

Scientific Investigations

Using Inspiration to Support Logical Reasoning

OBJECTIVES

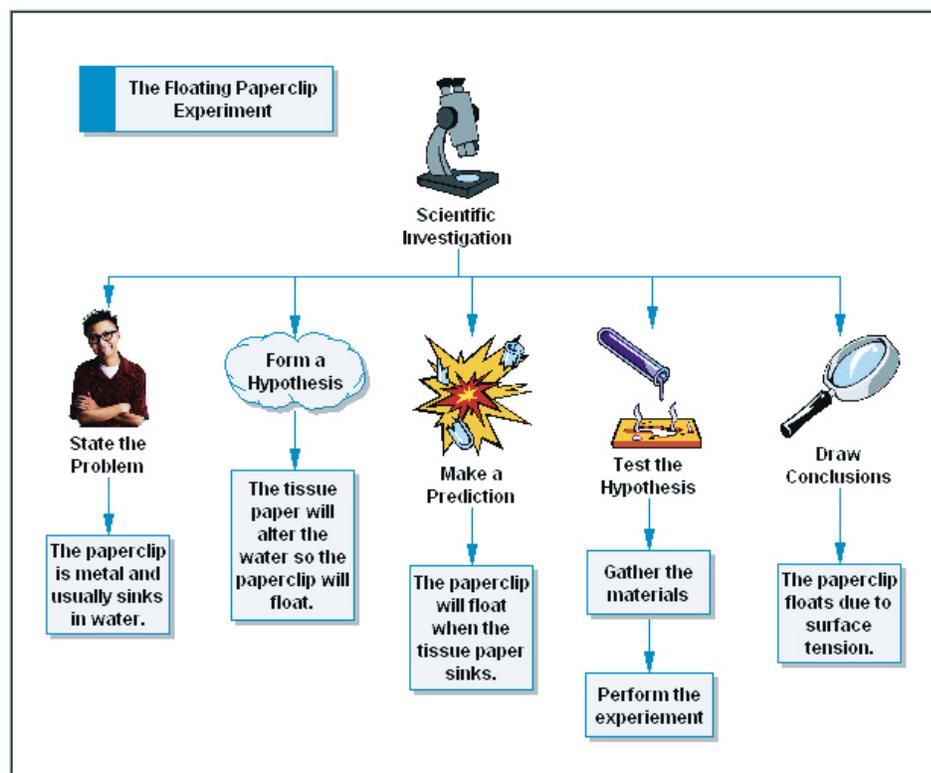
- Document a scientific investigation
- Understand the steps involved in scientific investigations
- Recognize possible outcomes of scientific investigations

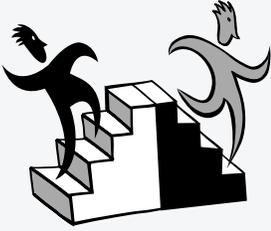
Note: Be sure to review the Scientific Investigations Template and Sample Activity and make modifications to suit the needs of your students and situation. Gather the materials for the science experiment.

MATERIALS

- Inspiration software
- Scientific Investigations Experiment Sheet
- Scientific Investigations Planning Sheet
- Scientific Investigations Template
- Scientific Investigations Sample Activity
- Science experiment materials and tools: Paper clips, tissue paper, bowl of water, pencil with eraser

The National Science Standards outline the nature of scientific inquiry and reminds us that scientific investigation involves asking and answering a question and comparing that answer to what scientists already know about the world. Although scientists use different kinds of investigations, they all involve logical reasoning and observation. Engaging students in this type of inquiry helps them to understand scientific concepts and develop an appreciation of how we know what we know about science.





Customizing to Meet Your Needs

You may want to simplify the investigative process for younger students:

- State the Question
- List your Observations
- Develop a Conclusion

Older students may want to create an additional scientific checklist to further validate their investigations:

- Are the arguments logical?
- Does the conclusion make a connection?
- Is this experiment replicable?
- Were the tools appropriate?
- Is there an alternative explanation?

Before the Computer

1. Begin the lesson with an explanation of scientific investigations. Describe to students that scientists use different kinds of investigations, including controlled experiments, data collection, and natural observations of things or events. Most scientific investigations involve systematic observations, carefully collected and relevant evidence, logical reasoning, and some imagination in developing hypotheses and explanations.
2. Invite students to share descriptions of science experiments they have conducted.
3. Distribute the Scientific Investigations Experiment Sheet and Scientific Investigations Planning Sheet and explain to students that they will be conducting a simple experiment called the “Floating Paperclip.” In this experiment, students learn that you can create a thin film on the surface of water in order to float light objects.
4. Summarize the experiment for the class and introduce students to steps of the scientific investigation listed on the Planning Sheet. Describe each step and point out the correlating explanations.
5. Divide the class into small teams and distribute the science experiment materials and tools to each team (paper clips, tissue paper, bowl of water, and pencil with eraser).
6. Before conducting the experiment, instruct the teams to complete the first three steps on the Scientific Investigations Planning Sheet:
 - State the Problem
 - Form a Hypothesis
 - Make a Prediction
7. Next, tell students to follow the instructions on the Scientific Investigations Planning Sheet to complete the experiment. Remind students to record their notes on the last two steps of the Planning Sheet:
 - Test the Hypothesis
 - Draw Conclusions

Students will observe that the paper clip will indeed float on the surface of the water at the conclusion of the experiment. Explain that this is a result of what scientists call “surface tension”—which means that there is a sort of skin on the surface of the water where the water molecules hold on tight together. If the conditions are right, they can hold tight enough to support the paper clip. Many insects, such as water striders, use this “skin” to walk across the surface of a stream.

8. Before moving to the computer, be sure that all teams have completed the experiment and recorded data on the Scientific Investigations Planning Sheet. Explain to students that it is through this investigative process that we are able to test new ideas, draw logical conclusions, and discover new knowledge.

At the Computer

1. Direct students to the Scientific Investigations Template and tell them to rename and save the file in the appropriate location.
2. Next, ask students to use the Scientific Investigations Planning Sheet as a guide in completing the symbols with the associated procedures.
3. Encourage students to switch to **Outline** view to enter their scientific investigative data into their Inspiration diagrams.
4. Add additional subtopics as necessary using the **Subtopic** button in **Outline** view or the **Create** tool in **Diagram** view.

Other Great Activities

- You can make the water surface in the “Floating Paperclip” experiment even tighter by sprinkling some baby powder onto the surface.
- Browse the Internet Connection section for more science experiment ideas or use your science textbooks to research additional experiments. Use the Scientific Investigation Template as the standard for recording scientific data.

Internet Connection

<http://collections.ic.gc.ca/science/english/index.html>

This site provides a selection of science experiments that are easy to conduct in your classroom.

<http://www.exploratorium.org>

Browse the resources available from the San Francisco Exploratorium and be sure to try some of the online experiments with your students.

<http://www.tryscience.org/>

Click any topic on the Try Science site to learn more about teaching scientific investigation to you students.



Tips & Timesavers

- You can move either end of a link to a new location on a symbol by selecting the link you want to move and dragging the link to a gray connection point to reconnect it to the symbol.
- You can change the direction and style of the arrowheads on links by selecting the link and choosing **Arrow Head Starting Point** or **Arrow Head Ending Point** from the **Link** menu and picking the style you want.