1 THE PURPOSE OF RESEARCH

CHAPTER OUTLINE

LEARNING OBJECTIVES

1. Describe the purpose of scientific research.
2. Describe two theories of knowledge: falsifiability and the scientific revolution.
3. Compare and contrast qualitative, quantitative, and mixed methods.
4. Explain the importance of ethics and objectivity in research.

SCIENTIFIC RESEARCH AND ITS PURPOSE

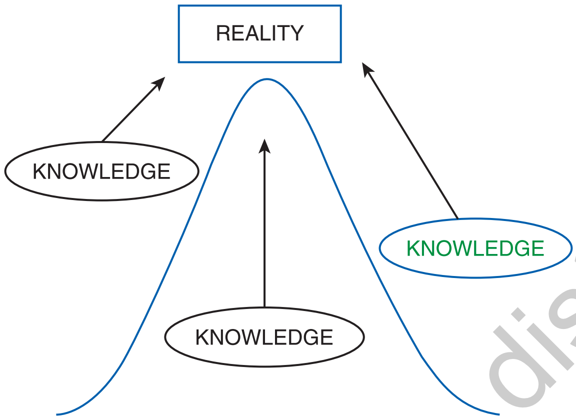
We, humans, are great knowledge accumulators. We love knowing about everything, and these days it is quite easy to obtain knowledge. I start the day by listening to the news on the radio while driving to work. My eyes catch a new billboard on the highway—something about hospitals and children's health. To get to my office, I walk across campus, but along the way, my senses are bombarded with advertisements, posters, and all kinds of information that beg for my attention. Finally, inside my office, I boot up the computer. Preparing for class is accompanied by checking my calendar, emailing students or colleagues, checking the weather for rain or snow, and, of course, double-checking my Google Slides presentation. My eyes also catch some information about a new research methods book, a new study on children's health, a new salmon recipe, and even a note about an upcoming Netflix show.

This is likely to be a familiar scenario in your life as well. We are accustomed to absorbing vast amounts of information every day. But how do we distinguish accurate from inaccurate information? What communications can we actually trust? You will probably agree that some nonscientific knowledge comes from cultural *tradition*, such as properly brining a turkey on Thanksgiving, the right amount to tip a waiter when eating at a restaurant, or even how to dress according to society's rules for different genders and occasions. So **traditional knowledge** is a form of knowledge that we inherit from the culture we grew up in. This includes everything we were taught as children that has become part of who we are and how we behave. It includes everything from a sense of when to speak up, whether or not to interrupt someone else, whether to look at people's eyes when talking to them, and when and how to say *thank you* and *please*, to more complicated norms and rules surrounding major life events such as marriages, deaths, and births of children.

Other types of knowledge emanate from **authority**. For example, you believe your doctor's diagnosis of your ear infection and take the antibiotics prescribed rather than following the advice of a random influencer who suggests you put garlic oil in your ear canal. Therefore, authority is a form of knowledge that we believe to be true because its source is authoritative. Parents, teachers, and professional figures are some examples of sources of knowledge. Knowledge also comes from experience, which is one of the first ways we learn as children. A child learns that it is dangerous to put hands on a hot surface because it is painful to the skin. **Experiential knowledge** teaches us through pleasant or unpleasant experiences and continues throughout life. Getting old is often accompanied by wisdom due to experiential knowledge.

Scientific knowledge, on the other hand, is based on studies conducted by researchers. In a nutshell, scientific knowledge is knowledge we can trust. Original scientific research is most commonly found in peer-reviewed journals—journals that perform a strict review process through anonymous scientists familiar on the topic. It is through systematic research that we produce new scientific knowledge. It appears that scientific knowledge is not directly related to other types of knowledge. Still we are all aware that tradition, authority, and experience may drive scientific research, at least initially and theoretically. Conducting research does not simply mean following a specific method and obeying a set of rules. It also means embodying a different way of looking at the world, viewing it simultaneously through two or more perspectives. Sometimes it means gaining a fresh pair of eyes. So do we actually *know* reality? From the very start, we must recognize that *reality and knowledge are two different things* (see Figure 1.1).

FIGURE 1.1 ■ Knowledge and reality are two different things. Through knowledge, we may get closer to reality, but we are fully aware that we may not make it all the way to the top.



Reality can be like an abstract concept that fades away every time we get closer. Like ants carrying bits of food, we march forward to find the truths we seek. Therefore, we can say that scientific research is the final product of conducting rigorous research. We generate this product by following sets of rules, embodying skills, and following a framework when analyzing our results. This book will familiarize you with the discipline and fortitude of these hardworking ants while simultaneously trying to instill in you the energy and the passion that it takes to become a great researcher. So let's have some fun!

Let's be honest—conducting research is not everyone's cup of tea. You likely have plans for your future career that do not involve scientific research, so why bother with this stuff? Here are four reasons that may change your mind. Note that none of them include "because it is required for your major."

1. It is thrilling! Shall I say more? Conducting research involves discovery, invention, fulfillment, and autonomy over your work.
2. It builds new skills and offers new career opportunities. It will open your mind to new ideas on what you might pursue in the future (e.g., becoming an entrepreneur, opening your own nongovernmental organization, running the farm or your family business in a different way, and many other ideas) and give you an extra skill to brag about in your job interviews.
3. It makes you an educated individual. You will evaluate future information differently, and critically. Even small things like absorbing news will take a different meaning when you are well versed in the scientific research process.
4. It makes you a persuasive communicator. Because of your knowledge and thorough understanding of how to conduct research, you will be able to support your arguments and be an engaging communicator.

In sum, we can conceptualize scientific knowledge as the kind of knowledge that follows detailed guidelines to reach conclusions. Scientific knowledge provides us with specific findings and information on how these findings became available. The "how" part is covered by the research methodology, where we document all the steps we took to come to a new finding or new knowledge. But before we go into the details of the methodology, we must take a peek into some theories of knowledge. Theories of knowledge attempt to explain in general terms how new knowledge is created and the philosophical approach for creating new knowledge.

THEORIES OF KNOWLEDGE

Research constructs new knowledge. Many theories attempt to define how knowledge is created. This book discusses the meaning of theory later on (see Chapter 3), but for now, let us consider theory as a conceptual framework that we use to explain something around us. Theories of knowledge, for example, attempt to explain how new knowledge is developed. It is the reasoning behind creating and discovering new knowledge. Two of the most important and perhaps widely accepted theories of building knowledge are Karl Popper's falsifiability and Thomas Kuhn's structure of scientific revolution.

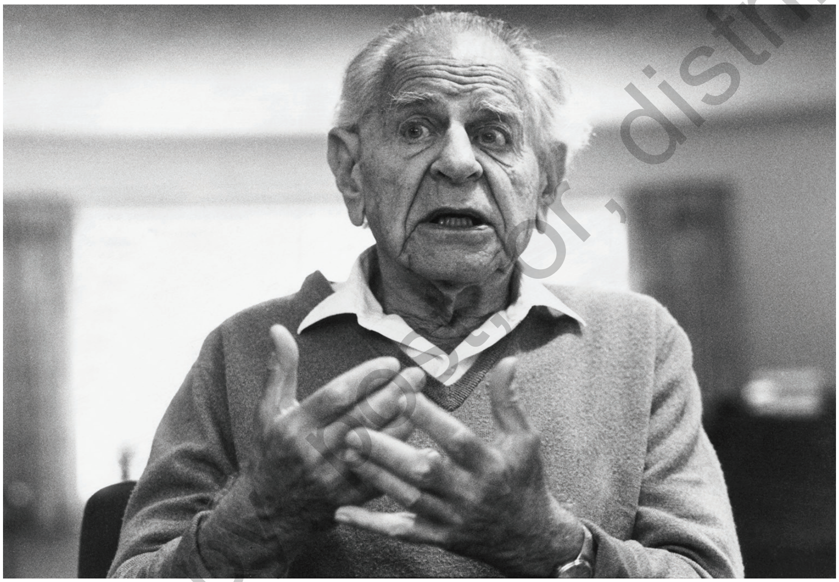
Karl Popper's Falsifiability

Sir Karl Popper was one of the greatest scientific philosophers of the 20th century (Stangroom & Garvey, 2015). His theory of falsifiability is a fascinating explanation of the growth of knowledge that we can apply to our daily lives to influence how we think and act. Popper devoted much of his thought and writing to the understanding of how knowledge grows and advances. His ideas are still applicable to today's research.

Popper observed that many grand theories claiming to explain everything about the world often err. What theory could be applied to absolutely everything that exists? Slowly but surely, he realized it was systematic attempts to prove things *wrong* that advanced scientific knowledge. Let's illustrate this point with a simple example. If we know—the word *know* here is of key importance—that drinking coffee in the afternoon can keep us up later than our usual bedtime, we may refrain from drinking coffee when we plan to go to sleep as usual. On other occasions, we may want to drink one cup to stay up later to finish that paper due tomorrow. We take this knowledge for granted, and we apply it daily (i.e., drink a cup of coffee early in the morning, but stay away from it in the afternoon).

One afternoon, we find that we are drained. In fact, we are so tired that we could go to sleep at 5 p.m. and not wake up until the following day. However, we don't want to go to sleep just yet, so we get a cup of coffee even though it is late in the afternoon. To help ourselves feel energized, we eat some dark chocolate or a double-chocolate brownie, increasing the amount of caffeine in our bodies even more. Remember, we know that coffee will keep us up because this has been our previous experience. Let's be professional here and call this experience by its scientific name: **empirical evidence**. Empirical evidence means data or information acquired by systematically observing people or events. It comes from gathering data from practical experience.

However, this time, the caffeine in our body does not work as we had predicted from empirical evidence. Instead of energizing us and keeping us awake, it puts us into a deep, dreamy sleep. We wake up 3 hours later, surprised that the coffee did not work. In Popper's terms, we have falsified an established theory. We have proven it wrong. By proving it wrong, we have added a new piece of knowledge to our already known theory. Now, instead of claiming that caffeine always energizes our bodies, we are claiming that sometimes—depending on how the body reacts to it—caffeine can have the opposite effect and put us into a deep sleep. We falsified an established theory and built a new theory on this knowledge. **Falsifying** a theory is our attempt to disprove an established theory, which is how we construct more advanced knowledge.



Karl Popper

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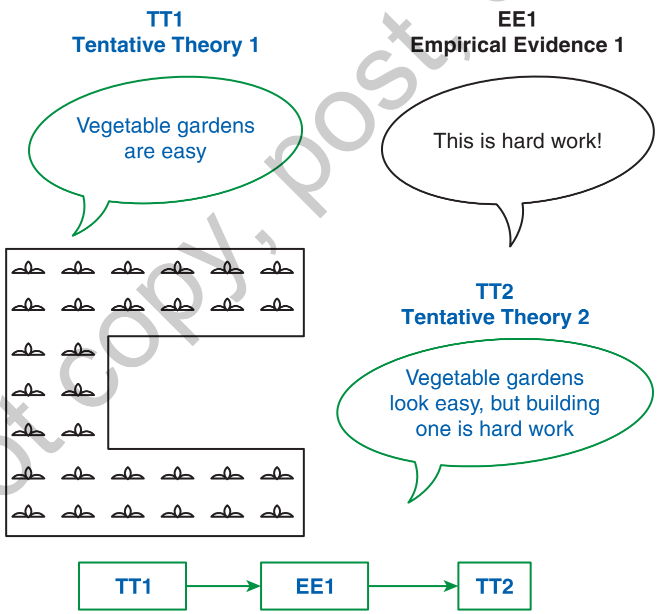
This is how we build new knowledge. Popper believed that to construct new knowledge, our goal should be to attempt to falsify established theories. Advancing knowledge is an evolutionary process that he expressed through the following formula:

$$PS1 \rightarrow TT1 \rightarrow EE1 \rightarrow PS2$$

A PS is a problem situation or issue that interests us or has a question attached to it. To explain this problem, there are several tentative theories (TT). Drawing from the previous example, the PS1 would be something similar to "coffee keeps people awake," and the TT1 would be "caffeine in coffee is a stimulant, and that is why coffee keeps people awake." If we try to falsify these tentative theories by error elimination, or EE—a process similar to natural selection—we find that most of our tentative theories are incorrect and there is a new explanation for the problem we started on. In our example, EE1 would teach us that "caffeine may not always keep the body awake." We build new knowledge through this natural selection process and end up with a new problem situation, PS2. Our new problem situation in this example would be that "taking too much caffeine when the body is overtired may have the opposite effect and put a person to sleep."

At the end of our empirical evidence, we have a better, more robust tentative theory. However, that does not mean this new tentative theory is an absolute principle. Rather, it is simply accepted until we succeed in falsifying it again. Popper brought a simple but essential understanding of how knowledge is built, and this is how our everyday knowledge is constructed as well. We accept something as true until the moment we falsify it. Once we manage to prove it wrong, we build a better understanding of that particular theory or piece of knowledge (see Figure 1.2 for another example).

FIGURE 1.2 ■ Our initial tentative theory about something as simple as putting together a vegetable garden could be overthrown from the empirical evidence once we try to develop it. At the end of our experience, we have a new tentative theory that is more inclusive.



Thomas Kuhn's Structure of Scientific Revolution

Thomas Kuhn was interested in the history of science and how knowledge is constructed. He defined knowledge as a summary of general truths and laws about the world that are scientifically proven. But how does science develop further? Most scientists occupy themselves with *normal science*. According to Kuhn, *normal science* is what we know: general rules, general laws, paradigms we have accepted as truths, and so on. **Normal science** does not aim to explore new ideas or build on scientific knowledge, experiment, or risk. It functions on what is already known and uses what we know as the ultimate truth. Normal science is *safe*. It is doing what we have been doing: relying on existing knowledge and not testing it.

Thomas Kuhn

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This reminds me of my husband's cooking habits. He will follow a recipe to a tee. If one ingredient is missing, he becomes paralyzed. If the recipe calls for onions and instead we have leeks—a cousin of onions—he will never consider experimenting with leeks. In Kuhn's terms, this is normal science, safe and predictable.

Normal science is made of accepted **paradigms**. A paradigm is an unchangeable pattern that we use over and over again. Specific rules and regulations govern the paradigms that are widely accepted by the scientific community. Normal science is composed of many such paradigms, and we follow those to reinforce what we already know. Scientists who subscribe to normal science, according to Kuhn, will not discover anything new, just like my husband will never know whether, compared to onions, leeks work better, worse, or the same in the recipe. These researchers are invested in reproducing the same normal science over and over. Boring, if you ask me.

The following quote from Kuhn's (1962) *Structure of Scientific Revolution* explains the paradigm in more detail:

> *Paradigm* is a term that relates closely to "normal science." By choosing it, I mean to suggest that some accepted examples of actual scientific practice—examples which include law, theory, application, and instrumentation together—provide models from which spring particular coherent traditions of scientific research. . . . The study of paradigms, including many that are far more specialized than those named illustratively above, is what mainly prepares the student for membership in the particular scientific community. (p. 8)

Now and then, we encounter **anomalies** or things that do not fit into the paradigms of normal science. When these anomalies occur, our understanding of normal science shatters. An **anomaly** is something that happens once or twice that does not fit into our commonly accepted patterns. When these anomalies start to occur left and right, they are no longer anomalies but build up to a **crisis**. A crisis is further defined as the accumulation of many anomalies against an accepted truth or normal science. We encounter a crisis when the normal science does not seem to fit with reality any longer.

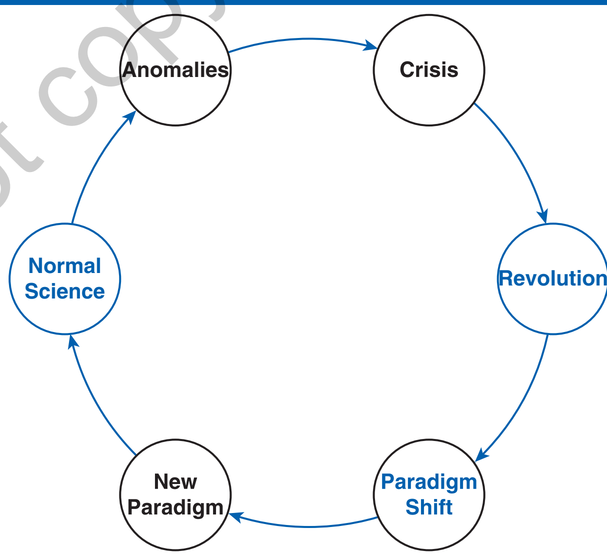
Sometimes, this makes me think of the prevalence of mental disorders in our society. Often, mental disorders, as defined by the American Psychiatric Association (2022), refer to behaviors that are abnormal—meaning that they are different from what is widely considered normal.

Now, if the number of such abnormalities increases all the time, we may need to reconsider the definition of what is truly normal. According to the Center for Behavioral Health Statistics and Quality (2021), an estimated 52.9 million U.S. adults aged 18 or older have some form of mental illness. This represents 21% of the population of U.S. adults. If more than 20% of the population exhibits behaviors that deviate from what is defined as normal, then maybe we encounter a crisis and need to reevaluate the definition of normality. Perhaps we should conclude that having a disorder is the new norm rather than an anomaly.

When anomalies accumulate, we start questioning what we have accepted as truth or normal science. Kuhn believed that to change established paradigms, we must undergo some form of crisis. Crisis can lead to a **revolution** in science. The revolution replaces the old paradigm with a new paradigm. This is when we see a **paradigm shift**. So, a paradigm shift happens when the widely accepted paradigm encounters many anomalies that lead to a crisis, then a revolution, and finally settle into a new paradigm. There is a specific note from Kuhn (1962) in explaining the revolution of science that concerns all young researchers: "Almost always the men who achieve these fundamental inventions of a new paradigm have been either very young or very new to the field whose paradigm they change" (p. 90). This quote should encourage and excite you as you launch your first attempt to construct new knowledge. After years of working with doctoral students, I can also see that those newer researchers in a field are often the ones who bring fresh and different perspectives to the established normal science.

Now, if you closely observe Figure 1.3, you will notice that we move from normal science, to anomalies, to a crisis, and to a revolution that gives way to a paradigm shift. However, the paradigm shift is connected back to normal science. It should not be forgotten that the new paradigm we build in response to the crisis and the revolution will soon be accepted and become the new normal science. In Kuhn's (1962) words,

FIGURE 1.3 ■ An Illustration of the Scientific Revolution



> Scientific revolutions are here taken to be those non-cumulative developmental episodes in which an older paradigm is replaced in whole or in part by an incompatible new one. . . . The man who is striving to solve a problem defined by existing knowledge and technique is not, however, just looking around. He knows what he wants to achieve, and he designs his instruments and directs his thoughts accordingly. Unanticipated novelty, the new discovery, can emerge only to the extent that his anticipations about nature and his instruments prove wrong. (p. 96)

To illustrate this point, I will go back to my husband's cooking. He loves to cook a dish with shallots and chicken breast. The recipe involves putting a lot of shallots and garlic together in a pressure cooker, then adding some chicken breast, a bay leaf, black pepper, cinnamon, and two tablespoons of tomato sauce. It cooks for 30 minutes and, voilà, becomes a wonderful, aromatic dish. We call it *çomlek*, pronounced chom-lak, a popular dish in my home country of Albania.

One day, I was really craving *çomlek*, but there were no shallots in my pantry. I had everything else, but no shallots. I had some colossal onions instead. I wondered how this famous dish would taste if I substituted the main ingredient with a related one. Shallots are, after all, onions of a different size. I peeled the big onions, partially sliced them, and inserted garlic in between the slices. I followed the rest of the recipe, and waited for results. My *çomlek* was delicious! It tasted much better than the classic one because the garlic had melted inside the onion, giving it an exceptional texture and taste. After a crisis (not having shallots on hand), I caused a revolution and re-created the recipe with a different type of onion. The outcome was a delicious paradigm shift! Now, we never use shallots for cooking *çomlek*. My new *çomlek* turned into normal science.

A QUICK LOOK AT QUALITATIVE, QUANTITATIVE, AND MIXED METHODS

There are three basic types of research methods: (1) qualitative research, (2) quantitative research, and (3) mixed methods. Let's see how they differ from each other.

Qualitative Research

Qualitative research aims at gaining insight and *depth* into whatever topic we want to know about. In qualitative research, we are not satisfied with simply gathering facts; we want to know more insights, emotions, events, experiences, perspectives, and details about the topic of research. We can be creative, connect issues, interpret the details we find, draw patterns from the raw information we collect, and so on. Certainly, there are rules on how this is done, but the process is fascinating and highly creative. If we are studying people, we get to talk to them, hear their stories, find out their concerns, understand their issues, sympathize with them, live in proximity with them, and truly try to understand their actions.

A solid qualitative study looks at an issue from various perspectives and attempts to detail a richer picture with a deeper understanding of people and events. We can use our artistic skills to describe what we have observed, bring out minutiae that the typical eye might miss, and direct attention to aspects of our research that no one thought about. As a result, our work can be deep and engaging.

Conducting qualitative research means being immersed in the study and having a great deal of determination, attention to detail, and a sense of commitment. Qualitative research requires deep contemplation on the topic in all stages, especially during data collection and analysis. That is why qualitative research is more often based on what researchers call **inductive reasoning**. Inductive reasoning begins with specific observations and moves to a broader understanding of a topic or problem, which often leads to creating new theories of science. Inductive reasoning allows researchers to become immersed in their study without preconceived notions or assumptions regarding how the results will look, but with the hope that many answers will be revealed as the work progresses. Often this starts with something observable. When the COVID-19 pandemic started, many people were forced to work and learn under new circumstances. Traditional universities switched to online teaching, and many people were working from home, sometimes next to other family members who were doing the same. These new circumstances and experiences could have been the primary data for an inductive study. Why were people frustrated? Was it the fear of the pandemic or their challenges with the new format of working and learning? Collecting that information and analyzing it to reach a broader theoretical understanding of how people adjust under unique unknown circumstances could be an example of an inductive study. Therefore, being creative and interpreting the data collected are important parts of a qualitative researcher's work. Inductive reasoning allows researchers to shift the focus of their study as necessary during the process of data collection. In other words, researchers follow what they find interesting to investigate further.

RESEARCH IN ACTION 1.1 ILLUSTRATION OF A QUALITATIVE STUDY

In the following qualitative study, we can see how the author explains the qualitative methodology used and the rationale for using it. We can become familiar with the strict guidelines followed to ensure the highest quality possible.

Source: Pajo, J. (2016, June 16). Two paradigmatic waves of public discourse on nuclear waste in the United States, 1945–2009: Understanding a magnitudinal and longitudinal phenomenon in anthropological terms. *PLOS One*, *11*(6), e0157652. http://journals.plos.org/plosone/article?id=10.1371%2Fjournal.pone.0157652. CC BY 4.0 https://creativecommons.org/licenses/by/4.0/.

Study Excerpt: From the Abstract

This project set out to illuminate the discursive existence of nuclear waste in American culture. Given the significant temporal dimension of the phenomenon as well as the challenging size of the United States setting, the project adapted key methodological elements of the sociocultural anthropology tradition and produced proxies for ethnographic fieldnotes and key informant interviews through sampling the digital archives of the New York Times over a 64-year period that starts with the first recorded occurrence of the notion of nuclear waste and ends with the conclusion of the presidency of George W. Bush.

COMMENT:

From the abstract, we become familiar with the scope of the study. This is qualitative research about the existence of nuclear waste in American culture. Let us take a look at the methodology where the researcher explains the qualitative methodology used.

Study Excerpt: From the Methodology

The core of the sociocultural anthropology tradition, as it is commonly taught and understood, lies with the researcher personally going to an unfamiliar human community where the researcher spends a substantial amount of time, often in the range of several consecutive months. Known as participant observation or ethnographic fieldwork, this methodology consists of observing the broadest possible range of daily practices, in which, and for as much as possible, the researcher also personally participates. The purpose of such effort is to achieve an understanding of the world from the community's shared perspectives. The data collected through this traditional methodology consists mostly of a record of the researcher's own observations and impressions as well as statements from exchanges and interviews with the members of the previously-unknown community that, ideally, becomes better-known over the course of this process.

COMMENT:

This is an excellent description of qualitative research and how it is carried out traditionally. Although some terms included here will be explained later in the text (such as *participant observation*), please note the importance of qualitative research to capture the community's perspective as well as the researcher's.

Study Excerpt: From the Findings

Nuclear waste continued to make headlines after 1969. Between 1969 and 2009, the New York Times reports that included in their headlines some combination of the keywords "nuclear," "radioactive," "atomic," and "waste" appeared amidst reports on political and environmental protests. The body of reporting identified here as "the second wave" corresponds to the presidencies of Richard M. Nixon (1969–1974), Gerald R. Ford (1974–1977), James Carter (1977–1981), Ronald Reagan (1981–1989), George H. W. Bush (1989–1993), William J. Clinton (1993–2001), and George W. Bush (2001–2009). The body of reporting since 2009 has not been included in the second wave, as the presidency of Barack H. Obama is currently ongoing. A total of 608 items of reporting are distributed by presidency as follows: 22 reports under the Nixon presidency, 18 under Ford, 157 under Carter, 160 under Reagan, 79 under the first Bush, 100 under Clinton, 72 under the second Bush. The core paradigm identified as characterizing this wave is actually focused on nuclear waste: here nuclear waste appears to be a topic on its own right. This paradigm characterizes nuclear waste primarily in terms of the harm it causes, dissociated from the benefits of nuclear exploitation. The unspoken understanding appears to be that nuclear waste carries risks that cannot be eliminated, and that cleaning it up will involve costs that cannot be avoided. So instead of optimistic hope for a final and safe solution for the disposal of radioactive waste, this paradigm is preoccupied with assigning responsibility for radioactive waste.

COMMENT:

Here the researcher is presenting one of the paradigms she concluded. Note how the keywords are identified at the beginning followed by illustrations of exactly where and how many of these keywords were found. After the information is given, the researcher provides us with the paradigm she identifies. We can see how the media primarily emphasizes the harm it causes rather than describing the benefits of nuclear waste.

Quantitative Research

Quantitative research starts with a lot of work up front, before the data are collected, and requires a good grasp of the topic of study and research conducted in that specific topic of interest. The design of the study is essential in quantitative work, because any shortcomings in the design will likely appear in the results. Quantitative researchers know exactly what data are going to be analyzed, how the information will be collected, and even the types of procedures that will be used to analyze data. Their entire work is based on the systematic calculation of data. Researchers involved in this type of research are usually adept at designing and using different means of data collection, a very difficult task, but necessary for collecting information properly.

Thinking ahead and taking measures for almost every detail of the study is the most challenging aspect of their work. A good sense of organization, categorization, and calculation is necessary before the study is launched. Quantitative researchers must be very specific about what they are testing for and put a great deal of work in preparing the most effective tool possible (e.g., questionnaire, survey) to measure the concepts and constructs. Conducting this work in advance of data collection is crucial because there is little room for change once the study starts. These precalculations and strong sense of organization give the quantitative researcher the ability to capture large amounts of data.

Quantitative research is commonly based on **deductive reasoning**. Deductive reasoning begins with a broad theory that can lead to a specific idea or concept that is ready to be tested. For example, a well-known learning theory is Lev Vygotsky's sociocultural theory of cognitive development. In a nutshell, the theory claims that social interactions are at the core of how children learn. It is easier for children to grasp new concepts when an engaging social environment surrounds them. In a deductive study, we may be using this theory to explore how young children on a swim team learn professional swimming. Applying Vygotsky's theory, we hypothesize that children engaged with their friends on the swim team are more likely to learn new skills than children who find themselves in an unfriendly social environment. Next, we have to decide how and what measures to use to test the idea. We have to measure the social interaction of children and then use the rating of their coaches to measure their swimming skills. We also need to consider the amount of time a child has been swimming and other factors. This means that the focus of interest is narrowed down into measurable pieces and we have specific expectations for the results of the study. Data collection in quantitative studies is straightforward, and there are no digressions or other routes taken by the researcher in the middle of the work. However, quantitative studies can be creative during the analysis of the data, especially if the researcher has collected enough information on various aspects of the population of interest.

RESEARCH IN ACTION 1.2 ILLUSTRATION OF A QUANTITATIVE STUDY

In this example, we can see how a researcher goes about sampling, data collection, and analysis of a quantitative study. This is a great example that can help familiarize us with the terminology used and the steps taken by the researcher to ensure high quality of data and the transformation of information into numbers.

Source: Ang, C.-S., Lee, K-F., & Dipolog-Ubanan, G. F. (2019, May 2). Determinants of first-year student identity and satisfaction in higher education: A quantitative case study. *SAGE Open*, *9*(2). https://journals.sagepub.com/doi/full/10.1177/2158244019846689.

Study Excerpt: From the Abstract

First-year undergraduates' expectations and experience of university and student engagement variables were investigated to determine how these perceptions influence their student identity and overall course satisfaction. Data collected from 554 first-year undergraduates at a large private university were analyzed. Participants were given the adapted version of the Melbourne Centre for the Study of Higher Education Survey to self-report their learning experience and engagement in the university community. The results showed that, in general, the students' reasons of pursuing tertiary education were to open the door to career opportunities and skill development. Moreover, students' views on their learning and university engagement were at the moderate level. In relation to student identity and overall student satisfaction, it is encouraging to state that their perceptions of studentship and course satisfaction were rather positive. After controlling for demographics, student engagement appeared to explain more variance in student identity, whereas students' expectations and experience explained greater variance in students' overall course satisfaction. Implications for practice, limitations, and recommendation of this study are addressed.

Study Excerpt: From the Methodology

Data were collected from students enrolled in a large private university in Malaysia. Of the 600 questionnaires sent out, a total of 554 students provided usable surveys with 35.7% males and 64.3% females. Their ages ranged from 18 to 29 years, with a mean age of 20.43 years (SD = 1.50). There were 82.3% Chinese, 3.6% Malay, 5.4% Indian, and 8.7% Others. A delineation of the participants in each academic discipline is as follows: 22% were from Applied Science, 56.3% from Business and Information Sciences, 3.6% from Hospitality and Tourism Management, 4.7% from Medicine and Health Sciences, 0.4% from Social Sciences and Liberal Arts and Creative Arts and Design, and 12.6% from Music disciplines. Seventy-eight percent were Malaysians and the remaining were international students. In terms of financing university education, 46% of students seek parents' help to fund their studies and the remainder relied on savings (15.1%), scholarship (15%), loans (12.3%), part-time jobs (9.2%), spouses (1.3%), and full-time jobs (1.1%). From the total sample, 174 students had either part-time or full-time jobs, while going to university, for the following reasons: to gain work experience (70.2%), to be financially independent (67.8%), for necessities (62.1%), to improve employability (58.6%), for savings (57.4%), for extra expenses (56.3%), to support family (51.7%), and to pay off loans (42.6%). A total of 178 students have thought of deferment for the following reasons: physical health (33.7%), thought they might fail (30.4%), financial reasons (29.2%), emotional health (27%), family commitment (25.8%), the university wasn't what they expected it to be (24.7%), job commitment (23.7%), to find a new job (23.5%), and changing courses (22.5%).

COMMENT:

From the methodology section, we get a solid understanding of all the details of the methodology, how the study was conducted, and who participated in it. We can draw a solid picture of the number of participants, their gender distribution, their majors, their financial situations, and how they were paying for their education.

Study Excerpt: From the Findings

A total of 84.2% of students said that improving job prospects was the biggest reason for attending university. Students also were motivated to attend university for both developing their talents and receiving specific training. However, meeting parents' expectations has a lesser impact on students' decision to attend university.

A total of 78.7% reported that they are clear about the reasons they came to university. Only 4.3% indicated that they do not know the type of occupation they wanted to do or the reasons for coming to the university.

A total of 53.5% of students perceived that the subjects at the university clearly build on their studies at school. However, 43.4% agreed the standard of work expected at university is much higher than they expected. A total of 47.6% of students acknowledged that their parents have little understanding about what they are doing at the university.

A total of 44.2% of students agreed or strongly agreed that they felt frequently overwhelmed. They were finding it stressful to manage their studies given other commitments, and 44.8% indicated that their workload was too heavy.

COMMENT:

The findings are depicting these students' situations. We can immediately see that an overwhelming majority of students go to school to secure a better job later in life. A small minority of the sample was unclear as to why they went to school. Just about half of the participants seemed to agree that the subjects they were learning in school would help them get the skills they needed to succeed in life, and less than half found the subjects and materials difficult. We also see that nearly half of them felt that the workload and other commitments were at times too heavy. Even from these short findings, you can clearly understand how the students feel about their higher education, their goals for going to school, and their workload.

Quantitative researchers often use structured questionnaires, surveys, or other types of questions with predefined multiple-choice answers, so it becomes possible to access information on a large number of subjects. To put this into perspective, we can think of the qualitative researcher as someone who knows a whole lot about one small, specific group of people; the quantitative researcher is someone who has fewer in-depth details but is able to target a much larger population with the information available. The qualitative researcher studies information in depth, whereas the quantitative researcher has a bird's-eye view.

Mixed Methods

Mixed methods refer to cutting-edge research studies that combine the best features of both qualitative and quantitative methodologies. What are the benefits? Why would a researcher be willing to do double work and follow both a qualitative and a quantitative design simultaneously? One can collect a lot of information about a large number of subjects, in addition to much-needed details and depth on some of the participants. Mixed methods has become a desirable approach to research with excellent outcomes because it offers a unique look into a study without limitations of each approach. There are various ways to combine qualitative and quantitative designs, but the most widely used types of mixed methods are (1) the convergent design, (2) the explanatory sequential design, (3) the exploratory sequential design, and (4) the embedded design.

Convergent design is used by researchers when the qualitative and quantitative data are collected simultaneously. Once the data are collected, the researcher examines and analyzes the data separately, only bringing the information together when compiling the results. This convergent design of mixed methods allows for a comparison of results from two different sources of data collection. It allows for a higher level of corroboration of results. Convergent design may require a lot more work, often by a team rather than one researcher. It is best suited to broader topics that are asking for an in-depth investigation and numerical testing.

Explanatory sequential design is a two-phase process that starts with quantitative data collection, followed by a qualitative collection of cases that are important to the study. The researcher first collects quantitative data, then looks at the results to design a second phase of the study, during which qualitative information is gathered to complement the main topic. This type of mixed method is best for studies that may ask for additional information and for researchers who have the available time to conduct a two-phase study.

Exploratory sequential design works best when the research question is qualitative by nature. This mixed-methods design is a two-phase process of data collection that starts qualitatively and is followed by a quantitative method. In this type of study, the researcher is gathering in-depth information in the first phase and follows up quantitatively in the second phase as a way of making sure that the qualitative conclusions are correct. The exploratory design works best for studies that aim to design a new theory because the methodology has the power to reach a conclusion and to test it in the second phase.

Embedded design occurs when the researcher has one qualitative or quantitative study going and collects different types of data before, during, or after the study. The combination can happen in many different qualitative and quantitative variations. This is a method widely used for very broad topics with a team of experts or researchers. The topics may be complex with many different elements, some of which may be addressed through different methods. Embedded designs are beneficial for researchers because they can combine primary and secondary data in a larger context.

Mixed-methods design is useful in studies where traditional qualitative or quantitative methods are not sufficient and will leave the study with significant limitations to consider. To better understand the benefits of a mixed-methods approach, let us look at a hypothetical example: Maia, a researcher, was interested in understanding whether eating cake was related to weight gain. She conducted a short questionnaire and surveyed many people at a local bakery. Maia asked them: (1) How often did you eat cake during a typical week this last year? (2) How much weight have you gained/lost this last year? (3) How often did you exercise during a typical week this last year?

She wanted to see whether eating cake was related to weight gain in any way, and whether this was the same for each participant regardless of how much a person exercised. Maia also wanted to know more about the population she was interviewing. She randomly picked a few people to speak with at length, adding some qualitative work to her quantitative research, and conducted some in-depth, unstructured interviews. When analyzing her data, she found that eating cake daily was related to participants' weight gain over the last year, but the relationship was not extremely strong. In some cases, the relationship was nonexistent regardless of whether people exercised regularly or not. It almost seemed like some people would eat cake and lose weight without exercising. This surely didn't make sense.

Maia investigated this topic further by analyzing her in-depth interviews. By talking to people, she realized that the participants who ate cheesecake daily rather than the ones who ate different types of cake gained the most weight. She also learned from these interviews that the bakery was strategically located next to a La Leche League International clinic, which could indicate that many of the women she surveyed had just had a baby and perhaps were still breastfeeding. Regardless of their sugar intake, they were losing weight from their previous pregnancy in conjunction with breastfeeding, instead of gaining weight. Maia was aware of the research findings from other studies showing that breastfeeding was associated with weight loss. She then took another look at the quantitative data and saw that most of her participants were women. The combination of these details and insights on the quantitative information she gathered added depth to her study and explained why the relationship between cake and weight gain was not as strong as she had anticipated. Mixed-methods research led Maia to have more confidence in drawing conclusions. As you can probably tell by now, this hypothetical example follows an explanatory sequential design where quantitative data are collected in the first phase and qualitative data are collected in the second one.

ETHICAL RESEARCH

Now that we've gone over the basics of the types of research that can be conducted, we must discuss **ethics**. In daily use of the word, we may understand ethics as the group of morals and values that govern our behaviors and decisions. Deriving from this general understanding, we use a set of rules and regulations that are primarily concerned with protecting the rights of people who participate in research studies. These rules are called research ethics.

The ethical treatment of research participants should always come first. But what does this mean? Obviously, we should never do anything that may cause harm to participants. There are many ethical rules to follow to ensure that a researcher's participants are protected from harm.

Ethical Rules

One of the most important ethical rules is providing participants with information about the study, particularly about any risks that could be involved. This process is formally called **informed consent**. Informed consent is a written statement in which the study is briefly explained, the potential risks or benefits from participating in the study are detailed, and all the other considerations for participants are included.

Consider drug trials, for example. Pharmaceutical companies are required to test new drugs on people. How else could they determine a drug's effectiveness? However, the drugs could have adverse side effects. Participants must be informed about these potential risks before participating in the trial. If English is not their first language, they need to be informed about these risks in their own language.

Furthermore, when a drug is tested for effectiveness, researchers split their pool of applicants in half. One group gets the new drug, and the second group, referred to as the control group, is given a placebo (a sugar pill or another nonpharmacological substance with no effects) instead. Neither group is aware of whether they took the medicine or the placebo, and the researchers measure the results from both groups. This way, researchers can compare the outcomes of the users and nonusers of the drug.

Participants are assigned to a control group or testing group without knowing which group they are in, so this needs to be clear to them from the start of the study. Sometimes patients are eager to try a new drug because of an illness and must be informed that they may not receive the medication as they had hoped. In some extreme cases, ethics will dictate that a participant's condition is so critical that immediate medical attention is required and participation in the study is ill advised. In other words, researchers must be honest with participants and inform them about how the study will be conducted and explain any issues that may occur. This is the first and most basic rule in conducting research.

Another important ethical rule is **confidentiality**. Confidentiality is the promise by the researcher not to disclose identifiable information about the participant to any third party. Confidentiality and **anonymity** are two different rules. In some studies, the researchers themselves are not aware of the identity of the participants, meaning they are anonymous. This is common in quantitative data collection and can sometimes be the case in qualitative research. Confidentiality, on the other hand, is common in qualitative studies, because the researcher often knows the identity of the participants.

Researchers go to great lengths to protect participants' identity and data, from using fictional names to securing records to ensure that participants cannot be identified. We often conduct research with vulnerable populations, such as undocumented immigrants, drug users, victims of abuse, and people with mental health issues who would be unwilling to participate were we careless about confidentiality. As a general rule, regardless of how sensitive the research topic is, we must always obey the rules of confidentiality.

Along the same lines is the rule against coercing. It is unethical to coerce people to take part in a study even if the coercion is subtle. For example, say a professor is investigating drug use among college students. Do you think it is ethical for students who enroll in this professor's classes to be surveyed? Such students may feel obligated to participate in the study because of the power that the professor has over the class, and they may participate unwillingly. In addition, students may not feel comfortable providing information about their personal drug use habits to someone who may judge their behaviors. You can easily imagine how students may not provide accurate information to the researcher about their drug experiences in such a study versus a study where anonymity is ensured. In addition to violating an ethical rule, these responses will lead to inaccurate or biased study results because the researcher will collect inaccurate data.

Conflict of interest is also an ethical factor. It refers to the possibility that the study we are conducting may protect a third party or be part of an outside agenda. For example, if we conduct a study on the likability of the latest movie shown in theaters and we are sponsored for the study by the film studio that produced the movie, we may be prone to look favorably at the likability rates. The fact that the film studio sponsored our study is a conflict of interest that needs to be disclosed when we present our findings. Conflict of interest should not be confused with offering incentives (e.g., money or gifts) to people participating in a research study. Sometimes, in-depth interviews or focus groups require a few hours with the researcher, and some researchers offer incentives that show appreciation for the participants' time. It is not mandatory to offer incentives for participation, and it depends on how much financial freedom is available to the researcher. Keep these rules in mind as you embark on your first research study.

RESEARCH WORKSHOP 1.1 COMPLETE A COURSE ON PROTECTING HUMAN RESEARCH PARTICIPANTS

Go to phrptraining.com to complete Protecting Human Research Participants, a free course that discusses how to protect the rights of research participants. (When you register, check the box that allows you to participate in continuing medical education credits.) This online training course takes about three hours to complete and consists of seven modules. The information provided is rich with details, definitions, and case studies. There are four quizzes that you will also need to complete that measure your understanding and knowledge of research ethics. You can reenter and continue the course at your convenience. After you have completed the modules and quizzes, you will have the opportunity to print your certificate of completion.

A Violation of Ethics

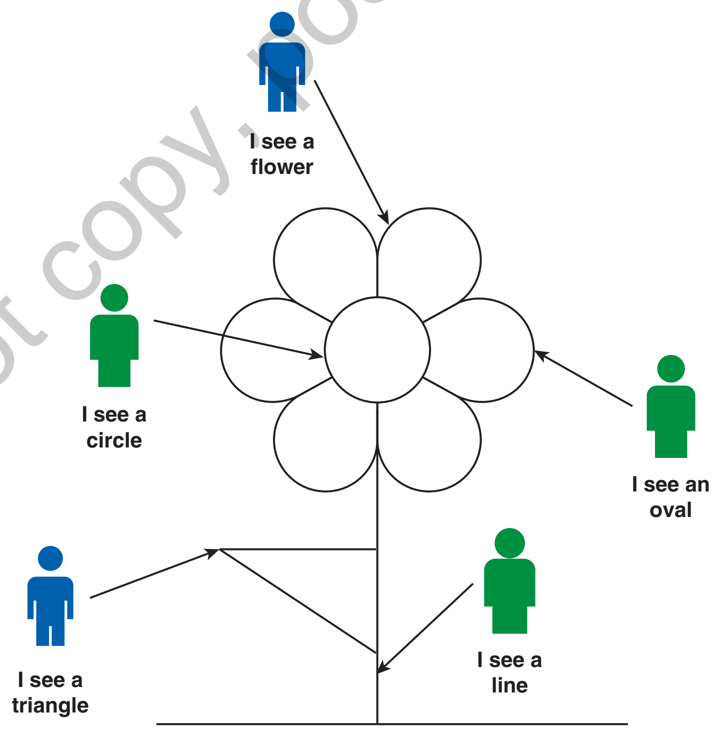
The Tuskegee syphilis study is an infamous case of an ethics violation in research. Between 1932 and 1972, the U.S. Public Health Service and the Tuskegee Institute conducted a study on the effects of syphilis on the human body. The researchers recruited 600 Black men to participate but did not disclose the focus of their study to their participants, who were simply told they were being treated for "bad blood." Many believed they were receiving free health services from the government.

Two-thirds of the participating men had syphilis, and even though penicillin was validated as an effective treatment in 1942, not one of the men in the Tuskegee study received treatment. Instead, the researchers observed the syphilis symptoms evolving among these men in order "to record the natural history of untreated syphilis among the [B]lack population." This continued for an additional 30 years and was finally revealed through a leak to the newspapers in the early 1970s. Only 74 participants survived. Around 40 of their wives were also infected, and 19 children were born with syphilis. The tragedy of the Tuskegee study is measured not only in numbers directly affected, but in the lasting resentment it caused within the Black community.

Researchers' Biases

An important skill of being a researcher is the ability to study concepts objectively (see Figure 1.4). **Objectivity** means perceiving something from different angles without personal preferences or judgments. Objective thinking is based on the facts about what has happened rather than our thoughts or emotions about it. Being objective is difficult and, some may argue, even impossible, but we can get close to it. One way of getting closer to being objective is our ability to recognize our personal biases and be aware of them. This awareness will allow us to guard ourselves from subjective thoughts and preferences. **Researchers' biases** are detrimental to our research, and although we may never fully get rid of them, it is important to reduce them as much as possible.

FIGURE 1.4 ■ Different people look at the same thing and have different perceptions of what they see. Researchers' bias is something that we need to accept and understand.



Subjective thinking is based on personal emotions, experiences, and prejudices. All people are subjective in one form or another because we are molded by our unique personalities and backgrounds. One common type of bias is called **selective observation**. Selective observation happens when we are focused on a specific occurrence or a specific group of people instead of including an entire sample in our observation. It implies focusing on what interests us and, consciously or unconsciously, failing to notice other things that may contradict our theory. Another similar form of subjective thinking is **overconfidence bias**, which relates to the researchers' overconfidence in their own abilities, intelligence, and critical thinking skills. It is possible for researchers to feel overconfident in their own abilities and not consider additional details or some aspects of the study that need more attention.

Another common type of bias is called **overgeneralization**. Overgeneralization happens when we use a small number of cases to draw conclusions about the entire population. Similar to selective observation, we overgeneralize when we use something we have seen once or twice and believe that this is how "it always happens."

Although we cannot eliminate all our biases, we can reduce then and approach objectivity by conducting research according to widely accepted rules. Still, we are our own greatest enemy. Our misconceptions, assumptions, and preconceived notions of the world interfere with the research process. At the same time, it is because of our assumptions, creativity, and understanding of the world that we can deliver magnificent research. Your creativity and your imagination play an important role in conducting research. Without it, your work will be monotonous. You may be great at following the rules of the game, but you need your own brand of creativity to make the most of your research efforts.

SUMMARY

This chapter discussed the ways we receive new knowledge and distinguished among the different types of knowledge. Traditional knowledge comes from information we gather from our culture and social environment, particularly from the rules, regulations, and behaviors we learn as children. Authoritative knowledge includes what our parents, teachers, and professionals tell us about life, behaviors, and social circumstances. We learn from experiential knowledge where our behaviors are modified because of our experiences. Although these different types of knowledge tell us about how life works around us, they may not be scientific. Scientific knowledge is the type of knowledge we trust the most because it follows strict scientific rules of discovery.

You were introduced to two main theories of developing knowledge: Popper's falsifiability and Kuhn's scientific revolution. In Popper's terms, knowledge is advanced when we disprove an established theory and falsify it. By building empirical evidence that contradicts an established theory, we can create a new tentative theory that is stronger than the previous one. Popper believed that we should always try to falsify theories in order to advance knowledge.

Kuhn's scientific revolution is conceptually similar. Kuhn saw the advancement of knowledge as a small revolution in itself. We have some accepted truths that he called normal science.

Normal science functions on what is already known and does not occupy itself with exploring new ideas. Normal science also includes accepted paradigms. However, occasionally we encounter anomalies—things that do not fit into the accepted normal science. The more anomalies we encounter, the more likely we are to move toward a crisis. The crisis will bring a revolution and a paradigm shift. This paradigm shift will substitute the old normal science with the new advanced science.

The chapter introduced the three main types of research methodologies: qualitative, quantitative, and mixed methods. Qualitative research is based on inductive reasoning and begins with specific observations and moves to a broader understanding of a topic. It attempts to bring new insights and create new theories based on specific observations of a topic. Quantitative research is based on deductive reasoning or the type of reasoning that looks at a problem with specific expectations and assumptions about the results of the study. Deductive reasoning begins with a broad theory and applies it to a specific measurable problem. Mixed methods is a combination methodology that uses the best features of quantitative and qualitative research. Mixed methods allows for a better understanding of a problem and the ability to look at a specific topic both broadly and narrowly.

This chapter also introduced you to ethical considerations in research and how to conduct research while protecting participants in any study. Whereas some forms of protection are more obvious than others, such as not causing any intentional harm to participants, others are subtler. There are rules of anonymity and confidentiality at the core of every study. Other rules include not coercing subjects to participate in research or being careful about conflicts of interest.

Finally, this chapter examined the researcher's capability of being objective and the importance of perceiving a problem from different angles without allowing our personal preferences to take over. Objectivity is difficult to achieve, but we can train ourselves to reduce our biases by becoming aware of them. Subjectivity is based on personal emotions, experiences, and biases that are part of who we truly are. Subjective thinking sometimes causes selective observation or overgeneralization. Selective observation happens when we pay attention only to a few selective cases or subjects in our study rather than its entirety. Overgeneralization happens when we think that we can apply the same findings from a small group of participants to the society at large. Though subjective thinking has its flaws, it is also a channel of our creativity—an important part of being a researcher.

KEY TERMS

Anomaly (p. 7)
Anonymity (p. 17)
Authority (p. 2)
Confidentiality (p. 17)
Convergent design (p. 15)
Crisis (p. 7)
Deductive reasoning (p. 12)
Embedded design (p. 15)
Empirical evidence (p. 4)
Ethics (p. 16)

Experiential knowledge (p. 2)
Explanatory sequential design (p. 15)
Exploratory sequential design (p. 15)
Falsify (p. 5)
Inductive reasoning (p. 10)
Informed consent (p. 17)
Mixed methods (p. 15)
Normal science (p. 7)
Objectivity (p. 19)
Overconfidence bias (p. 20)
Overgeneralization (p. 20)
Paradigm (p. 7)
Paradigm shift (p. 8)
Qualitative research (p. 9)
Quantitative research (p. 12)
Researchers' bias (p. 19)
Revolution (p. 8)
Scientific knowledge (p. 2)
Selective observation (p. 20)
Subjective thinking (p. 20)
Traditional knowledge (p. 2)

TAKING A STEP FURTHER

1. What is the difference between reality and knowledge?
2. What is research methodology, and what do we need it for?
3. Can you think of examples that can illustrate Popper's falsifiability?
4. How does inductive reasoning differ from deductive reasoning?
5. What are some examples that can illustrate Kuhn's paradigm shift?
6. How does traditional knowledge differ from subjective thinking?