



WEEK 1. The Scientific Method

INTRODUCTION

The Bible says that “in the beginning, God created the heavens and the earth” (Genesis 1:1).

We’re going to spend an entire year learning about the creation of the world. We’re going to look at it from a scientific perspective, so that we can learn how it works and how His creation affects our everyday lives.

SUPPLIES NEEDED

- *Science Notebook*
- *Cotton swabs*
- *Water*
- *Small cups or glasses*
- *Unsweetened baking cocoa*
- *Lemon juice*
- *Salt*
- *Honey*

WEEK 1. The Scientific Method

DAY 1.

HEAR

What does the word science mean? The word science comes from the Latin word **scientia**, which is pronounced see-en-she-a. The root of this word is **scio**, pronounced see-oh, and it means to know. In other words, science is a collection of facts or truths that we know.

The Scriptures tell us that “the fear of Yehovah is the beginning of knowledge, but fools despise wisdom and instruction” (Proverbs 1:7). In other words, true knowledge only begins when we fear Yehovah, but many foolish people despise His wisdom and instruction.

Psalms 119:130 says, “The entrance of Your words gives light; it gives understanding to the simple.” Many scientists, or men and women who are seeking knowledge about our world, have read these words of Scripture and decided to use the Bible to direct them as they studied.

However, many people reject the Scriptures as a source of knowledge or science. They reject the idea that Yehovah created the world, and without that foundation, they have to come up with other causes for the world we see around us. Even though they might appear to be wise, the Bible calls them fools for despising the wisdom and instruction found in God’s Word.

Here is one problem we encounter often in science: “The first one to plead his cause seems right, until his neighbor comes and examines him” (Proverbs 18:17). The first person who tells us about something in our world seems correct, but without some sort of standard, we have no way to know if the person is telling the truth or not.

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Scientific Method:

The process of the investigation of knowledge about creation. It is composed of observing, hypothesizing, and experimenting.

We are going to use the Bible as our foundation for science. We are going to start out with the rule that the Bible is true in everything it says about our world. However, we are also going to show you that the evidence surrounding you constantly agrees with the Scriptures.

What Is the Scientific Method?

Have you ever been curious about something you saw while walking outside? Maybe it was a strange flower, some animal tracks in the mud, or a bird's call that you had never heard before. Did your curiosity make you want to leave the trail and go find out more? Maybe you took a picture and went home to look it up on the Internet.

All scientific investigation starts with curiosity. Since mankind was not present for most of the first week of Creation, we did not see firsthand how Yehovah made the world. We are very curious about everything that we see around us! Adam and Eve must have felt the same way.

When we are curious, we begin to investigate to learn more. Maybe we leave the trail and find that the animal tracks we saw in the mud lead to a large hole in the ground. Maybe we sit next to the hole for a few minutes and hear scratching noises from the darkness. Our investigation is already leading us to make some conclusions about what kind of creature could be down in the hole.

A wise scientist writes down his discoveries so that others can follow in his footsteps or even discover more than he did. Let's assume that you took a spiral notebook and pencil out of your pocket and drew a picture of the tracks you saw in the mud, as well as a quick drawing of the hole in the ground. Using your arm, you roughly measured the size of the hole, and you also drew a picture of the plants surrounding the hole. You tried to write down the sounds you heard, to the best of your ability, so that you'd be able to make those same sounds for your family at dinner this evening. Maybe your older brother will use your drawings tomorrow to find the hole again, even though rain is in the forecast this evening and the tracks will be washed away. Maybe you use your notes to find an audio file of animal sounds online. Your notes would be invaluable in helping you identify the animal you discovered today!

If every scientist in the world were to use a similar method to write down what he learns, then other scientists could come behind him and use his notes to learn and discover more.



In fact, we have just such a method for recording information. **The process of investigation of knowledge about creation is called the “scientific method.”** It is composed of three steps:

1. Observing
2. Hypothesizing
3. Experimenting

Observing

To observe means to gather facts using our five senses. Usually observation begins with what we see, but not always. Sometimes we pay attention to things that we hear, smell, taste, or touch. A good scientist tries to observe with all of his senses at once.

While we observe, it is important that we write our observations down. Our senses notice many things, but we do not always remember them clearly. If we are to gather facts, we must be careful to also collect those facts to share with others.

Hypothesizing

A hypothesis (pronounced high-poth-eh-sis) is an “educated guess.” It comes from two Latin roots:

Hypo (pronounced high-poe) means “under.”

Thesis (pronounced thee-sis) means “a set.”

So a thesis would be a set of knowledge that has been set down, but a hypothesis is “under” that, or not quite up to that standard. We are not sure of it. It is only a set of knowledge that we have a good guess about.

When we observe something in the created world, even though our Creator knows and understands everything about it, we are not quite up to His standard. We don’t know everything He knows, nor we were around to observe His creation of the world. We are only able to make educated guesses, or hypotheses.

However, just because we are guessing doesn’t mean that we can’t make “educated” guesses. We can use the

information gathered by scientists who have gone before us and build upon that information to learn even more.

For instance, if we are trying to guess what animal lives in the hole we saw, we can use stores of information available to us in books and online to start to narrow down what kind of animal lives in a hole of that size, with tracks that match what we drew in our sketchbook. If the animals we find in the reference materials also make sounds similar to the ones we observed, then we can certainly begin to make an educated guess about what sort of animal’s hole we discovered.

Like our observations, we should write down our hypotheses.

(Note: the word *hypotheses* is plural for hypothesis; it is pronounced high-poth-eh-sees.)

In your notebook, you would use a complete sentence to write down as much detail about your guess as you can. You would also be wise to include notes about any reference materials you used, in case you wanted to look at them again in the future. (Maybe your brother will also want to look at that book or website tomorrow as well.)

Experimenting

Now it is time to test your hypothesis, to see if it is correct. **Testing a hypothesis is called experimentation.** Maybe you could set up a camera next to the hole in the ground, to record a video of any animals that enter or leave the hole in the next hour. Possibly your younger sister would be willing to sit a safe distance away, to watch with a camera and snap a picture of anything she sees, in exchange for your willingness to wash the dishes for her after supper this evening.

As you can probably guess, you should write down the steps of your experiment in your notebook. First, **write down your best prediction of what you think will happen.** In the case of the mystery animal, write down what you think will happen in the next hour or so. Your sister may wish to look at this to see if she is paying attention to the right things.



Keep a journal, a pen, and possibly a camera with you when you explore Creation, so that you are ready to record whatever you see.

A primary source is the recorded testimony of a firsthand witness to an event. The witness was actually at the event and experienced it personally.

A good prediction can be accurately tested. As we will discover in the coming lessons, we can accurately test things by measuring them with precision. We'll learn more about this soon, but in our backyard example, a camera will help your sister capture what she sees in a way that can be accurately shared with others later.

Are Observations Necessary?

What would happen if a scientist could not observe something himself? How would he be able to prove something actually happened?

In Deuteronomy 19:15, we read that "by the mouth of two or three witnesses the matter shall be established."

According to the 1828 Webster's Dictionary, someone can be included as a witness if one of the following statements is true:

- Someone was personally present at an event and was an eye-witness to what happened.
- Someone can furnish evidence or proof.

So if two or three such witnesses were personally present at an event so that they could tell what they saw, or if they can furnish evidence or proof from others, then a scientist can include that

information in what he is studying.

A good scientist would write down the names of the witnesses and, if possible, what they observed, using their own words.

Sometimes this "evidence" is found already written down. **These recorded testimonies of firsthand witnesses are called primary sources.**

However, if a scientist acts on information that he didn't see himself, and for which he has no primary sources or first-hand witnesses or evidence, then he is making an **assumption**. This often happens without anyone's realizing that they're assuming things, but it can cause large problems and make it difficult for new scientific discoveries to happen.

Cause and Effect

Many times we observe things that happen in our world, but we might not observe what caused them to happen.

For instance, you might observe that something caused a hole in the ground, but you didn't observe what caused the hole to be there.

You might make the assumption that a rabbit made the hole in order to build its burrow or nest. However, unless you directly observed the rabbit making the hole, or unless you had other direct evidence, you would only be assuming the cause of the hole.

Suppose you were a farmer that had been living on a piece of land for over 50 years, during which time you had directly observed many rabbits coming out of their holes in the grounds and had other direct evidence of how rabbits make their burrows.

You would likely be very safe making an assumption that a new hole you found yesterday was made by a rabbit. You would make a hypothesis based on credible evidence, and your hypothesis would likely be correct.

Your theory would have been tested many times, over 50 years. We might call it a scientific theory or even a law of nature.



LEARN

Have a discussion with your students about each of the following questions:

- What does the Latin root *scio* mean?
- What does the word *science* mean?
- What is a scientist?
- What rule will we use as we study science?
- As we discuss questions each day, how could we discover the answers? One way is to sit by a computer or use our phones or tablets, looking things up as we discuss. We could also look at books that we have obtained at the library. Are there any other ways?
- We will use our Bibles each week as we are introduced to a new scientific topic. Let's start by reading Proverbs 18:17. What do you think this verse has to do with science?
- All scientific investigation starts with curiosity. What do you think this means? Have you ever been curious about something YHWH made?
- The process of investigation is called the "scientific method." What does each word mean?
 1. Observing
 2. Hypothesizing
 3. Experimenting
- What would happen if a scientist could not observe something? How can he prove that what he is observing is true? Look up Deuteronomy 19:15.
- What is an experiment?
- What is a prediction? The ability to be accurately tested is a sign of a good prediction. What does this mean?
- What is "cause and effect"?
- What is a theory? What is a theory that has successfully been tested repeatedly?

We have scheduled topics of discussion to go with each topic. However, don't feel that you must limit the discussion to only these things! You should feel free to discuss things that you know are important to your family. Allow the Holy Spirit to guide you as you learn together.

KEEP

- Complete the activities for Day 1 in your Science Notebook.



DAY 2.

HEAR



Watch this 5-minute video about Newton's First Law of Motion:

- <https://homeschoolingtorah.com/links/newtons-first-law-of-motion>
- You can also scan the QR code to watch the video.

Discuss the following together:

- There were three scientists mentioned in the video. Why did they become curious?
- How did they use the **observation** step of the scientific method?
- How did they use the **hypothesis** step of the scientific method?
- How did they use the **experimentation** step of the scientific method?
- In the illustration given in the video, how can you see cause and effect? Are there any causes or effects you might not be thinking of?
- Why do you think this is called a **law** of motion, rather than just a **theory** of motion?

DAY 3.

HEAR

Discuss the following together:

- What does it mean to be accurate?
- What does it mean to be precise?
- We call mathematics the "language of science." Why do you think this is?
- What is an equation?
- What is trial and error?
- What is a measurement? Can you name some things that can be measured? (Length, volume, mass, time, temperature. Define as needed.)

The students will be adding definitions for "accurate" and "precise" to their Student Notebook.



KEEP

- Complete the activities for Day 3 in your Science Notebook.



HIGH SCHOOL

Watch this 12-minute video about Scientific Notation:

- <https://homeschoolingtorah.com/links/scientific-notation/>
- You can also scan the QR code to watch the video.



Discuss the following together:

- What are significant figures?
- What is scientific notation?
- What is the metric system?

DAY 4.

DO

You've probably noticed that your tongue can taste many different flavors. Do you think you know why?

- Complete the activities for Day 4 in your Science Notebook.



DAY 5.

KEEP

- Complete the activities for Day 5 in your Science Notebook.



HIGH SCHOOL

- Check out a library book on the life of Sir Isaac Newton or Galileo Galilei. Try to have it read within a week.
- Make a list of 3-5 character qualities in their lives that helped them become excellent scientists.
- Plan to share the list with your family next week.