



Using Tangrams to Teach the Scientific Method

Title: Using Tangrams to Introduce the Scientific Method

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Theme/Topic: The Nature of Science

Introduction: This lesson uses Tangrams to create and test “If, Then” Statements. Students will work through the Scientific Method naturally while solving problems associated with various shapes using Tangrams.

Subject(s)/Grade level(s): Middle School Science

Duration of lesson: One class period

Connection to NGSS:

Next Generation Science Standards Core Statements:

- Science depends on evaluating proposed explanations.
- Science knowledge is based upon conceptual connections between evidence and explanations.
- Scientific knowledge is open to revision in light of new evidence.

Essential Questions:

- How can the scientific method be applied to real world Scenarios?
- Can the Scientific method be utilized to construct various Tangram Shapes?

Learning Objectives:

- SWBAT create hypothesis by using “if/then” statements.
- SWBAT work through the scientific method via engineering processes.
- SWBAT communicate results with peers.

Materials Needed:

- Set of Tangrams (Can be found at https://www.amazon.com/Learning-Advantage-Tangrams-Set-4/dp/B001UFWJLW/ref=sr_1_10?dchild=1&keywords=Tangram+class+set&qid=1628003203&sr=8-10)

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- The following website can be utilized instead of physical Tangrams:
<https://mathigon.org/Tangram>
- Youtube Video: “A Sage’s Journey: The Story of Tangrams”
<https://www.youtube.com/watch?v=X5mc-dkYLfI>
- Worksheets
 - Tangrams Student Worksheet (Found at end of lesson plan)
 - Bellringer (Found at end of lesson plan)

Pre-Assessment of Prior Knowledge:

- Bellringer is used to identify strength and weakness in student vocabulary and understanding of the scientific method.

Lesson Activities/Instructional Strategies:

1. Students walk into the classroom and immediately begin work on Scientific Method Bellringer.
2. Students watch the 5-minute video: “A Sage's Journey”
3. Ask students to brainstorm ideas of shapes that could be created using: two large triangles, two small triangles, a medium size triangle, a square and parallelogram.
4. Conduct a brief lecture about the scientific method and the use of “If/then” statements to create testable solutions to a problem.
5. Students are asked to work in pairs. These may be chosen by student or teacher.
6. Pass out Tangram Worksheet. Put at least 6 examples of blacked out shapes on the board for students to choose from. Students place the shape they would like to work on in the dedicated area on their worksheet.
7. Students work on the Tangrams student worksheet with their partners.
8. Provide the following example using a pine tree shape: If two small triangles make a square, then that square can be used as the base of the tree.
9. Students are instructed to work on their own “if/then” statement and complete the worksheet.
10. Teacher is visible and ready to answer any questions that arise.

Resources:

- Youtube Video: “A Sage’s Journey: The Story of Tangrams”
<https://www.youtube.com/watch?v=X5mc-dkYLfI>
- https://www.archimedes-lab.org/Tangramagicus/Tangram_legend.html (legends)
- <https://chinesepuzzles.org/Tangram-puzzle/>
- <https://mathigon.org/Tangram>
- <https://www.interactive-maths.com/Tangrams-ggb.html>
- <http://www.cccg.ca/proceedings/2014/papers/paper56.pdf>



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Closing/Reflection Activity: Students actively complete the work of the sage and the excitement of the king by creating shapes using Tangrams. Students provide their own ideas as to why Tangrams are so popular in Eastern Asia.

Post-Assessment: Student worksheet serves as post-assessment

Extension Activities/Extending the Lesson/Cross-Curricular Connections:

- Completing this lesson alongside the Legends Unit in ELA could provide students with a fresh perspective not given independently in Science or ELA alone.
- This lesson can also be used alongside a math course. When involving math more complex hypothesis can be given such as those dealing with the pathogen theorem and trigonometry.
- Art and science would work well together to provide students an opportunity to complete the engineering process in creating usable classroom furniture using Tangrams.



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Tangrams Student Worksheet

Name: _____

Date: _____ Pd. _____

Objective: Student will be able to:

- Create a hypothesis using “If/Then” statements.
- Work through the scientific method.
- Communicate results with peers.

Instruction:

1. After watching “A Sage's Journey” Pick one shape you would like to work on for this activity. Draw your shape on the space provided below.

2. Create an “if/then” statement as an initial step to solving the Tangram Puzzle. Use the example provided in class to determine how to complete this.

If _____, then
_____.

3. Begin attempting to solve the Tangram shape using your hypothesis. (Please note, this may take many attempts as your hypothesis covers only the initial step.)

Did your first attempt at a hypothesis work? (Place an “X” next to your response)

_____ Yes, Go to Question #6

_____ No, Go to Question # 4

4. Formulate a new hypothesis using an “if/then” statement.

If _____, then
_____.

Attempt to solve the Tangram shape using your new hypothesis. (Please note, this may take many attempts as your hypothesis covers only the initial step.)

Did your first attempt at a hypothesis work? (Place an “X” next to your response)

_____ Yes, Go to Question #6

_____ No, Go to Question # 5

- 5.

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6. Formulate a new hypothesis using an “if/then” statement.

If _____, then
_____.

Attempt to solve the Tangram shape using your new hypothesis. (Please note, this may take many attempts as your hypothesis covers only the initial step.)

Did your first attempt at a hypothesis work? (Place an “X” next to your response)

_____ Yes, Go to Question #6

_____ No, Go to Question # 7

7. Draw the solution to your Tangram Puzzle. Highlight the shapes used in your “if/then” statement in the space below. When finished write a step by step explanation as to how you solved the Tangram puzzle. This explanation should be clear enough that a classmate could replicate your findings.

8. Draw what you believe to be the closest you came to solving your Tangram Puzzle in the space below. Highlight the shapes used in your “if, then” statement. Explain why you feel as though you were not able to solve your Tangram puzzle. Provide ideas you have that may help others solve the puzzle.

Bell ringer and shapes pages

Scientific Method Bellringer

- ▶ Put the following steps to the scientific method in order

- A. Draw a conclusion
- B. Test the Hypothesis
- C. Ask a Question. Develop a question or problem that can be solved through experimentation
- D. Form a Hypothesis. Predict a possible answer to the problem or question
- E. Analyze the Results
- F. Share the Results.

