

# The Scientific Method

by Sophia

### WHAT'S COVERED

In this lesson, you will be introduced to the major topics within sociological research. You will become familiar with the process used to conduct research and the principles that guide researchers' choices when they design and conduct a study. You'll also use your knowledge of sociology to build your problem solving skills. Specifically, this lesson will cover:

# 1. The Scientific Method

Humans and their social interactions are so diverse that it might seem impossible to study them scientifically, as one would study applied physics or biology. But this is exactly why sociologists employ the scientific method for studying human behavior. The **scientific method** is a multi-step procedure that involves systematically formulating questions, gathering data, and questioning hypotheses. It involves a series of prescribed steps that have been established over centuries of scholarship, involving the development and testing of theories about the world based on empirical evidence. It establishes parameters that help make sure results are reliable and verifiable, and it is defined by its commitment to systematic observation of the empirical world. Most of all, the scientific method strives to be objective, critical, skeptical, and logical.

The results of scientific studies in sociology tend to provide people with access to knowledge they did not have before, whether knowledge of other cultures or their own culture, knowledge of rituals and beliefs, or knowledge of trends and attitudes. Armed with this knowledge, those who have studied sociology can improve their problem solving skills to solve problems both in everyday life, and in society.

When designing a research study employing the scientific method, researchers want to maximize the study's **reliability**, which refers to how likely research results are to be replicated if the study is reproduced. If another sociologist follows the same research protocols, will they come up with the same results? If so, then the study is reliable. The more exciting the findings, and the more they challenge prevailing understandings, the more likely it is that other sociologists will try to replicate them.

→ EXAMPLE A researcher wanted to study the impact of sports participation on behavior-related problems among high school girls. At a dozen high schools, she collected information about which girls participated in sports, and monitored their records for the remainder of their time in high school, noting whether there was a difference in detentions and suspensions among student athletes and non-athletes. This study is reliable because it could be repeated in more high schools, or with different cohorts of students.

Replication of prior studies is a cornerstone of science and social sciences. A sociologist who studies

teenagers may replicate their studies several times in regular intervals, studying either the same generation as it grows up or teenagers at the same age and of the same demographic in different decades. Another researcher may build on that research to see how social phenomena, like a global pandemic, affects those same teens or generations of teens.

Researchers also strive for **validity**, which refers to how well the study measures what it was designed to measure. A study is valid if it has been designed thoughtfully enough to ensure that there aren't complicating factors muddying up the results, and that the study isn't accidentally measuring the wrong thing for the research question at hand.

→ EXAMPLE If a researcher is studying the behavior of people with gambling addictions, they might consider asking gamblers to recall their recent wins and losses. But this method would likely not be valid. Just asking the subjects for their wins and losses might tell us more about the gamblers' memories, or about whether they fudge the truth to make themselves appear better, than it tells us about their actual wins and losses. A more valid measure would be the quantitative data analysis of their betting slips and receipts. In that way we can compare actual data instead of people's recollections and self reports.

Sociologists can use the scientific method not only to collect data but also to interpret and analyze the data they collected. In so doing, a researcher seeks to apply objectivity and identify any biases they may be unconsciously bringing into the work. This doesn't always succeed! But sociologists deliberately use the scientific method to maintain as much objectivity, focus, and consistency as possible in a particular study. In the end, the scientific method provides a shared basis for discussion and analysis.

# ▶ ျားဦး Problem Solving: Skill Tip

In the next section, you'll discover how to apply the steps of the scientific method to sociological questions such as how to promote diversity and inclusion at your child's school. You can also try using the scientific method outside of this course to solve problems and make decisions in your everyday life, like how to increase collaboration between members of your team.

#### TERMS TO KNOW

#### Scientific Method

A multi-step procedure that involves systematically formulating questions, gathering data, and questioning hypotheses.

#### Reliability

How likely research results are to be replicated if the study is reproduced.

#### Validity

How well a study measures what it was designed to measure.

# 2. Steps of the Scientific Method

We have discussed some of the principles underlying the scientific method, but what is it exactly? The scientific method is a multi-step procedure that involves systematically formulating questions, gathering data,

and questioning hypotheses. There are eight steps of the scientific method.

# 2a. Define the Problem

In a world full of fascinating topics and rich settings for sociological inquiry, this is the easy part! Simply pick a broad topic or population that interests you. For the purpose of example, let's say that you are interested in social media and teenagers.

Ask broad, topical, problem-defining questions about your chosen topic, such as:

- What exactly am I going to study?
- What do I observe about social media use by teenagers?
- What interests me about social media use by teenagers?
- Is there a type of social media that seems most impactful?
- Which teenagers am I going to study?
- What aspects of social media use are of interest to me?

# 2b. Review the Work of Others

Social scientists like to say, "Don't go out and reinvent the wheel." In other words, don't replicate work that has already been done; make sure what you're doing is unique, and that you are building on the work of prior researchers. Use what others have observed about your topic as your starting point.

As you review the existing studies on your social media and teenagers, you might ask:

- What have other people studied about social media and teenagers?
- What groups of teenagers have previously been studied a lot? What groups of teenagers have been studied less?
- Has social media changed since the last studies on teenage users?
- Are there flaws or gaps in the existing work?
- Do we believe the conclusions of the existing work?
- What questions haven't been asked yet?
- Will a different methodology yield different results?

# 2c. Hypothesize

A **hypothesis** is an educated guess about how things are related to one another, often predicting how one form of human behavior influences another. Using limited data gathered from your more casual observations and previous research, you propose a possible explanation or relationship, which you will prove or disprove in your study.

Attributes of a good hypothesis include:

• It proposes an explanation or relationship that can be proven true or false by your further research.

→ EXAMPLE "Social media makes teenagers lonely" is not a very good hypothesis because it would be hard to show that to be true. "Teenagers who spent above average amounts of time on social media have fewer social connections" is something that you could prove or disprove, so it is a stronger hypothesis. • The topic is narrow, specific, and manageable.

→ EXAMPLE You will never be able to study all teenagers of all ages using all social media platforms. A better hypothesis might focus on the impact of Snapchat use on suburban middle class 16-year-old girls.

• It includes independent and dependent variables. We will explain this further soon, but for now you can think of a good hypothesis as one that includes a stimulus (the independent variable) that is prompting a change or response (the dependent variable.

→ EXAMPLE You might hypothesize that teens whose parents monitor their social media use will experience less cyberbullying. The stimulus, or independent variable, is the monitoring of the teen's social media use. The change or response, or dependent variable, is the amount of bullying the teen might experience.

## TRY IT

One way to narrow down your hypothesis is to write if/then statements about your topic. What are some if/then guesses you might make about teens and social media? You might say "if a teen uses Instagram for more than two hours per day, then they are more likely to have self esteem problems." Or, "if teenagers don't use social media, then they will be socially isolated." Think of a few other plausible if/then statements about teens and social media, whether or not you believe them to be true. Which might make the best hypothesis for a research study?

#### TERM TO KNOW

#### Hypothesis

An educated guess about how things are related to one another, often predicting how one form of human behavior influences another.

## 2d. Design a Research Plan

In this step you determine exactly how you're going to test your hypothesis, which is how you're going to find the answers to your questions. There are many ways research can be organized in sociology, which we will explore in-depth later in this challenge. Things to consider are:

- How will I access potential subjects?
- What are the appropriate procedures for acquiring the consent of teenagers and their guardians?
- How will I win the trust of the subjects?
- Which research methods will provide the kind of results that will prove or disprove my hypothesis?
- What can I learn from previous studies that have been done with teens and social media?
- How will I phrase my questions?
- How will I test the validity of my research tools?
- How will I know when I have sufficient data?

## 2e. Collect Your Data

This is often the most labor-intensive stage. You're actually going out and gathering the raw data according to the research plan that you have in place, whether that means interviewing teens, distributing and collecting

surveys in schools, following teens on social media and tracking their usage, or bringing a group of teens into the lab to ask them questions as a group. Things to consider are:

- Are my research tools valid?
- Are there ways to make data collection more efficient?
- Are there any abnormalities in the data that need to be reviewed?
- Do I need to amend my research design?
- What benefits do I predict will be yielded by any adjustments?

# 2f. Interpret Your Data

**Data interpretation** is the process of reviewing data through a predefined process, which helps to make sense of collected data. You analyze your data in order to judge how it supports the relationship you are exploring between your independent and dependent variables. The goal is to use the data you collected to shed some light on the hypothesis that you posed in step three. Questions to consider:

- Is there evidence of causation, that one thing is responsible for another thing happening?
- What are the best measures to demonstrate proof of your hypothesis?
- Are there inconsistencies in the data?
- Is there an explanation for the inconsistencies that do exist?
- How many of my measures support my hypothesis?
- Is there enough evidence to support my hypothesis?

## TERM TO KNOW

#### **Data Interpretation**

The process of reviewing data through a predefined process, which helps to make sense of collected data.

## 2g. Explain the Findings

The results section is where you report your findings and the methodologies used to determine those findings. The results section should simply state the relevant facts as determined by your research outcomes. Various data should be organized in the order of your argument. Here you avoid any data that doesn't add to your argument.

Things to consider:

- Am I presenting this data in an objective manner?
- Does this finding support my hypothesis?

Your results and findings are documented formally. For a student that means a research paper, for a professional sociologist it might mean writing an article that can be published in a journal or in book form so that others can read it and review the work.

# 2h. Pose New Questions

In this last step of the scientific method, you want to pose new questions that come to light based upon your work, so that the process can continue. You may want to point out things that you overlooked or propose new directions for future research. Science is a process of gradual refinement and it's beneficial to point out areas you may have left unstudied.

## 🗇 SUMMARY

In this lesson, you looked at the guiding principles of **the scientific method** and became acquainted with the **steps of the scientific method**. You also explored how the scientific method strengthens your problem solving skill.

Best of luck in your learning!

Source: THIS TUTORIAL HAS BEEN ADAPTED FROM "INTRODUCTION TO SOCIOLOGY" BY LUMEN LEARNING. ACCESS FOR FREE AT LUMEN LEARNING. LICENSE: CREATIVE COMMONS ATTRIBUTION 4.0 INTERNATIONAL.

## TERMS TO KNOW

#### **Data Interpretation**

The process of reviewing data through a predefined process, which helps to make sense of collected data.

#### Hypothesis

An educated guess about how things are related to one another, often predicting how one form of human behavior influences another.

#### Reliability

How likely research results are to be replicated if the study is reproduced.

#### Scientific Method

A multi-step procedure that involves systematically formulating questions, gathering data, and questioning hypotheses.

#### Validity

How well a study measures what it was designed to measure.