

Mathematics: The Language of STEM

Donation Dilemma

Mrs. Long

CONTENT AND TASK DECISIONS

Grade Level(s): 4th

Description of the Task: Students will work together in groups of 3 to collect and analyze data from a survey to determine how the principal at Jefferson Elementary should spend the donation money.

Indiana Mathematics Content Standards:

4.DA.1 Formulate questions that can be addressed with data. **Use observations, surveys, and experiments to collect, represent, and interpret the data using tables (including frequency tables), line plots, and bar graphs.**

Indiana Mathematics Process Standards:

PS.1- Students will make sense of the problem and persevere in solving them by looking at the problem and the constraints on the problem in order to identify possible combinations.

PS.2- Students will reason abstractly and quantitatively by representing combinations using manipulatives and charts.

PS.3- Students will construct viable arguments and critique the reasoning of others by making possible combinations of items and justifying why they think it works best and by analyzing others reasoning in their group.

PS.4- Students will model with mathematics by using manipulatives to represent items and quantities.

Mathematics Content Goals:

The goal is for students to be able to collect, analyze, interpret, and present data in a real-world problem. Students need to be able to accurately represent data in a visual manner using standard methods of bar graphs, frequency tables, circle graphs, or line plots. Additionally students need to be able to look at and analyze the represented data to be able to answer relevant questions. Students need to be able to explain their reasoning to others.

Language Objectives:

Use collected data to create visual representations of the results and answer real-world questions about the collected data.

The teacher will focus on the content vocabulary, such as frequency, tally, plot, graph, survey, collect, represent, interpret, result, and data.

Materials:

- Survey
- Recording charts
- Pencil and Paper
- Markers or crayons
- Computer access (optional)

THE LESSON

Before: The teacher will peak students interest by stating that an anonymous donor has left their entire inheritance to Jefferson Elementary. The principal is trying to decide what to spend the money on. Several teachers have suggested options such as new playground equipment, more books for the library, and materials for the science lab. The principal wants to know what the 4th Grade students think the money should be spent on. He has asked you and your 2 friends to collect, represent, interpret, and present the data from a survey given to the students.

Activate prior knowledge Teacher will ask students “Does anyone know what an inheritance is?” The teacher may need to explain the concept to students. The teacher will then ask students “Can anyone explain what a donation is?” This concept should be familiar to some students. As students respond, the teacher will ask students to describe what it is and provide examples using prompts as needed so that all students can understand that a donation is something that is given to help a person or organization.

- **Be sure the problem is understood** Students will work together in groups of 3 to collect data from a survey to find out how the school should spend the money. Groups will administer the survey to the 4th Grade students. Groups will collect the data and determine how to represent the data in a visual form. Groups will then analyze and interpret the results. Groups will present their findings to the class. Teacher will demonstrate the elements of the various graphs. Students must use a frequency chart and at least one graph to present their data. Students may choose to use multiple graphs if desired. The group must choose which donation option had the highest number of votes based on the data and justify their choice to the class.
- **Establish clear expectations** Students should work together to administer the survey and collect the results. Students should work together to create a frequency chart using the results of the data. Students should create a visual representation of the data using at least one of the following formats: bar graphs, circle graphs, or line plots. Students should work together to analyze the results. Students should then discuss and agree upon the donation option that would be best for the school and the reasons why. Groups will then present their findings to the class and justify why they chose their option.

During: During this time students will be given the materials and asked to complete the task. Remind students that they must include all survey responses in their data set. Students must complete the frequency table and one visual chart. Students may complete other charts of the data if time permits.

- **Let go,** Teacher will distribute materials to groups of students and allow students to begin collecting, representing, and analyzing the survey data.
- **Listen actively,** Teacher will walk around and visit with groups to monitor discussions and listen for student thinking. If teacher notices errors in thinking then teacher will provide additional support.
- **Provide appropriate support** Teacher may need to clarify directions, (make sure that students have included all data from the surveys), model discussion techniques (ensuring that everyone in the group is participating), ask questions to prompt student thinking (Is it a need or a want?, Should every student have their own ____ or can you share?) Teacher may need to clarify how to create the best scale for the range of data given (by 2’s, 5’s 10’s 20’s, etc.).
- **Important:** During the group work time, the teacher should give students an idea of a time frame so that they will have time to discuss their analysis and think about their reasons before being asked to present to the class (For example: “You have 30 minutes to tally the survey results, complete your frequency table and create your visual graph.” As students are working, provide updates on the time remaining. Then the teacher could say, “At this point, look at your possible options and as a group determine which one would your group choose and why? Be sure to

discuss your reasoning because you will be asked to present to the class in about 10 minutes.)

- **Provide worthwhile extensions.** For groups that complete the task with extra time, teacher could extend the problem by asking what would happen to their options if the survey was given to a different grade level. Another extension might be to add additional options on the survey. A third extension might be to allow groups to use the computer to administer their survey (perhaps SurveyMonkey) and to create their graphs (perhaps in Word, Excel or Powerpoint).

After: At this time, students exploration time will end. Teacher will have students come together as a whole group to discuss possible options and provide reasons for their choice.

- **Promote a mathematical community of learners** Teacher will remind students to be good audience members by sitting still, eyes on the speaker, and listening attentively. Groups will present their option to the class using the document camera so that the rest of the students will be able to see their frequency chart and graph. Groups will explain why they chose this option to the class. Each group will present.
- **Listen actively without evaluation** Teacher will listen attentively to each group as they present.
- **Make connections** Teacher will help students to make connections by discussing needs and wants (need=pencils, wants=concession stand items), discussing the various options (sharing vs. own), discussing the different ways of visually presenting the data using the various graphs (bar graph, frequency table, circle graph, and line plots), and discussing the connections between them.
- **Summarize main ideas** Teacher will summarize the lesson by reminding students that data can be presented in a many ways. You can use the data results to answer a variety of questions.

ASSESSMENT

Observe: Teacher will observe groups as they work to ensure that students are using the data appropriately to determine the best options for the donation dilemma. Teacher will observe students to ensure that all students are actively participating in the group. Teacher will observe groups as they justify their reasoning for choosing their option.

Ask: Which graph will best represent your data set? Which option did your group choose and why?

Assess: Teacher will check groups work for accuracy.