of the Progress flag (using the Progress' Pride Flag slide).

Important note for teachers: Make sure to use the correct pronouns for the flag's creator. Daniel Quasar's pronouns are xe/xem or they/them. You may have to introduce the concept of gender-neutral pronouns to students if they are unfamiliar with pronouns other than she/her/hers and he/him/his to refer to a singular person. Welcomingschools.org has a K-2 lesson on pronouns that teachers might find useful in developing an introduction to gender-neutral pronouns.

Distribute the Initial Investigations handout to students and allow them to work in pairs or small groups to answer the three questions. After a sufficient amount of time, bring the class back together and have students share their responses to the questions on the Initial Investigations handout. When discussing the last question, the teacher should do the following:

1. Assess any possible misconceptions. For example, because students have learned that rectangles usually have two lines of symmetry, they may mistakenly believe that the flag has two lines of symmetry because the flag is in the shape of a rectangle.
2. If a student does not pose the question "Do the colors matter?" during the discussion of the last question, the teacher should pose this question to probe student thinking for the next part of the lesson. This is the purpose of the Thinking about Question 3: Do the Colors Matter? slide of the "What's in a Symbol?" slide presentation. Ask students to consider the "matching parts" portion of the definition. What does it mean to be "matching?" Would the colors matter in a match? These questions can be used to facilitate a discussion on the importance of being precise when defining mathematical terms.

Introduce students to the definitions on the Two Types of Symmetry slide. These are concepts that have been used in higher mathematics (specifically, abstract algebra) when discussing the work of M. C. Escher.

Move on to the Which One? slide and ask students to consider if the Progress flag is an example of symmetry of the outline or color-preserving symmetry.

Allow students a few minutes to summarize their learning from today's lesson. Challenge students to go home and find some image that has both color-preserving symmetry and symmetry of the outline to share with the class the next day.

Day 2
Review the definitions of color-preserving symmetry and symmetry of the outline with students at the beginning of class. Allow students to share the items they found at home that had both color-preserving symmetry and symmetry of the outline.

Distribute the Color-Preserving Symmetry and Symmetry of the Outline handout to students and allow them to work in pairs or small groups to answer the five questions.

After a sufficient amount of time, bring the class back together and elicit students' understanding of the five questions on the Color-Preserving Symmetry and Symmetry of the Outline handout. To assess student understanding, invite students to share their examples and nonexamples with the class.

Have student volunteers share what they wrote (or drew) for the final question on the Color-Preserving Symmetry and Symmetry of the Outline handout (this question can be displayed for the class using the Thinking about Question 5 slide of the "What's in a Symbol?" slide presentation). This question is intended to revisit the flag's significance in relation to LGBTQ+ identity. Allow students to consider/discuss the other questions posed on the Thinking about Question 5 slide of the "What's in a Symbol?" presentation.

After discussing the importance of the colors of the Progress flag in relation to LGBTQ+ identity, distribute the My Identity Flag handout to students.
Each student should create their own individual flag (i.e., they should not work in groups for this) as homework. Encourage students to work with their family members to create a flag that captures their personal and cultural identity.

Day 3
Note: This day may take place immediately following day 2 or at a later time, depending on how long the teacher thinks students will need to work on their identity flags. The teacher should display student identity flags around the classroom. Students can be placed in small groups to conduct a sort of gallery walk, in which groups circulate around the room, visiting each of their classmates' identity flags. As they circulate, groups should discuss and record answers to the questions on the Identity Flag Gallery Walk handout.

Reconvene students for a whole-class discussion of the gallery walk and overall lessons learned about both symmetry and identity.

Assessments and Extensions

Assessments
Student-identity flags and the gallery walk may be used to assess their understanding of the learning objectives and standards of this lesson.

Extensions

1. Have students consider if an image that has color-preserving symmetry always has symmetry of the outline and vice versa.
2. Introduce students to the concepts of rotational and reflective symmetry and have them discuss those concepts in the context of the Progress flag and their identity flags, as well as in other symbols and images.

Questions and Reflections

Note: Student reflection questions are included in the gallery walk activity.

Teacher Reflection

1. What went well in this lesson, and what needs improvement? (How would I teach this lesson next time?)
2. Which students showed an understanding of lines of symmetry and the two new types of symmetry presented in this lesson? How did they demonstrate this understanding?
3. Which students showed opportunities for more growth? What were their misconceptions? What instructional strategies might I implement to support them?
4. How did I create a safe environment for my students to share their identity flags and discuss other elements of identity? How can I improve in this area for future lessons?
5. How did my students talk about the identities of their classmates and LGBTQ+ people? What words did they use? Were they respectful? How did I contribute to and set the tone of that conversation?
6. Do any specific students need greater support in respectfully discussing the identities of their peers or of other individuals different from themselves? Which supports would be helpful for those students?
7. What did this lesson show me that I needed to learn in terms of LGBTQ+ people and their experiences?
8. What did I learn about my students from this lesson and from their identity maps? How might I incorporate that information into future lessons?

Objectives and Standards

Learning Objectives
Students will be able to do the following:

- Identify lines of symmetry for various symbols and create line-symmetrical figures
- Create examples and nonexamples of images that have lines of symmetry that are color preserving or a symmetry of the outline
- Analyze and discuss (respectfully) similarities and differences between their identity and that of their classmates

Common Core State Standards for Mathematical Content

- CCSS.Math.Content.4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

Teaching Tolerance Social Justice Standards

- ID.3-5.1 I know and like who I am and can talk about my family and myself and describe our various group identities.
- DI.3-5.7 I have accurate, respectful words to describe how I am similar to and different from people who share my identities and those who have other identities.

Related Resources

Supporting LGBTQ+ Students in K–12 Mathematics
Journal Article

References