1. Objective & Introduction

Today's lesson objective is: **Students will be able to identify questions that can be answered through scientific investigations and evaluate the appropriateness of these questions.**

Why do we ask questions? It's something we do all the time, but did you ever stop to think about why we do it? When a person asks a question, they are looking for some type of information and they ask the question to help them find what they were looking for. In science we ask questions all the time, but it's important to know how to ask the right questions. This lesson will help you make sure your questions are the best that they can be.

Take a moment and think about this objective. What strategies will you use to determine if you are asking a good question? Are these strategies different than the ones you used to define inquiry? What do you think the perfect question looks like?

Open your digital notebook and describe any strategies that you might use in this lesson. Will you make a list? Will you search for the steps on the Internet or draw a chart of the paths you could follow? Think about the effective learning methods you have used in the past.

2. Asking Good Questions

We ask questions all the time. Sometimes it is simply to gather information that is easily accessible, such as "What time is it?" "What's that smell?" or "What's that song on the radio?" The possibilities are endless. We are constantly gathering information that we need for daily life or to increase our knowledge about something. It is the question that opens the window for an answer to enter someone's mind.

We can ask different types of questions, including those that verify information, those that increase knowledge, and those that are testable.

A question that is verifying information often has a "yes" or "no" answer or one verifiable factual answer.

**Example –** "Is it raining outside?" That simply has a "yes" or "no" answer.
**Example –** "What shape is a stop sign?" The answer is a verifiable fact.

If you are asking a question that increases your knowledge about a subject, it usually also requires you to have some prior knowledge on the subject.

**Example –** “When is the next low tide?” We need some prior knowledge about tides and the moon’s influence on them in order to answer or understand this question.

Lastly we have questions that are testable. This means we can design an experiment or take measurements to find the answer.

**Example –** “Does insect blood contain white blood cells and red blood cells?” We could actually test the blood of an insect to see if it contains both types of blood cells.

Let’s practice identifying the types of questions.

**1. When is the next full moon?**

What type of question is this? Do we need prior knowledge to answer it? Can we answer with a “yes” or “no”? Can we test anything to find our answer?

We actually need some prior knowledge for this one. In order to know when the next full moon will occur, we have to know that the moon travels in a lunar cycle. Therefore, this is a knowledge-based question.

**2. How many feet are in a mile?**

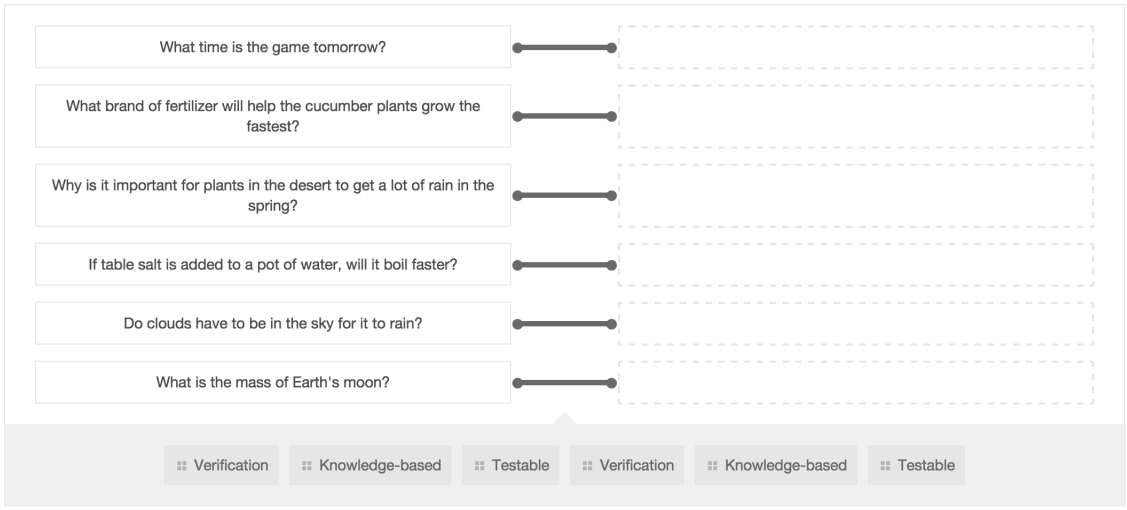
What type of question is this? This question is asking us to verify some information. We can respond with a factual answer, which in this case is 5,280 feet. This is a verification question.

**3. How long do you have to soak your fingers in water before they wrinkle?**

What do we need for this question? Are we verifying? Are we experimenting? We can actually answer this question by testing it. If we put our fingers in some water and time how long it takes them to wrinkle, we will have our answer. Therefore, it is a testable question.

Now it’s time for you to try some on your own.

Match the following questions to their types.



3. Scientific Answers

We know that asking questions is part of scientific inquiry, and we know we ask a lot of questions, but can they all be answered by science? The answer is no.

Scientific questions are different from everyday questions. In order for a question to meet the requirements of a good scientific question, it has to meet the following criteria:

The question must be about objects, organisms, or events in the natural world.
The question must be answered through investigation and the collection and analysis of data.
A question cannot be answered by science if it deals with anything supernatural. Things that are presumed to be supernatural can't be measured.

A question also can't deal with any personal preferences or moral beliefs. These type of questions are subject to bias and can't be measured.

Let's practice determining if a question can be answered by science or not.

**1. Do ghosts exist?**

This question deals with something supernatural; therefore, it cannot be answered by science. People may guess and offer evidence about this subject, but there is no way for us to test this question.

**2. How many pieces of plastic found in the park are recyclable, and how many are non-recyclable?**

This question is about objects found in the natural world, so we can actually test the question. It would be easy to design an experiment to answer this question, so it can be answered scientifically.

**3. Which genre of music is better, hip hop or rock?**

This question is based on personal preference, so it cannot be answered scientifically.

Now it's your turn to try some.

Decide if the question can be answered by science.

| | Yes | No |
|---|---|---|
| How do volcanoes form? | ○ | ○ |
| Which brand of shoe is better, X or Y? | ○ | ○ |
| What is the best flavor of ice cream? | ○ | ○ |
| Do ghosts exist? | ○ | ○ |
| What is the best shape for a blade on a windmill? | ○ | ○ |

4. Specific Questions

We know that there are a few different types of questions that we can ask, and we know how to ask questions that can be answered scientifically, but we can't stop there. We have to make sure that our scientific question is meaningful, interesting, and, most importantly, testable.

You need to make sure your question is a specific as possible.

For example, asking the question, "Does animal blood have the same blood cells as human blood?" is too broad. If you make it more specific—"Does golden retriever blood have the same number of chromosomes as human blood?"—it is a much more meaningful experiment. Try to remove as many factors as possible.

The main objective when creating a meaningful question is to make it specific and meaningful.

Let's practice. Which of the following is the more meaningful question?

**1. Is plastic found on the baseball field worse than plastic found on the football field?**

**2. How many of the recyclable pieces of plastic found were located on the baseball field versus the football field?**

Question 1 is not very specific, so it is not a good question. Question 2 is specific and testable, so it is a good, meaningful question.

**3. Why is there so much trash on the school playing fields?**

**4. How does the percentage of aluminum cans on the field change before and after a lunch period?**

Question 3 is too broad, so it is not a good question. Question 4 is very specific, so it makes a great science question.

Now you can practice on your own.

Choose the question that is the most meaningful and specific.

1. 
2. 
3. 
4. 
5. 

5. Summary

Questions are important; they help us learn new things. However, we always have to try to make sure we are asking the right questions. Remember to make your questions specific and meaningful and you will be on the right track.

If you need to review you can click the Reteach icon. If you are ready for the assessment you can click on the assessment icon. Good luck!