

Generating and Recording Data

Summary

Students will learn about function machines and the data they generate.

Main Core Tie

Mathematics Kindergarten

[Strand: MEASUREMENT AND DATA \(K.MD\) Standard K.MD.3](#)

Materials

- [Paper Fish](#) (pdf)

(You will need at least 20 each of green, purple, red, yellow, blue, orange, and pink.)

Box made into a function machine (large enough for teacher to perform function inside box)

Dry erase markers

Magnet strip

Background for Teachers

Vocabulary words used in this activity:

Function machine—A machine that can perform a function on the input before it sends it out as the output. (The teacher performs the function for the machine and sends out the output.)

Input—What is placed in the input side of the machine.

Output—What comes out the output side of the machine.

Record sheet—A sheet to record the input and the output of the machine.

Function—What the machine does to the input before sending it out as the output.

Intended Learning Outcomes

1. Demonstrate a positive learning attitude.
2. Develop social skills and ethical responsibility.
3. Demonstrate responsible emotional and cognitive behaviors.

Instructional Procedures

Invitation to Learn

Hold up a toaster and ask the class what you are holding. Tell them that the toaster is a machine that performs a function. Ask the students what is going to happen to the bread you are putting into the toaster. Explain that the function of this toaster is to take whatever is put into it and toast it before it pops it out. The toaster is a *function machine*. Explain that the bread we put into the machine is called the *input* and the toast it spits out is the *output*. The function of this machine is that it heats the bread and toasts it before it sends it out as toast.

Ask the students to think about a washing machine. What is the input that goes into that machine? What is the output of the washing machine? What is the function of the washing machine?

Instructional Procedures

Tell the students that we are going to explore the data generated by a function machine.

Hold up the box you have made into a function machine. Point out where the hole is for the input, where the hole is for the output, and where you can put your hands inside the machine to perform the function of the machine. Make sure the students understand that you have to make the machine work.

Tell the students that if we record what the input is, and record what the output is, we will be

able to figure out what function the machine is doing. Then we will be able to predict what the output is going to be before the machine sends it out.

Have a student place 1 purple fish in the input side of the machine. Add 2 green fish to the purple fish and put them out the output side of the machine.

On the record sheet, show that the input was 1 purple fish, and the output was 1 purple fish and 2 green fish.

Have a student put 1 yellow fish in the input side of the machine. Add 2 green fish to the yellow fish and put them out the output side of the machine.

Return to the record sheet and show that when 1 yellow fish was the input, 1 yellow fish and 2 green fish was the output.

Have a child place 1 red fish into the input side of the machine. Add 2 green fish to the red fish and place them out the output side of the machine.

Record on the record sheet that when 1 red fish was the input, 1 red fish and 2 green fish was the output. Now that you have three outputs for the students to look at, ask the them what the function of the machine is. They will be able to see that the machine is adding 2 green fish to whatever is put into it before it sends it out.

Ask the students to predict what will happen if 1 green fish is put into the machine.

Have a student put 1 green fish in. Add 2 green fish to the green fish and put it out the output side of the machine.

Record the data on the record sheet.

Ask the students to predict what will happen if 2 fish are put into the machine at the same time.

Have a student put 1 pink fish and 1 orange fish into the input side of the machine. Add 2 green fish to the fish and send them out.

Ask the students what will happen if the input is not a fish. Put 1 small teddy bear in the input side of the machine. Add 2 green fish to the teddy bear and put it out the output side of the machine. Explain to the students that no matter what they put into the input side of the machine, the machine is going to add 2 green fish to it before it sends it to the output side of the machine. The function you are making the machine do is to add 2 green fish.

Tell the children that the next time they use the function machine it may have a new function.

Next time it may add something other than 2 green fish. They will have to look at the data again next time to see what function the machine is doing.

Strategies for Diverse Learners

Adaptations for learners with special needs and a variety of learning styles:

Children who are unable to see the pattern created by recording the output of the function machine need more work with patterns. Pattern strips are a useful tool in every kindergarten class. These strips are about 1" wide and 8.5" long. They have circles, squares, or triangles on them that the students can color to show patterns.

Write the name of a pattern on the board. Students have to tell how many crayons they will need and then color in the shapes to show the pattern that are asked for. As the children get better at doing the patterns, put a pattern on the board. They have to tell two other names for the pattern before they color their strips. In kindergarten, we learn about "one more than" and "one less than." This is a good way to introduce the idea of using numbers in a function machine.

Children who understand the concept of a function machine could be placed into small groups and allowed to make the function machine work themselves as they get more practice. They need to remember that once they decide what the function of the machine is going to be, the function stays the same no matter what the input is.

For those students who are already understanding a lot more about math and numbers, there are function machine applets available on the Internet at the Web sites listed in the resources. Those

students can put numbers in as input and try to figure out the function the machine is doing by looking at the output. Function machines do not always have to use addition. They can also subtract, multiply, and divide.

Extensions

Provide ideas for integration with other curricular areas.

The output of the function machine creates a pattern that the children have to recognize in order to discover the function of the machine. Patterns are all around us. Give the students a clipboard with paper and pencil and have them draw where they find patterns in the world around them. Take them down the hall and then outside so they will have some patterns from both inside and outside of the school.

Explore other ways that data can be generated. Have students flip a coin and record the heads and tails. They can roll dice and record what numbers are rolled. They could spin a spinner and record what the spinner lands on. They could pull ducks from the Lucky Ducks game and record the numbers that are under the ducks.

Family Connections

Children go on a function machine hunt in their homes with their families. Have them list what the machine is, what the input is for the machine, what function the machine does, and what the output of the machine is. Have them share their list with the class.

Assessment Plan

This lesson is the first introduction of a function machine to the students. They need to be exposed to and use the function machine a number of times before they are assessed on the idea of a function machine. When the time is right, make a rubric using the [Assessment Rubric](#) (pdf).

Bibliography

Research Basis

NAEYC, Bredekamp, S. & Copple, C., Eds. (1997). *Developmentally Appropriate Practice In Early Childhood Programs*, Revised Edition.

“Teachers plan for children to learn mathematical concepts through solving of meaningful problems. Math skills and problem solving are the focus of instruction. . . A variety of math manipulatives and games are provided and used. . . (pg 173).”

Authors

[Utah LessonPlans](#)