Teacher's Guide: Population Sampling: Fish

Recommended Grade Level: 5–8
(also applicable to grades 9-12 for students requiring significant support in learning)

Suggested Time: About 50-60 minutes spread over one or more class periods, plus additional time to complete a writing assignment

Goals

Following are the big ideas that students should take away after completing this lesson:

- Population sampling is a method you can use to gain information about a large population.
- You can use data to make predictions about what conditions will be like in the future.

Vocabulary

(See definitions on page 6.)

- abundance
- data
- estimate
- population
- random
- representative
- sample

Key Literacy Strategies

Following are the primary literacy strategies students will use to complete this activity:

- Making inferences (screen 4, 6, and 7; writing assignments 1 and 2)
- Determining important information (screens 5 and 8)
- Identifying and using text features (screen 6; writing assignment 1)
- Understanding problem/solution (screen 8)
- Sequencing events (screen 11)

Note: In addition to the key literacy strategies listed above, students will also use each of these strategies to complete this lesson:

- Monitoring comprehension
- Synthesizing
- Making predictions
- Developing vocabulary
- Connecting prior knowledge to new learning
- Developing a topic in writing
- Identifying and using text features (photographs, captions, diagrams, and/or maps)

Overview

Population Sampling: Fish is a student-directed learning experience. However, while students are expected to work through the lesson on their own, teachers should be available to keep the lesson on track, organize groupings, facilitate discussions, answer questions, and ensure that students meet all learning goals.

The following is a summary of the lesson screens:

Screen 1:   Students are introduced to the main theme of the lesson: determining how sampling can be used to measure large populations.

Screen 2:   Students begin to consider how they can use mathematics to understand how many fish live in a lake.

Screen 3:   Students learn what the goals are for the lesson, which strategies they will be using to complete the lesson, and the important vocabulary words they will use during the lesson.

Screen 4:   Students watch a video of members of the Ojibwe tribe taking a survey of a local lake in an effort to find out how healthy the walleye fish population is. Students are introduced to population sampling and think about the sampling methods that the Ojibwe use. They write a short answer to a question about the methods used to sample the fish.

Screen 5:   Students learn about random samples. The importance of finding a representative sample is discussed, and students watch another video of the Ojibwe students and biologists surveying fish in the lake. They then write an answer describing what the Ojibwe members found by counting and measuring fish in their sample.

Screen 6:   Students read about some of the difficulties of sampling: it is not an exact way to get a representative sample. Then, using two pictures of possible random samples of the fish gathered, they write which picture is more representative of the whole fish population.

Screen 7:   Students read about patterns that can be detected by using data over time. They look at a chart of data from different years to decide whether the walleye population is growing or shrinking.

Screen 8:   Students read a passage about the impact of fishing on the walleye population in a lake. After reading, students describe how they could use a population survey to figure out how to maintain a healthy population of fish in a lake.

Screen 9:   Students answer three multiple-choice questions that assess their understanding of statistics and sampling.

Screen 10:   Students complete an interactive vocabulary activity, and then choose two words from the vocabulary list and write a new sentence for each word. These tasks demonstrate their understanding of the meanings of the words.

Screen 11:   Students use an interactive activity to put the steps of conducting a survey in the correct order.

Final
Assignment: Students select and complete a writing assignment about the lesson topic.

Before the Lesson

❑ Go through each screen of the lesson, including all the interactive activities, so that you can experience ahead of time what students will be doing. As you go through each screen, jot down your own expectations for students' responses.

❑ Determine if students will be working individually or in pairs on the lesson. Some students may be able to work independently with little or no support. Students who are less familiar with the subject area or who struggle with literacy skills may benefit from working with another student. An effective way to do this is to pair a stronger student with a less able reader. You can also have students work individually on certain tasks and in pairs on others, depending on their experience and needs. If students will be working in pairs on any portion of the lesson, let them know if they will be expected to type in their notes individually or together.

❑ Provide instruction on key vocabulary (vocabulary words are defined in the lesson on screen 3, and on page 6 of this guide).

❑ Determine what students already know about sampling, taking surveys, and random events. Record their ideas on a chart. You may want to structure the chart with these questions: What is a survey? Why do people conduct surveys? What is a sample? This will give you a sense of the background knowledge and possible misconceptions that students have before beginning this lesson. If time allows, return to the chart after students have completed the lesson to add new learning and correct misconceptions. Note: You may want to record their new learning in a different-colored ink so they can see how much they've learned.

❑ Arrange computers with Internet access so students can work individually or in pairs.

❑ Before students begin, suggest a timeline for completing the lesson, mention the different types of media they will encounter, and let them know how you expect them to submit their work. You may want to provide an outline of this information on a chart, chalkboard, or whiteboard, or as a handout.

Lesson Assessments

The following are descriptions of the lesson features that will be part of the packet of materials that students will submit. Students will use the packet for reference when writing their final assignment. It also serves as a formative assessment tool to monitor students' work as they are progressing through the lesson.

- **Notes** – Students take notes on screens 4, 5, 6, and 8. If time allows, review their notes before students begin their writing assignment.

- **Multiple-choice questions** – Students complete the three questions on screen 9. Walk around to make sure students answer all three questions before they continue. If students click to go to the next page before they finish, their work will not be saved.

- **Match It!** – Students complete an interactive vocabulary activity on screen 11. They begin by dragging the vocabulary terms into the correct sentences. After they finish and save their work, they will be able to check their answers against an answer key. When

they are done, they will be asked to choose two vocabulary words and write a new sentence for each word. Sentences should demonstrate a clear understanding of the meaning of each word. An inappropriate response would be "The city had a big population." An appropriate response would be "The city's population had been growing, and now it seemed more crowded."

- **Arrange It!** – Students complete the concept map activity Arrange It! on screen 11. Students organize the steps in two surveys to put them in the correct order. Students will not be able to check their answers online, so you will need to provide them with correct answers when they are finished with the lesson. You can choose to review the answers as a class or return the corrected packet of materials to students before they begin the final assignment.

  The proper distribution of answers is as follows:

  Question: What is the abundance of walleye in a lake?

  1. Make a plan for sampling the population of walleye in a lake
  2. Drop two nets at different locations in water
  3. Pull up nets
  4. Identify number of walleye in the samples
  4. Estimate the number of walleye based on available data

  Question: What is the most popular lunch in the cafeteria?

  1. Make a plan for sampling the population of students who eat lunch
  2. Write a survey with questions about lunch choices
  3. Pick students at random to complete the survey
  4. Gather survey results
  5. Determine which lunch is most popular based on data

- **Final Assignment** – Students complete one final writing assignment. You can choose to let students make their own selection or assign one according to your goals for the lesson. Use the rubric on pages 7 and 8 to assess the writing assignments.

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Lesson Aids and Extensions

Use the following suggestions to help students if they are stuck on a particular screen, to prepare students for completing their writing assignments, or as follow-up discussions to reinforce learning.

- **Watching Videos** – Encourage students to watch the videos more than once. After the initial viewing, provide students with a specific content focus to frame their next viewing(s) of the video. This will help them draw connections between the main topic and the information that the videos have to offer.

- **Participating in Discussions** – Organize class discussions or encourage students to talk about their questions in pairs. You may want to use the following discussion starters:

  o What did the Ojibwe people want to find out about the walleye fish population in their lake?

o How did they find this out?

o What is a population sample? Why is this a convenient way to find out about a larger population of something? What are the problems with this sampling method?

o What are some interesting survey questions you might want to find answers to?

o What would a representative sample of the students at school look like?

- **Reading the PDF Text** – Before they read the PDF text on screen 8, ask students how much they know about fishing. Perhaps some students have gone fishing and can share their experiences. Stress the importance of responsible fishing—taking either too many or too few fish out of their environment can have big repercussions on the health of the fish populations. You may want to revisit these questions and issues after they read the passage to clarify any misconceptions.

- **Sharing Student Work** – It may be motivational, and a further learning opportunity, for students to post their final essays so that their classmates, peers, and/or parents can see them. This may also provide an opportunity for students to comment on and discuss each other's essays.

  If you do not already have access to an online writing community, Teaching Matters™ provides TeXT, free classroom publishing tools that allow teachers and students to create and publish their own online eZine. More information and a free signup are available at Teaching Matters: TeXT (http://text.teachingmatters.org).

- **Reflection and Self-Assessment** – After students have turned in their writing assignments, you can choose to have them assess their learning. Bring students together as a whole class or in small groups to discuss the questions below. You may want to return to the chart of their ideas developed before the lesson and record their new learning. You may also have students respond individually to the questions and then convene the class to discuss the chart.

  o What did you learn?
  o What was surprising?
  o What questions do you still have?
  o What was the easiest for you to understand and do?
  o What was the most difficult?

Vocabulary Definitions

abundance

The size or amount of a population. It can also mean a large number, such as in the sentence, "The garden had an abundance of flowers."

data

Information about a subject. Data can be mathematical (such as the number of fish in a lake) and also descriptive (such as the color of a certain butterfly).

estimate

To make a guess informed by data. For example, you may estimate the amount of time it takes you to get to school by thinking about the length of time it took on each of the past 10 days.

population

A group of living things (people, animals, or plants) living in the same area. For example, a population could be a group of fir trees in a forest or all the people in a country.

random

An event that happens by chance or by luck.

representative

A word that describes a small group that has similar features of a larger group.

sample

A small part of a larger population. Samples are used to learn what a larger population is like. This is called *population sampling*.

Final Assignment Rubric (page 1 of 2)
Population Sampling: Fish

1. For four years, a group of biologists used sampling surveys to gather data about the walleye population in a lake. Here is the number of walleye that they trapped during the survey:

    2008: 17 walleye

    2009: 16 walleye

    2010: 8 walleye

    2011: 12 walleye

Pretend you are one of the biologists. What might you think about the health of the walleye population in the lake? In your response, discuss:

  a) what these results might mean;

  b) why they are not exact; and

  c) why population surveys such as this one are important.

4	**3**	**2**	**1**
Provides a clear and accurate response to the question. Ideas are elaborated, with three or more relevant supporting details from the reading passage, video, and other materials in the lesson.	Provides an adequate response to the question. Topic and ideas are generally well organized, with two relevant supporting details from the reading passage, video, and other materials in the lesson.	Provides a generally accurate response, with one supporting detail from the reading passage, video, and other materials in the lesson.	Provides an inaccurate response to the question or fails to address the question. May include misinterpretations. Understanding of the topic is not apparent.
Uses at least three vocabulary words (or a form of the vocabulary words) from the lesson, and uses them all correctly.	Uses two vocabulary words (or a form of the vocabulary words) from the lesson, and uses them both correctly.	Uses one vocabulary word (or a form of the vocabulary word) from the lesson, and uses it correctly.	Does not use any vocabulary words, or uses vocabulary words incorrectly.

Final Assignment Rubric (page 2 of 2)
Population Sampling: Fish

2. Janelle is interested in finding out how long it takes people to get to school every day. However, her high school has over 1,000 students! She does not have time to interview everyone but still wants to come up with a representative sample. She asks two friends how she should get the information she wants.

Elon says: "You should just ask 30 people when they got off the bus in the morning. That way you can get a lot of data quickly."

Fay says: "I think you should ask five random people every hour during the school day. That will give you data from about 30 people, and not all of them will have taken the bus to school."

  a) Who suggested the better method?

  b) Why do you think it is better?

  c) Design another type of sampling survey that you think is better than those offered by Elon and Fay.

4	3	2	1
Provides a clear and accurate response to the question. Ideas are elaborated, with three or more relevant supporting details from the reading passage, video, and other materials in the lesson.	Provides an adequate response to the question. Topic and ideas are generally well organized, with two relevant supporting details from the reading passage, video, and other materials in the lesson.	Provides a generally accurate response, with one supporting detail from the reading passage, video, and other materials in the lesson.	Provides an inaccurate response to the question or fails to address the question. May include misinterpretations. Understanding of the topic is not apparent.
Uses at least three vocabulary words (or a form of the vocabulary words) from the lesson, and uses them all correctly.	Uses two vocabulary words (or a form of the vocabulary words) from the lesson, and uses them both correctly.	Uses one vocabulary word (or a form of the vocabulary word) from the lesson, and uses it correctly.	Does not use any vocabulary words, or uses vocabulary words incorrectly.

Scoring the Rubric

Here are two suggestions for scoring the final assignment rubric. Select the option that best meets your needs or develop your own grading system.

Option 1: This option provides one score for each submitted assignment.

Assign a score of 4 or below for the written response (first row of the rubric) and a score of 4 or below for the use of vocabulary (second row of the rubric), for a total maximum score of 8. The interpretation of scores is as follows:

Score	Grade	Narrative Interpretation
7-8	A	Excellent
5-6	B	Good
4	C	Adequate (Fair)
3 or below	D	Minimal

Option 2: This option provides two scores for each submitted assignment: one for written content and one for the use of key vocabulary. An advantage of separate scores is that you can weight students' comprehension and composition differently than you do their knowledge of vocabulary. It can also help you identify specific needs for future instruction.

Assign a score of 4 or below for the written response (first row of the rubric) and a score of 4 or below for the use of vocabulary (second row of the rubric) and then score them separately. The interpretation of scores is as follows:

Score	Grade	Narrative Interpretation
4	A	Excellent
3	B	Good
2	C	Adequate (Fair)
1	D	Minimal

The final grade may look like this: A/B (A for content and B for vocabulary use).