The Effect of
_____ on _____
(independent variable) (dependent variable)

Science is all about investigating questions or problems in order to find a solution. This means that curiosity is one of the most important aspects of science! Think about the questions you come up with on a daily basis. Where do they come from? What makes you question the world around you? Every question you develop comes from an observation, so you must begin any scientific process with your five senses!

You will design your own procedure based on the following information. In order to carry out a successful experiment, you must organize your initial observations, your hypothesis, your subjects or groups, and the variables you will be manipulating and observing.

Observations:

_____

_____

Hypothesis: Is it testable? Be sure to include both variables!

_____

_____

Independent (manipulated) variable:

_____

Dependent (responding) variable:

_____

Control Group:

_____

Control Variables/Constants: Make sure they're kept the same throughout the experiment!

_____ _____ _____

_____ _____ _____

Procedure: Describe the steps you will take to carry out the process of testing your hypothesis:

1. _____

   _____

2. _____

   _____

3. _____

   _____

4. _____

   _____

5. _____

   _____

Data: Use another sheet of paper to construct a data table for your experiment.
Conclusion: Write a detailed summary describing the outcome of your experiment. Was your hypothesis correct? Why or why not? What could be done to improve your experiment?

Diaper Disaster

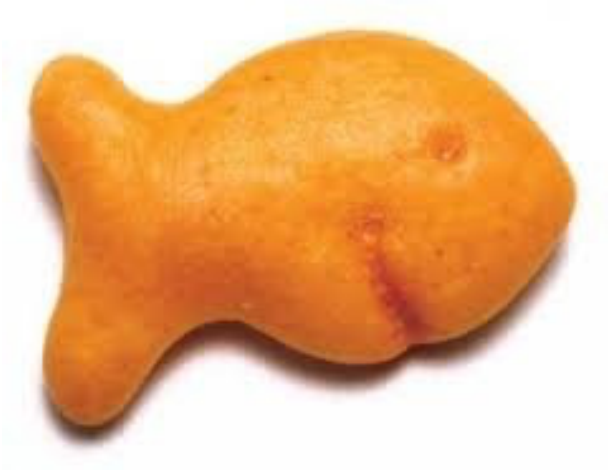
These are words that nobody wants to hear! Challenge your students to put their knowledge of science to the test and save parents from this nightmare scenario! In this activity, your students will identify controls and variables and work through the basic steps of science to test the effectiveness of various diaper brands.

Materials:
3 separate newborn diaper brands (varying in cost) - 1 of each diaper per group
Water
Graduated cylinder
Stopwatch

Procedure:
Calculate the cost of each diaper by dividing the cost of the package by the number of diapers.
Allow students to make observations about each diaper.
Students will develop a hypothesis.
Note: To allow for differentiation, you may choose to encourage students to design the experiment themselves or you can help them define the following variables and constants.
Identify the independent variable (the diaper brand).
Identify the dependent variable (the amount of absorption).
Discuss control groups (comparing each diaper to one another acts as the control in this scenario).
Identify experimental constants (how to check for leakage, how much water to pour, where to pour, speed of pour, time in between pours, etc).
Students will carry out their experiment until they determine a "winner".
They will develop a conclusion explaining the outcome of their hypothesis and discussing the data and variables they tested.

Going for Gold...fish

It's everybody's favorite fish-shaped cracker! Cheesy and delicious, they can brighten up any afternoon snack, but what type of science is going on as these little guys "swim" into your belly?



Materials:
Fun-shaped crackers
Small cups or beakers
Various solutions ranging in pH (recommended: diet soda and regular soda)
Stirrers
pH strips

Procedure:
Allow students to make observations and predictions about which solution will cause the crackers to break down the fastest.
Students will develop a hypothesis.
Note: To allow for differentiation, you may choose to encourage students to design the experiment themselves or you can help them define the following variables and constants.
Identify the independent variable (solution types, ex: soda types).
Identify the dependent variable (the rate of cracker breakdown).
Discuss control groups (comparing each solution to one another acts as the control in this scenario).
Identify experimental constants (how to check for breakdown, how often to stir, amount of liquid, etc).
Students will carry out their experiment until they determine the rate of cracker breakdown in each solution.
They will develop a conclusion explaining the outcome of their hypothesis and discussing the data and variables they tested.
*This activity can also be used to demonstrate the effects of acidic solutions and can be related to bodily processes such as enzyme action, digestion and even dental health.

LearnEdNotebooks.com

Thinking Thermally

with 60-Second Science

What will happen to molecules within a glow stick as they are exposed to different temperatures? How can this be observed?

Check out YouTube video: 60-Second Science: Thinking Thermally

Materials:

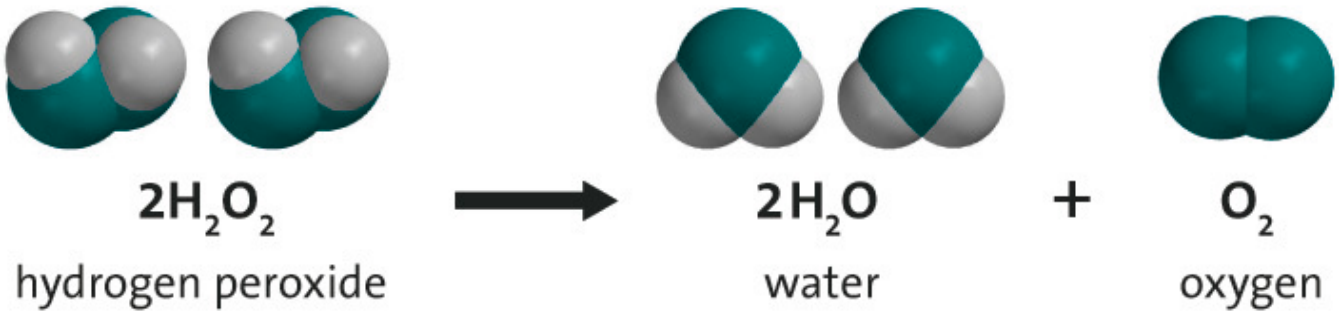
3 glow sticks (same size and color)
Ice Water
3 beakers or cups
Hot Water
Room Temperature Water

Procedure:

Allow students to make observations and predictions about which temperature will cause the glow stick to glow brightest.
Students will develop a hypothesis.
Note: To allow for differentiation, you may choose to encourage students to design the experiment themselves or you can help them define the following variables and constants.
Identify the independent variable (water temperature).
Identify the dependent variable (amount of light given off by the glow stick/molecular movement).
Discuss control groups (room temperature water).
Identify experimental constants (color of glow stick, age of glow stick, amount of water, etc).
Students will carry out their experiment by observing the amount of light given off by each glow stick. They will fill the first beaker with cold water, the second with room temperature water, and the third with hot water. They will then crack the three glow sticks until they light up and place one in each beaker. They will develop a conclusion explaining the outcome of their hypothesis and discussing the data and variables they tested.

Bubble Trouble

What will happen when you change the amount of a catalyst added to a chemical reaction? Check out this experiment to find out!



Materials:

Safety goggles	Dish soap	2 16-20 oz bottles
Baker's yeast	Hydrogen peroxide	Warm Water

Procedure:

Allow students to make predictions about the effect that yeast will have on a reaction rate. Prior knowledge: Yeast species contain an enzyme called catalase that breaks hydrogen peroxide down into water and oxygen. When added to hydrogen peroxide and water, a visible reaction can be seen.
Students will develop a hypothesis.
Note: To allow for differentiation, you may choose to encourage students to design the experiment themselves or you can help them define the following variables and constants.
Identify the independent variable (amount of yeast or catalyst).
Identify the dependent variable (reaction rate or amount of bubbles given off by the reaction).
Discuss the control group (a comparison of the amounts of yeast added will act as the control).
Identify experimental constants (size of container, amount of peroxide, amount of soap, etc).
Students will carry out their experiment by observing the amount of bubbles produced from adding two different amounts of yeast to a hydrogen peroxide and dish soap solution.

Wear safety goggles and perform this experiment over a sink or in a large tray or bowl.
Mix 50 ml hydrogen peroxide with 5 ml liquid dish soap in a water bottle.
Repeat in a second water bottle.
In a separate container, mix 1/2 teaspoon (~2.5 ml) yeast with 30 ml warm water. In another container, mix a tablespoon (~15 ml) of yeast with 30 ml warm water.
Slowly add the 1/2 teaspoon mixture into the first bottle. Observe.
Slowly add the 1 tablespoon mixture into the second bottle. Observe.

Students will develop a conclusion explaining the outcome of their hypothesis and discussing the data and variables they tested.

Renew the River

Activity from LearnEd Notebooks
www.learnednotebooks.com

A dangerous trend is occurring in the Crystal River in Sustainaville. Once a thriving ecosystem, it is now becoming polluted by high population growth and bad ecological practices in the town. The residents of Sustainaville have forgotten the importance of recycling and proper waste disposal, causing the river to become frighteningly polluted.

Work with 3-4 other classmates as the town council of Sustainaville. In order to solve this crisis, you must develop a plan of action to clean the water. The ecosystem is declining quickly, so time is of the essence. You have a $1000 budget to purchase the supplies you need and develop this plan.

Supply List:

-Spoon $100	-Sponge $200	-Coffee Filter $250	-Sand $250
-Aluminum foil $200	-Plastic baggie $200	-Plastic Cup $200	

Preparation:
Each group will need access to a "polluted water" sample. Before the activity begins, use a plastic bin or storage container to create a sample. For every gallon of water, add 1/2 cup of soil, 1/4 cup of paper confetti or hole punches, 1/4 cup of vegetable oil, Note: Teachers may choose to set this up in advance.

Mission:
As the town council, you and your group must develop a plan to save the Crystal River ecosystem. Develop a detailed proposal addressing the problem and explaining what your short-term solution is. You must include a budget and an explanation of why each item will be purchased. You should also include a long-term plan of action to help educate the residents of Sustainaville about environmentally-friendly practices. Draft your plan using the provided sheet and submit it to your teacher to purchase the supplies.

After all groups have received their polluted water sample and purchased supplies, you must race the clock to get your water as clean as possible. You and your group will have 15 minutes to treat your water sample and try to restore Crystal River's sparkling natural beauty.

After the 15 minutes has elapsed, each group must submit their sample for review. As a class, you will evaluate each group's success and compare it to how wisely the budget was used. Were you able to save the Crystal River ecosystem? Assess your own team's performance and describe why or why not your plan was successful. How can you pledge to keep a situation like the Crystal River disaster from occurring in your own town?

Renew the River

Town Council Action Plan

Town Council Members:

Describe the problem and explain potential contributing factors:

Summarize your short-term plan of action to clean the river:

Describe your proposed budget:

How will your team educate residents of Sustainaville about Earth-friendly practices? Are there any resources you can provide the town to prevent future problems?

Renew the River

Town Council Action Plan - Results

Town Council Members:

Was your team successful at restoring the ecosystem? Why or why not? How could your team have improved its effectiveness?

What can you do to protect your own home town from the dangers of pollution?

Research a local or world-wide pollution crisis and describe how it impacted surrounding ecosystems. How was the problem addressed? What were the short-term effects? Are there any long-term effects? How can humans protect the planet from experiencing these negative events?

Name: _____

Date: _____

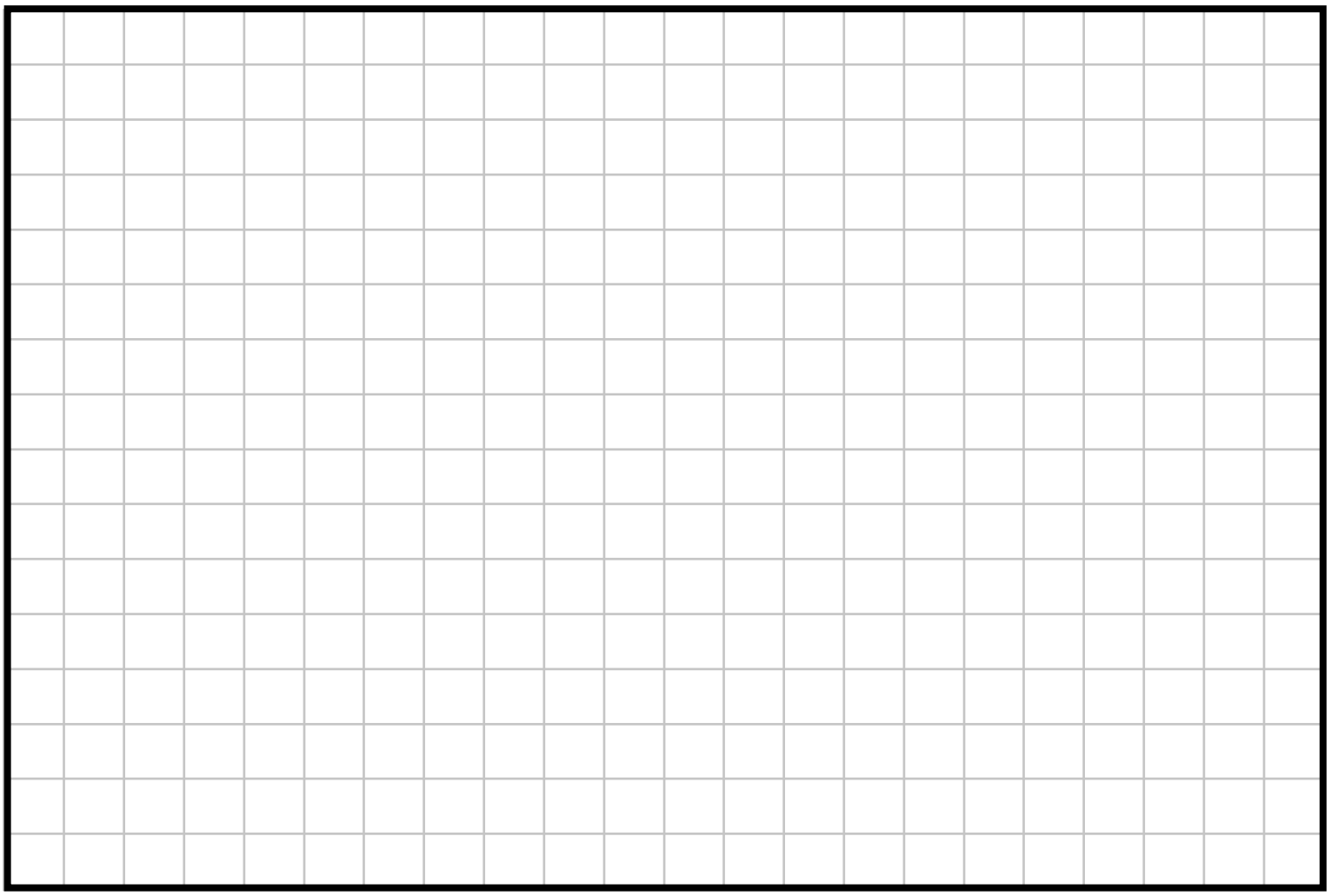
Hole in One - A Golf Ball's Journey

learnednotebooks.com

Not all golf balls are destined for a hole in one on the golf course. Today you will engineer a different course for a golf ball - an obstacle course! Working with a group (or as a whole class) to design your course, you must follow all rules listed below. Decide what tools to use, which machines to incorporate and how to construct your course. Remember, creativity is key! Once your plan is developed, draw your course blueprint below. After you collect all of your supplies, you will build your obstacle course and explore how machines make work easier as the golf ball travels through your course.

Rules & Regulations:

- Once the golf ball begins its journey, you may not touch it.
- The golf ball must contact at least three different simple machines.
- The golf ball must travel at least ten feet.
- The golf ball must change vertical distance of at least two feet.
- The golf ball must complete its journey into a cup, can or similar container.
- The longer the journey, the better!



1. Use the chart below to identify each discuss the six types of simple machines.

Simple Machine	Description	Purpose	Example
Pulley			
Wedge			
Wheel & Axle			
Inclined Plane			
Screw			
Lever			

2. What is work?

_____

3. How do simple machines help to reduce work?

_____

_____

4. Was your golf ball able to complete the obstacle course? Why or why not?

_____

_____

5. What could your team have done to improve the course?

_____

_____

_____

Engineering Design Practice

Challenge your classmates and create a structure supporting as much weight as possible using only the following supplies:

- 10 3x5” index cards
- 4 rubber bands
- 1 glue stick

Your structure will be tested by stacking textbooks on top of it (one at a time, in even amounts of time as determined by your teacher). Describe each step of the engineering design process as you complete this assignment. You will also need to include a blueprint or diagram of your design and the steps you took to build it. You will test your structure with the rest of the class and analyze which methods and designs worked best to support the most weight.

How have technology and engineering design impacted your life? Give specific examples:

_____

_____

_____

Illustrate the steps of engineering design by using the flow chart below: