

SCIENCE

THE SEARCH

Discovering the Principles
that Govern God's Creation

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BOOK 3 CAUSE & EFFECT

REVISED STUDENT DIRECTED TEXT

THE CORNERSTONE CURRICULUM PROJECT

OBSERVATION NOTEBOOK

9/9/94 Activity 1 - Powder

Properties

- . white
- . shiny crystals
- . some particles white but dull looking
- .

The mystery powder is composed of three different kinds of materials:

#1

#2

#3

SAMPLE

ACTIVITY 5

SWINGING SYSTEMS

MATERIALS

a large swing
a stop watch, or a watch with a second hand

OVERVIEW: EXPLORING & NAMING THE CONCEPT - VARIABLES

LESSON PLAN

MATERIALS OR INFORMATION I NEED

WHAT I AM TO DO AND TO CONSIDER

1. Go with your family to a park that has large swings. You might consider asking your mom to pack a large picnic basket.

Swing for a few moments.

"Describe the swing."

"Objects can be put together to form a group of related objects. Such a group of objects is called a system. For example, the seat, chain, and bars of this swing make up a system. The objects in this system interact when you set in the seat and you swing. Call this your swinging system. As you swing there is interaction "

"The parts of a system are called the subsystems. Name the subsystems of your interacting swinging system."
(Answer: Check the answer key.)

"How does the swing system work?"

2. Set on the seat ... Go back and stop when you come back to the starting point.

Note: During the remainder of this activity, make sure you do not push ('pump') as you swing.

"One complete swing, one back and forth movement, is called a

Cycle."

"Swing for a few seconds ... Count the number of cycles you go."

"See how long it takes to go one cycle."

Using your stop watch, time one cycle.

"How long did it take?"

"A more accurate way to measure a cycle is to find the time it takes to go 10 cycles and then divide by 10."

"Try it again."

"How long did it take?"

"The **time** needed to make one cycle is the **Period.**"

"What is the period of your swinging system?"

"Do you think there might be a way to change the swinging system so that it will have a different period?"

"Try one or two of your ideas."

"How did you change the swinging system? What affect did it seem to have on the period?"

Remember!
Do NOT pump as you swing!

The idea

"As you have observed, the parts of a system can differ. For example, you can start out swinging from different heights, or the amount of weight in the swing can be different."

"A part of a system that can be arranged in different ways is called a

Variable."

You will need the help of another person.

"Look more closely at some of the variables of the swinging system."

"Sit in the seat."

With you in the seated, be pulled back higher than before..

Using a stop watch or a watch with a second hand...

"What is a cycle?"
(Answer: One back and forth movement.)

"Count the number of cycles you go in one minute."

"You count the number of cycles ... I will time your swing."

"How many complete back and forth movements did you go in one minute?"

This time be raised even a little higher.

"What difference do you think it would make if you are let you go from here? ... Do you think you would swing more times, less times, or the same number of times in one minute?"

"Why do you think so?"

"See what happens. You count the cycles while I time you."

"It should have been the same or about the same each time.."

"Is that what you expected?"

"I wonder why it was about the same each time?"

Be pulled back even higher.

"I wonder ... will it make a difference this time? What do you think?"

"Let's test your idea to see if it makes any difference."

"How many complete cycles did you go this time?"

"In this experiment what was the variable...what did you change?"

(Answer: Check the answer key.)

"What do you think? ... Does where I release you seem to make any difference in the number of swings in one minute?"

"Make a statement about the distance you are pulled back and the number of cycles you go in one minute."

(Answer: Check the answer key.)

3. Pull your child back...release your child.

"How many cycles do you think you will go in one minute? ... Why do you think so?"

"You count the number of cycles."

"Did you predict correctly?"

4. Now have two children (or a heavier person) sit in one swing seat. Pull them back any distance.

"What part of the system have you changed? What variable are you investigating?"

(Answer: Check the answer key.)

"Since there is more weight in the swing, weight is the variable you will investigate."

"Do you think you will swing more times, fewer times, or the same number of times in one minute?"

"Why do you think so?"

"I will time you while you count the cycles."

"How many complete cycles did you go?"

"Is it what you expected?"

"I wonder... why did you go about the same number of cycles?"

"Change the weight again to see if you get the same results."

"Is it what you had expected?"

"So far you have found that neither the point at which the seat is raised nor the weight in the seat seems to have any effect on the number of swings in one minute."

5. Throw the swing over the top bar one time so that the swing will be shorter. Observe the swing system now..

"How is the swing system different now?"

"Do you think that you would swing more times, fewer times, or the same number of times in one minute with the shorter swing?"

"Why do you think so?"

6. Sit in the seat and test your prediction.

"You count the cycles and I will time you for one minute."

"How many complete cycles did you swing? Is it more times, fewer times, or the same number of times as before?"

"Is that what you expected?"

7. Throw the swing over the top bar another time.

"Is the swing longer or shorter?"

"Will you swing more times, fewer times, or the same number of times with the swing like this?"

"Why do you think so?"

"Test your idea."

"What did you find out?"

"What were the three variables that you tested?"
(Answer: Check the answer key.)

"Describe how changing each variable changes the number of cycles in one minute?"
(Answer: Check the answer key.)

"What caused the cycle of the swinging system to change?"

"Can you explain why increasing the weight seems to have little or no effect on the number of swings in one minute?"

"What about the release point? Why would the number of swings in one minute be the same or about the same?"

"What was the effect of changing the length of the swing?"

ACTIVITY 6

BOUNCING SYSTEMS

MATERIALS

basketball
golf ball
soccer ball
tennis ball
yard stick or meter stick

OVERVIEW: EXPANDING THE CONCEPT - VARIABLES

LESSON PLAN

MATERIALS OR INFORMATION I NEED

WHAT I AM TO DO AND TO CONSIDER

1. You will need all the materials listed above.
You may need to ask someone to help you
make the measurements..

"Which ball do you think will bounce the highest?"

"Drop the four balls on a hard floor several times."

"What do you observe?"

"Do you think that dropping the balls from different heights is a variable that will effect the bounce of a ball?"

You are to drop the ball from each level 5 times and find the average. The average is found by adding each distance and dividing by 5.

Basketball

1 2 3 4 5 average

Knee level:

Waist level:

Nose level:

Make a similar chart for each type of ball.

"Drop the balls from knee level, from waist level, and then from nose level...use the yard stick to measure how high the ball bounces."

"How does the bounce of the ball vary with how high you hold the ball?"

"Give evidence that distance above the floor is a variable."

"Which ball bounces the highest? Which ball bounces the lowest?"

"Arrange the balls in order from the one that bounced the most to the least."

"What were the variables you investigated?"
(Answer: Check the answer key.)

"Which ball bounced the highest?... the lowest?"

"Let's compare these two balls again."

"You take the best ball and drop it from knee level."

"How high did it bounce?"

"Now take the ball that bounced the least and drop it from your nose level."

"How high did this ball bounce?"

"Was it better than the first ball?"

"Now which ball bounced the highest?"

"Was this a fair comparison?"

"To compare the bounce of the two balls is it necessary to keep the dropping height the same?"

"From this last experiment can you tell which ball will bounce the highest? ... Why not?"

"Okay, this time you will drop them from the same level."

"For this experiment use the ball which bounced the highest and the one which bounced the lowest."

"Drop both of them from your waist level?"

"Drop mine one the bounced the lowest first. . ."

"How high did it bounce?"

"Now I want you to drop the other ball on the carpet or rug."

"Drop this ball."

"How high did your ball bounce?"

"Which ball would you say has the greatest bounce?
What do you think?"

"Was the last comparison a fair comparison?"

The idea:

"What property of these balls were you
investigating?"

"What variables did you investigate?"
(Answer: Check the answer key)

"To make a fair comparison of the how much a ball
bounces what must you do?"
(Answer: Check the answer key.)

"When one variable is kept the same for several
investigations, it is called a

Controlled variable."

"If you were going to run a race to see who was
fastest. Would it be fair for one person to start 30
seconds before you begin? ... Why not? ... What
about if you had to run around one block and the
other person had to run around two blocks?"

"What are some of the variables you would need to
control in a race?"
(Answer: Check the answer key)

"Why is it important to control all but one variable
in an experiment?"

"If more than one variable is allowed to change in an
experiment, is it possible to determine the
appropriate cause?"

ACTIVITY 8

ANOTHER SWINGING SYSTEM

MATERIALS

string
scissors
stop watch, or watch with a second hand
washers

OVERVIEW: EXPANDING THE CONCEPT - VARIABLES

LESSON PLAN

MATERIALS OR INFORMATION I NEED

WHAT I AM TO DO AND TO CONSIDER

You will need the materials listed above.
If you need help conducting the experiments,
just ask your parents.

1.

"What are some of the properties of this washer?"

"What are some of the properties of the string?"

"Put the string and washer together to form a system by tying one washer to the end of the string."

"Describe your system? ... What are the subsystems?"

"There is interaction between the washer and the string."

"Do the objects interact by themselves?"

"This new system is called a

Pendulum."

"What variables do you think affect the swing of the pendulum?"

"What affect do you think each variable will have on the system?"

"Experiment with the system to determine the properties of the pendulum system."

"What variables did you investigate?"
(Answer: Check the answer key.)

"When you investigate the weight of the pendulum, which variables should you keep the same?"
(Answer: The length of the string and the release point.)

"When you investigate the release point, which variables should you control?"

"When you investigate the length of the string, which variables should you control?"

Design and conduct an experiment to determine what affects the swing of a pendulum.

The Pendulum System

POSSIBLE VARIABLE

PREDICTION

OBSERVATION

EXPLANATION

Weight

Release Point

Length of String

"Which variable or variables affect the swing of the pendulum system?"
(Answer: Check the answer key.)

"What would have happened if the length of the string were not controlled?"

Which variables did not seem to affect the swing of the pendulum?"
(Answer: Check the answer key.)

"Does this system remind you of another system you investigated?"
(Answer: Check the answer key.)

The idea:

"Some variables seem to make no difference in the outcome of an experiment while other do. The variables which do make a difference and which must be controlled are called

Relevant variables."

"When a relevant variable is overlooked in an experiment, the results of an experiment can be wrong."

"Why is it important to control some variables in an experiment?"

"Begin looking for variables that affect your life."