

Lesson Title: Tie Dye Science

Lesson Overview: In this lesson students will test several fabrics to find which works best for tie dying. Students are just beginning to learn about analyzing the data collected in a scientific experiment. With teacher direction and support, students will be able to successfully gather data and analyze it to choose a fabric that will work well for tie dying. Students will then create tie-dyed shirts.

Topic(s): Matter and Its Interactions

Grade or Grade Band: 2nd grade

Lesson Objectives:

- Experiment with a variety of fabrics to find the ones best suited for tie dying
- Record observation data collected during the experiment
- Analyze data to determine the best material for a tie dye t-shirt

Next Generation Science Standards:

2-PS1-2. Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose. * [Clarification Statement: Examples of properties could include strength, flexibility, hardness, texture, and absorbency.]

Science and Engineering Practices- Analyzing data in k-2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

North Dakota Standards:

2-PS1-2 Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

Time Needed (estimate): 2 – 30-minute sessions

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Preparation/Materials

Background knowledge students must have to be successful:

2nd grade students should be somewhat familiar with planning and conducting experiments. They should be able to observe and recognize similarities and differences. With proper teacher support 2nd graders should be able to record their observations and analyze these observations.

Differentiation and accommodation to support learning for all students:

To aid with organization, hand out the materials in prelabeled Ziplock bags.

Students may need to be guided through steps 1 through 7 multiple times before they feel comfortable completing the procedures on their own.

Essential terminology:

Consistent- to do things the same each time

Fading- When colors don't appear as bright over time

Reliable- you can trust the information

Websites:

Tie Dye Video: <https://youtu.be/NxSDYS2RxE>

Materials needed:

- Permanent markers
- Isopropyl alcohol
- Pipettes
- Ziplock sandwich bags
- Small white fabric squares
 - polyester
 - nylon
 - wool
 - 90% cotton
 - 50% cotton
 - felt
 - linen
- 1 cotton t-shirt for each student

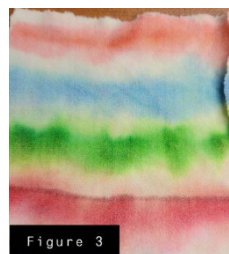
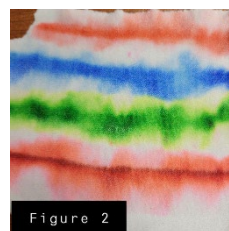
Engage:

Wear a bright tie-dyed shirt to school on the day of the lesson. This will draw attention if students aren't used to seeing you in this type of shirt. Students may ask you about your shirt prior to the science lesson, be sure to respond that it has something to do with today's science lesson. At the beginning of your science lesson, point out your shirt and ask the students to think of reasons how a tie-dyed shirt fits into our science lesson. Validate their responses and expand on them if necessary. Let students know that a scientist will often test different materials to find the one that works best for their purpose. Today we are going to experiment with different materials to see which ones will work best for creating tie dye patterns.

Explore:

Explain to students that scientist will often test different materials to see which one will work the best for them. Today we are going to test fabrics to see how well they absorb and hold colors for making tie dye shirts. Distribute the "Fabric Testing Recording Sheet" and one of the fabric squares. Before beginning, explain to the students why it is important for scientists to be consistent or make sure they follow the same procedures. If a scientist is consistent their test results will be more reliable or able to be trusted.

1. Start with just one of the fabric squares and 4 different colors of permanent markers. Instruct students to draw a single straight line across the fabric using 4 colors of their choosing. See Figure 1.
2. Students should record whether color easily transferred to the fabric in the column labeled "Easy to Color"
3. Fill a pipette with isopropyl alcohol and drop alcohol down each line until the entire piece of fabric is wet.
4. Students should record if color spreads out well on the fabric when wet. See Figure 2.
5. Wash the piece of fabric with one squirt of hand soap and cold water
6. Students should record whether the color faded after washing. They may also notice the water or soap become discolored while washing. See Figure 3.
7. Label a Ziplock sandwich bag with the name of the type of fabric. Store the fabric in the bag and repeat steps 1 through 7 with the remaining fabrics.
8. When student have tested all of the fabrics, guide them to answer the analysis questions at the bottom of the recording sheet.



Explain:

Once students have completed testing all of the fabrics and answered the analysis questions at the bottom of the "Fabric Testing Recording Sheet," ask the students "Which fabric do you think will work best for making tie dye shirts?" Allow students to discuss their recommendations. One of the top choices should be cotton. Wool and linen are also good choices for tie dying, but you may have to have a conversation about why they may not be the best choice for daily wear. Wool can be itchy and hot while linen is heavier and more rigid.

Watch the Tie dye science video with the class: <https://youtu.be/NxSDYS2RxE>

Allow students time to think about the designs they would like to make on their t-shirts. Hand out the t-shirts and make sure there are several colors of each permanent marker available for student use.

Extensions for learning more about this topic:

Art- Develop an activity about primary and secondary colors or color mixing in further tie dye experiments.

Cultural Connections- Learn about the Japanese art of shibori- an ancient tie dying technique

Science- test different types of markers, dyes or liquids

Evaluation:

Student evaluations should be based on the completion of the "Fabric Testing Recording Sheet," answers to the analysis questions and discussion questions.

Name: _____

Fabric Testing Recording Sheet

Type of Material	Easy to Color on		Color Spreads Out		Color Fades after washing	
Polyester	Yes	No	Yes	No	Yes	No
Nylon	Yes	No	Yes	No	Yes	No
Wool	Yes	No	Yes	No	Yes	No
90% Cotton	Yes	No	Yes	No	Yes	No
50% Cotton	Yes	No	Yes	No	Yes	No
Felt	Yes	No	Yes	No	Yes	No
Linen	Yes	No	Yes	No	Yes	No

*Teacher note - Add or delete any fabrics you wish to use

Look at all of the fabric squares in your labeled bags as you answer these questions.

1. Which material allowed the color to spread out the best? _____

2. Which material faded the LEAST? _____

3. Write down the names of three of the materials that allowed the color to spread out but didn't fade too much.
 - a. _____
 - b. _____
 - c. _____

4. Compare your list with others in the class. Which material is the most popular?
