

Mobius STEM Connections

<p>Title: Mobius STEM Strips Estimated Time: 1 Period</p>	
<p>Core Ideas (GSE Standards): While there are numerous grade-level core ideas that can be incorporated into this lesson, it is designed primarily for students to consider how science, technology, engineering, and mathematics (STEM) can be connected in relevant and important ways. If we want our students to consider how the concepts under study are linked to other important ideas, we have to provide opportunities to investigate and discuss these connections.</p>	
<p>Developing and Using Models Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution.</p> <p>Obtaining, Evaluating, and Communicating Information Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.</p>	<p>Crosscutting Concepts Systems and System Models: A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot.</p> <p>Structure and Function Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.</p>
<p>Authentic Scenario The original Mobius strip was discovered in 1858 by visionary mathematician and astronomer August Mobius. A Mobius strip forms one of the most famous surfaces in mathematics. The surface is an unusual one – a one-sided surface that is <i>non-orientable</i>. Mobius was able to show that these strange one-sided surfaces are actually an integral part of mathematics, magic, science, art, engineering, literature, and music. In this activity, students make a Mobius strip and then explore and discuss vital connections between science, technology, engineering and mathematics. They then use a Mobius template to create their own strip to illustrate key connections between concepts/ideas of their choice.</p> <p>Guiding Question: Why is it important to explore how ideas are connected in our natural and engineered world?</p>	

5E Stage	Student Activities	Teacher Activities
	How will students engage actively in the three dimensions throughout the lesson?	How will the teacher facilitate and monitor student learning?
Engage	<ul style="list-style-type: none"> In small groups, students develop simple 3-4 word definitions for science, technology, engineering and mathematics. Students discuss their definitions and look for connections between each of these disciplines. Students generate questions based on their discussion. 	<ul style="list-style-type: none"> As needed, provide a STEM template for students to write their definitions. Encourage students to keep their definitions as simple as possible (K.I.S.S.) Discuss student generated questions. Help students to consider plausible and relevant connections

Explore	<ul style="list-style-type: none"> • In the exploration, students color, fold, and tape the Mobius strip hot dog style. • Students then do a half-twist to the strip and carefully tape the ends together. • Students observe this strange shape and record their observations. • Using their thumbs and index fingers, students gently pull the Mobius strip until it completes several cycles of movement. • Students discuss how STEM disciplines actually act as a system where a group of related parts that make up a whole and can carry out functions its individual parts cannot. 	<ul style="list-style-type: none"> • As needed, assist students in the proper cutting, taping and half-twist of their strips. • Encourage them to carefully observe the strange shape. • As needed, help them to see how the strips form one continuous loop without a real beginning or end. • Promote active discussion regarding connections between STEM subjects.
Explain	<ul style="list-style-type: none"> • In groups, students consider/explain how the shape of the strip helps to illustrate how STEM disciplines are connected and related. • As a class, discuss how the strip helps to illustrate how STEM disciplines are connected and related. • After doing so, students read the article Some Mobius Strip STEM Connections to Consider. 	<ul style="list-style-type: none"> • As needed, help students to consider how shape of strip cleverly connects topics that are related. • After students read the article, discuss the scientific and symbolic significance of the Mobius Strip.
Elaborate	<p>Using the template provided, students should create their own Mobius strip to show the relationships/connections between a science/STEM topic of their choice.</p> <p>Extra Credit: Create a Mobius strip to show the connections between other topics, events, etc. (you can do some awesome Mobius valentines).</p>	<ul style="list-style-type: none"> • Encourage students to be super creative and emphasize that everything is connected in our natural and engineered worlds.
Evaluate	<p>Formative: Each student presents their Mobius strip to their group members and discusses how each idea/topic is connected.</p> <p>Students complete journal entries documenting observations, ideas, discussions, and creations.</p>	<p>Formative: Facilitate ongoing questioning & discussion</p> <p>Summative: Evaluate student presentations Evaluate journal entries.</p>

Teacher Notes: When discussing STEM definitions try to keep things as simple as possible.

Science – exploration of the natural (and man-made) world to gain understanding

Technology – tools to explore the world

Engineering – designing and building new tools to explore world

Math – using numbers, equations, patterns, and shapes to solve problems

I would recommend making your own Mobius STEM strip ahead of time. It is a little tricky to just add a half-twist (180 degrees) and the shape produced seems awkward at first. Once kids complete their strip, make sure that they practice moving it between their fingers so they can appreciate the nature of a one-sided (or continuous) surface. It is also challenging but very worthwhile to have students create their own Mobius strips and this makes an excellent and unique homework assignment. Hopefully, this activity will help students to consider how things connect in our natural world.

Materials needed:

1 STEM Template per group

1 STEM Strip and Mobius Strip Template per student

Some Mobius STEM Strip Connections to Consider Article

1 scissors per group or student

1 roll of scotch tape per group.

Colored pencils, crayons, or markers.