Chapter 8
Quantitative Research

What is Quantitative Research?

We make decisions using numbers most every day. It might be easy to see a computer purchase as a quantitative decision: First, you have to determine how much money you have to spend. Next, you would have to determine what specifications you would want on that computer: How fast is the CPU? How much RAM? What is the size of the screen? What type of video card? Next, you have to compare how much money you have to the computer you want. Finally, you have to research online or by going to the store, where you can get the best deal on the computer you want for the money. These all seem to connect because you are comparing numbers to other numbers. But we use numbers to make many decisions in everyday life. Simple decisions such as how much to spend on lunch, what clothes to buy, or whether we can go out to a movie, are determined by how much money we have, or how much time they will take. These are all quantitative decisions. In fact, some of these decisions have multiple layers. Take, for example, what might be the simple decision of what to have for lunch. At one level, there is the matter of money. Do you have enough money to buy the food that you want? Another layer is time and convenience—how much time would it take to get the food you want, and how far away is it? Then there is a decision about a food’s nutritional value, another quantitative decision if you are measuring the amount of calories, protein, or sugar.

So quantitative research, or using numbers as evidence, is quite common even if we don’t recognize the many layers that such decisions require. Sure, the quantitative decisions we have discussed so far seem far removed from the measured rate that the polar ice cap is melting or polling numbers from a recent election. The concepts, however, are the same—using numbers as evidence to make a decision.

If we were to define quantitative research, we might say that it is any research that involves the manipulation of numbers to make claims, provide evidence, describe phenomena, determine relationships, or determine causation. In such research, it is the numbers of a phenomenon, an opinion, or the results of an experiment that provide evidence for a researcher to make claims. Quantitative research uses a number of methods to collect, interpret, and report what these numbers mean, but these methods are usually very systematic in order to maintain the consistency of these numbers across different contexts. For this reason, quantitative research is said to be generalizable, which means that its results can be applied to other contexts and situations through statistical or mathematical modeling; in other words, this type of research can be used to make predictions about what was being studied, whether phenomena, opinions, or experiments. For example, Google has a tool called Google Trends (http://www.google.com/trends) that keeps track of searches that people type into their search engine tool. Recently, Google reported that their search data for “flu symptoms” matched the
Centers for Disease Control (CDC) flu studies from the last few years, and they were in fact able to report those numbers 10 days quicker than the CDC.

Another important concept to quantitative research is sampling. In the Google flu example, although the trend that Google discovered matched the CDC trend, it isn’t a measure of every single flu case in the United States. There are people who don’t use computers or don’t use Google. Similarly, not everybody reports to the CDC or to a hospital when they get the flu. However, a sample of a population, if large enough, can make predictions about that population. Let’s look at another example, this time from business. Imagine a major soft drink company wants to create a new energy drink. Their drink development team has come up with five different flavors, but they aren’t sure which one they should market, so they decide to have a focus group. The focus group consists of randomly selected volunteers who don’t work for the company, but who are paid to give their opinions on products. Random selection means that they are more likely to represent the population because, generally speaking, a random sample of the larger population will often represent that population’s diversity. This focus group will decide for the population because it would be impossible for the soft drink company to survey everybody about the drink, just like it would be impossible for Google or the CDC to get flu data from the entire population. For more on sampling, refer to Box 8.1.

A lot of quantitative research is also deductive, which is to say that it is usually testing a hypothesis that has already been established before the numbers have been collected. Numbers are important to determine when a hypothesis has been confirmed or not because they are precise measures. Numbers are precise because they are mutually exclusive and relative to each other. What this means is that a numbered result cannot be any other number; furthermore, a number is usually in comparison or relative to other numbers. For example, if you were to tell somebody that you are a good student, that could mean a lot of things; however, if you were to say that you had a 3.82 GPA, then that is a more precise measure. Of course, this precision also leaves out much of being a good student—everything you know and are that isn’t tested or graded in the classroom such as your extracurricular reading, writing, and other activities—but it is easy to see from the GPA just how good a student you are. Because of this precision, researchers in quantitative research are usually looking for something—a particular number being met before a hypothesis can be confirmed or rejected. Similarly, your college or university was looking for a minimum GPA or SAT score to be met before you could be admitted.

You are probably familiar with many types of quantitative research already. From measuring respiration in a biology class to taking a survey on the Internet, you have probably been either the subject of quantitative research or the researcher conducting it. What counts as evidence in quantitative research are the amounts of data collected. However, in quantitative research, it is important that the researcher determine beforehand what number will count as significant. Significance in quantitative research is a very specific term—it means the result is important. Although it may sound unusual, the researcher determines what amount or number is significant. Let’s explain this a bit more. Imagine you are taking a survey about a new MP3 player. The survey asks a number of questions about certain features and whether you would...
like to see these features or not. One feature of the player is that it will display a slideshow of images while music is playing. If one person doesn’t like the feature, but another does, it doesn’t seem that big of a difference. But imagine a thousand surveys were completed about this MP3 player. If 200 people did not like the feature, but 600 did, and 200 people were indifferent, what is the company to do about the feature? Do they risk not implementing the feature to satisfy the 200 people who didn’t like it? What about the 200 people who were indifferent to the feature? As you can see, in quantitative research, it is important that the researcher determine what these numbers will mean and how significant they will be. Just because one response is more than another doesn’t make it automatically clear what should be done or how important the difference is.

Because quantitative research has precise measures that are generalizable, two more terms are important to understand when doing quantitative research. The first is reliability. Reliability means a test or measure consistently reveals the same results. The second is validity. Validity means that the test or measure actually shows what it is intended to show. Reliability and validity are often thought to be the same thing, but as you can see from the next example, they are different. If you created a survey for college students that asked them to rank their favorite music out of ten options, and of the 100 surveys you gave out to a sample, 50 students said their favorite music was opera, would this be reliable and valid? In fact, if you were to give the same survey to the same sample, they would probably say the same thing, so this is a reliable measure, but knowing what you know about college students, you would probably think it was not valid. Maybe the survey was only given to music performance or voice majors. In this case, you can see that a random sample is very important in any research that is intended to be generalizable. In contrast, if you were to give the survey to a different 100 college students, would 50 say they thought opera was their favorite music? Probably not. As you can see, it is possible to have reliability without validity, but you can also have validity without reliability. If a researcher were to give a similar survey as that above, but instead, asked qualitative, fill-in-the-blank questions about what music type students like, there would be so much variability that it would be difficult to get a consistent or reliable answer. In this case, it would validly show that college students appreciate everything from jam bands to hard bop to ska punk to afro-pop, but it would not show any consistent patterns except that people classify music differently.

BOX 8.1 Sampling

Sampling means taking a small group of people from a larger population to represent that population. For example, if you wanted to learn whether college students preferred Mac or PC computers, you could survey every college student, but that would cost too much, and furthermore, it wouldn’t necessarily give you different results than if you had surveyed a representative sample of college students. One of the interesting things about quantitative research is that a properly derived sample from a population will, in fact, give you similar results to surveying an entire population. Where it gets tricky is when you have particularly large populations, such as the entire U.S. population, because with greater size comes greater diversity, and trying to represent that diversity in a sample is difficult.
Not only does sampling refer to the selection of human participants, but to materials, animals, or any other type of object of study as well. For example, if you were testing a pesticide on mountain pine beetles, you couldn’t test it on all beetles—you could only find a sample.

There are many different types of sampling, but we will discuss four types that are the most useful to know and use in your research. Each type of sampling has its advantages and disadvantages. Although a true random sample is often the best, any of the following are useful. Just make sure to describe which of the following four methods was used when you write about your method of research. Your research audience will usually be familiar with these terms, so simply writing, “a convenience sample of 100 college students was selected” should be enough for academic audiences.

- **Convenience sample** – convenience sampling means that you grabbed a sample of people or materials that were convenient and most available to you as a researcher. There is no telling how representative a convenience sample is of a given population because the sample was not picked with any sort of purpose except that it was available to you. Journalists often do convenience sampling for stories because they are trying to meet a deadline, and it is easy to ask the “average” person on the street for his or her opinion. A lot of informal surveys also use convenience samples. Just surveying your close friends would be an example of convenience sampling.

- **Purposeful Sample** – purposeful sampling refers to selecting people or materials that meet particular criteria. If you wanted to study video game players, you would want to purposefully sample only video game players. You might have to go to an Internet game café or local gaming clan to get a large enough sample. Sometimes studies will sample a larger group of people but only use data from a purposeful sample. For example, a questionnaire might be given to all students about their video game playing habits, but only those participants who answered a specific series of questions on that questionnaire might be used in the final study as a purposeful sample. In this case, researchers will ask all students to prevent a demand effect problem with research in which some part of the study influences how the participants respond rather than giving an honest response.

- **Stratified Sample** – a stratified sample is a combination of a purposeful sample and a random sample. Sometimes you want to target some variable or variables in your study, so you might purposefully be aware of those variables when selecting from a random population. For example, if you were studying whether gender had an influence on iPod color choice, you would want to make sure you surveyed an equal number of women and men, and all of which would have to be iPod owners. Thus, you have a sample of iPod users, and two sub-populations, one of women and one of men.

- **Random Sample** – a true random sample is not as random as it sounds, but is based on a mathematical model that any member of a given population has an equal chance of
being selected for the sample. This may sound simple, but let’s imagine you wanted to get a random sample from a college campus. How would derive it? Not all students go to the library, or student center, or to athletic events, yet, these are all students who are part of the student population, as are the students who don’t go to those places. Do you see the difficulty? Just asking six of your closest friends to participate is not random. Even standing outside of the library on a Tuesday, asking everybody who enters to participate is not random either (if going to the library was typical of a given population, then libraries would be far busier than they already are). Truth be told, selecting people entering the library is more random than asking your friends, or even everybody on your dorm floor, but it still is not completely random. For such a study, a true random sample might be selecting every student with a student number that ended in odd or even number. Random sampling depends on your research design; resources also often determine how you select your participants. In more complex research designs, computer programs are used for selecting a completely random sample. Despite all of these concerns, use your best efforts to obtain a random sample by recognizing that if you are surveying people or testing materials of a given population, you want to make sure to find a sample in which every member has an equal chance of being selected and can represent the diversity of the population from which it was drawn.

Discussion and Practice

1. Imagine you wanted to study student movie attitudes at your school. You decide you want to conduct a quantitative survey.
   a. What would be the advantages and disadvantages of each of these sampling methods for selecting participants to take your survey?
   b. How would you go about getting a representative sample using each of the four methods?
   c. What audiences would care about your sampling method and why?

Who Does Quantitative Research?

Although you may think of quantitative research as most prevalent in the sciences, such as biology, chemistry, or engineering, almost every major and discipline uses some type of quantitative research. There is the obvious use of surveys that quantify experience or opinions, but there are also other measures such as testing that equate a number with level of ability, intelligence, or understanding. There are many different ways to collect and manipulate numerical data, only some of which are connected solely with one or a few disciplines.

In psychology, numbers are used to count frequencies of a given phenomenon or applied to an action so that it may better be analyzed or compared to others. When a researcher applies a number to an individual’s ability or intellect, it is called psychometrics. Intelligence quotient (IQ) tests are a type of psychometric measure, although there are many other tests used for determining intelligence. Determining significance with such measures is usually based on a large sample of people measured so that there is a valid comparison of the measure. One
A recent long-term study published in the journal *Intelligence* examined whether later school performance was related to early intelligence measures in children. The researchers found that higher intelligence at age 11 was related to better school performance at 16, with girls outperforming boys in all subjects but physics (Dreary et al., 2007).

In sociology, trends in migration, populations, disease, marriage, income, and other quantitative measures are often used in a descriptive way to characterize societies or communities and also to make predictions when such issues are applied to other communities. In addition to trends in populations and communities, sociology also looks at more local issues. For example, a 2007 study published in *The Social Science Journal* looked at the effect of smoking bans on alcohol consumption, finding that such bans hurt beer and spirits demand, but increased demand for wine (Gallet & Eastman).

Physics and engineering research is based mostly on quantitative research that is deterministic. What this means is that certain quantitative methods and mathematical models are good at predicting or determining a result. Let’s take a specific example. There is a lot of research that goes into designing a bridge, but one small part is measuring the tensile strength of the steel that will be used in the bridge’s construction. If a researcher knows the ultimate strength and yield strength for the steel, he or she can predict the support and foundation required for that bridge. Previous measurements of tensile strength are reliable and valid and thus determine the future tensile strength measures. However, when dealing with these issues, new metal alloys and processes of manufacture are constantly being researched to provide more dependable engineering materials. For example, a recent article in the journal *Engineering Fracture Mechanics* compared current train wheel alloys with a new nanostructured alloy that was shown quantitatively to be less prone to failure (Zhang & Gu, 2008).

Even in the humanities, such as history and English, quantitative studies are conducted. In English and linguistics, there are studies that show frequencies and types of writing errors. There are also studies that chart the frequencies of a word or group of words. For example, one study published in the *Journal of Pragmatics* compared frequencies of metadiscourse in academic, journalistic, and fiction writing (Hempel & Degand, 2008). Simply put, all texts are filled with content words and function words. Content words are the ideas, and function words or metadiscourse (literally, words about words) help you organize the ideas for an audience. Phrases and words like, “for example,” “therefore” and “on one hand” are types of metadiscourse. In this study, Hempel & Degand found through quantitative research that academic writing has more metadiscourse than does fiction or newspaper and magazine writing. This is an important distinction to remember in considering how you write for different audiences and genres. In history, there are quantitative studies on everything from the railroad’s economic impact on communities at the turn of the century to the great depression’s impact on art.

Because quantitative research comes in different varieties, there can be a lot of debate about when and how to use such research. Although deterministic quantitative research seems more compelling in real world application, there are still many variables that cannot be controlled for.
Space probes and satellites can still go off course, and bridges still suffer structural problems. In contrast, non-deterministic research in the social sciences and education can use statistical methods to predict future trends. For example, even though SAT scores are debated as a measure of accepting students into college, they are valid in predicting that, generally speaking, those with a high score earn high GPAs in their first year of college. Additionally, a great deal of medical research is non-deterministic. Doctors can only make predictions based on past frequencies of a given treatment’s effect on a disease or condition—they cannot be 100% sure all the time. It is important to remember that quantitative research is only the best tool for discovering and recording knowledge for particular situations, and it isn’t inherently better or worse than any other type of research.

Discussion and Practice

1. Using your library or the Internet, find a quantitative study related to your major. If you don’t have a major, look for a quantitative study related to a field that interests you. Ideally, you should find a study or piece of research and not just an opinion or newspaper article. In other words, look for something published in an academic journal or through an online database. Your librarian should be able to help you with this task if you are having difficulty. Obviously, for some majors, this will prove to be easier, but we guarantee that for every major, you will be able to find a quantitative study. Once you found this study, read it as best you can and write a short rhetorical analysis. Namely, what is the purpose, who is the audience, and who is writing this piece? Also, discuss how difficult or not it was finding a quantitative study on your major. Why do you think that quantitative research is valued (or not) for those in your major?

Where Does Quantitative Research come from?

What makes quantitative research quantitative are the amounts, frequencies, and numbers of phenomenon. However, not all numbers are created equally. In quantitative research there are different types of numbers, and their ability to support an argument as evidence depends on the type of number they are. The source of the number or where it came from also changes what can be done with the data.

What Are Some Types of Quantitative Data?

Quantitative data that the researcher collects can come in one of three forms: raw data, aggregate data, and inferential data. All studies begin with raw data, and the researchers manipulate that data into evidence either by adding groups together or performing a statistical test. This may sound confusing at first, but it is really an easy distinction.

Raw data is just a number or series of numbers—the numerical results from a survey or test that have not been manipulated or statistically analyzed yet. (Turn to the end of this chapter, Quantitative Cases, Section B for an example of what raw data might look like.) It is the best source because it hasn’t been manipulated. As evidence, however, it isn’t very good because
raw numbers don’t mean anything for your audience. Let’s imagine a study looking at the average age in months that babies in a particular study started talking. The raw data would consist of just the numbers: 8, 7, 8, 9, 10. There is no real argument here, just numbers.

Aggregate data, on the other hand, has been manipulated so as to give a collective result for a series of data. The collective result is usually expressed in a measure of central tendency (we describe this process later in the chapter). As evidence, aggregate data is good in descriptive studies because it can be used to make an argument. For example, in the series of numbers we presented in the raw data description, we can make an argument that babies in a particular study first started talking, on average, at 8.4 months. This is an aggregate of the raw data. Note that we aren’t arguing that babies will always talk on average at 8.4 months, because all we did was compute the average of a past study and did not compute whether it was representative of future populations or not.

Inferential data means that the source of data has been statistically manipulated so as to make a prediction or show a relationship. These inferential statistics make the best argument because using a statistical measure, we can make an argument that most babies will start talking at 8.4 months, or even that a particular gender might begin talking before another gender. Note the difference between the aggregate and the inferential is that we can make a claim beyond the study sample and into the future.

Let’s imagine another simple example. You want to create a survey about social networking websites like Facebook or Myspace. You are interested in finding out if people prefer one website or the other, and want to ask them further to rate the features of each of the websites. You also ask for basic demographic information such as age, ethnicity, education, and gender. As a first stage, the responses to the survey are raw data. On one hand, it is the best source because with all the raw numbers, you have the most options to make an argument with. However, you wouldn’t just put raw numbers into a research report—your audience would be overwhelmed. As evidence for an argument, raw data is not very effective. Thus, you decide to do a simple measure of central tendency, which means finding the average, of what age or what genders use either Facebook or Myspace. This aggregate data can be used as evidence to help you better make an argument about which social networking site is used more often by your study participants. However, as a source of data, measures of central tendency or averages just tell the audience what you found in an organized way, and they don’t say much past that. If you wanted to show whether gender and/or age contributed to liking a particular website or a website’s features, or if you wanted to make some claim that your sample was representative of a larger or future population, you would have to calculate inferential data. Unfortunately, even though it is the best evidence for your arguments, the inferential data as a source for other researchers leaves them the least to work with—they would have to replicate your entire study if they wanted to study some quality that you didn’t study.

Most basic surveys and questionnaires that you see reported in newspapers use aggregate data. As a source, they are easy to report and understand, and provide straightforward evidence for simple arguments. Most academic studies and articles in journals use inferential
data as evidence because it can be used to support complex and substantial arguments. When we consider secondary sources, or those sources that are a report of what other researchers have done, almost all data presented are either aggregate or inferential. Only you, as a researcher conducting your own study, will be able to collect raw data to later manipulate into an argument. Most published studies do not dump all of their data on the page—for one thing, it would be overwhelming and confusing to an audience, but for another, a researcher or writer wants to make very clear and focused arguments, and all the data might clutter that argument up.

**How Do Numbers become Data and Evidence?**

Not all numbers are created equally. Take a moment to consider temperature. Imagine you were planning a trip to visit some friends in San Diego in July. You are trying to figure out what clothes to pack. If you ask your friends, they might say that the weather is nice, but what does that mean? Nice isn’t relative to anything else, so you ask them to compare the weather in San Diego to where you live currently. They might say that it is cooler in San Diego than where you live, but that still isn’t the best measure, so you look up the forecast on the Internet to find out it is supposed to be 76 degrees while you are there. In this example, there are three types of evidence: name-only (“it’s nice”), relative (“it’s cooler than where you are at”) and a continuous, specific measure (“it’s 76 degrees”). This example represents three of the four common types of numerical evidence.

Manipulating raw data depends on which one of the four types of numbered data you have collected. Although all numbers are a precise, mutually exclusive indicator of a phenomenon, not all of them mean the same thing.

**Nominal** – nominal numbers aren’t “true” numbers but just signs standing in for some other quality. “Nominal” means in name only. Nominal numbers are often used when coding qualitative data. When there is a lot of qualitative data that needs to be condensed and analyzed, it is often coded with a letter or number to indicate a series of events, a quote, an opinion, or some observation. Rather than write a particular qualitative phenomenon down every time it is seen, many researchers will create a code sheet that has a number or letter code. This is nominal data because the code doesn’t mean anything outside of the research—however, these codes do make it easier to count the data for quantitative research. In fact, the only manipulation of nominal data is counting frequency and mode, or counting the result that occurs most often. Gender is often nominally coded—it has a number quality in that it is mutually exclusive, people either identify as male or female, but there is no average number that can be computed from it. In our previous weather example, “it’s nice,” represents the nominal. We could apply a number to it, 1, 42, or 100 and it wouldn’t matter. Why would we want to apply a number to it? Imagine you were doing a study of what 100 people said in interviews about weather in California—in some cases, it might be easier to count the frequency of people who said “it’s nice” if we have a code for it rather than always have to count every time “nice” was mentioned.
**Ordinal or rank**—ordinal numbers are also applied to a phenomenon by a researcher, but they are continuous, which means that 2 follows 1, follows 0. Ordinal numbers can be averaged, and otherwise manipulated. The difference is that ordinal numbers don’t have a consistent scale. An example of ordinal numbers is a movie review score on Netflix or Facebook. We might say that a 2 star movie is better than a 1 star movie, but how much better? There is no indication from an ordinal number how much better a 2 is from a 1. Is a 2 star movie twice as good as a 1 star movie (1 X 2 = 2)? Is a 4 star movie twice as good as a 2 star movie? Ordinal numbers can be manipulated to provide descriptive data (e.g. “Tropic Thunder had an average rating of 3.95 stars”), but they are difficult to compare to other numbers because they aren’t on a consistent scale. Ordinal data is most often seen with some Likert scales (see Box 8.2) and other types of arbitrary rankings. Notice these are rankings; for ordinal numbers, a higher number is more than a lower number. Also notice that a higher number isn’t “better” than a lower number, it is just “more”—you could say that in the movie Star Wars, Darth Vader was rated with an evilness factor of 5 and Han Solo was rated with an evilness factor of 2. You wouldn’t say that Darth Vader is “better” than Han Solo. Returning to the weather example up above, we can see that “it’s cooler than where you are” is relative and thus would be ranked differently than the temperature of your home town.

**Interval**—interval numbers scale consistently and they are continuous. The distance between the numbers is equal, hence why they are called interval. Temperature is the classic example of interval numbers. Ten degrees colder holds the same range as ten degrees warmer. Because of the consistent ranges between a number or series of numbers, interval data is considered true quantitative data in that not only do the numbers mean something, but they can be consistently added or subtracted from each other to gain a result that also means something. It should be obvious that the “76 degrees” from our previous example is an interval number.

**Ratio**—The major difference between interval data and ratio data is that ratio data has an absolute zero, which would mean that a given phenomenon doesn’t exist. This is important quality for many types of research. Age, weight, and height are ratio measurements because there is an absolute zero, and that zero means absence of the phenomenon. By contrast, if you were to say it was zero degrees, as in the interval measurement of temperature, the zero is merely indicating where the temperature is on a scale, whether Celsius or Fahrenheit, negative or positive, but there never isn’t a temperature, or absolute absence of temperature.

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**Discussion and Practice**

Consider you are watching a football game between the Indianapolis Colts and the Pittsburgh Steelers.

1. Indicate which of the four types of number the evidence is (nominal, ordinal, interval, or ratio):
   a. Attendance at the game
   b. Current score
   c. The down
   d. Player jersey numbers
   e. Length in yards of a play
2. Indicate which of the three sources each of the arguments is (raw, aggregate, inferential):
   a. Rothlisberger passed for 8, 6, -2, 25, 55, 21, 44, 4, 6, 3, 5, 15, 30, 41, and 13 yards.
   b. Manning passed for 293 yards
   c. Quarterbacks with higher jersey numbers will have higher pass yardage than those with lower jersey numbers.

3. Consider the variety of quantitative sources and evidence at a football game. What sources and evidence would appeal to your friends when making an argument about the game? What sources and evidence would appeal to those watching ESPN or a local sportscast? What sources or evidence would appeal to somebody who didn’t know much about football?

**What Are the Advantages and Disadvantages of Quantitative Research?**

Because not all numbers are the same, some researchers do not consider the use of nominal or ordinal numbers in the social sciences like psychology and sociology true quantitative research. Don’t worry too much about this argument. Simply put, different research questions and contexts call for attention to these differences in measurement and numbers. What is important to understand is that researchers use quantitative research to make arguments of precision, but this is a conscious rhetorical choice of the researcher.

Sometimes your purpose will require that you use certain types of numerical data, such as in doing a study of whether a drug is effective so that the FDA might approve the drug for sale. Because qualitative and interpretive types of research aren't very good at predicting future effects, quantitative data would be required here. As an audience, however, the FDA routinely accepts all types of research, whether text-based, qualitative, or quantitative.

In other situations, the audience might require numerical data. For example, if you have ten minutes at a meeting with investors to share results from a focus group about a new product, it might be easier to code a number of the interviews and observations quantitatively and tell the investors that a certain number of people indicated satisfaction with the product. This type of evidence will appeal to that audience. On the other hand, if the research & development department of your company wants to improve the product before release, they will want more comprehensive and qualitative data—they will want to know why the focus group was satisfied with the product. The most important point is to pick the most appropriate and precise evidence for your rhetorical research and writing situation.

We started this section by talking about how the source of the number changes the meaning of that number, and we further talked about how different types of numbers aren’t the same. At first glance, this may go against what you thought numbers represented. For example, you may have considered your English or writing classes as more subjective and open to interpretation.
than math classes because in math there always seems to be a right and wrong answer. That has more to do with numbers being mutually exclusive rather than any inherent subjective/objective quality within either. Mutually exclusive is just a fancy way of saying that a 1 equals a 1, and that not only can’t it be any other number, but another number can’t be it. When writing, you might think a sentence like, “I ain’t gonna go to that party” is wrong. Well, if you were writing that to a close friend, it’s not “wrong.” If you were writing it as part of a movie script, it isn’t wrong either. In fact, you could be writing the sentence in an academic essay to make a point about the party or the person saying it. Thus, the sentence can be right or wrong depending on the context (see Chapter 1). Just like with writing, certain numerical data is better for arguing certain cases to certain audiences than other numerical data. What makes a number a number is that mutually exclusive quality. Numbers aren’t inherently better at making arguments, but their mutual exclusiveness make them better at providing precise evidence for certain types of arguments.

Discussion and Practice

1. Besides those issues we have already discussed, what are some further disadvantages of quantitative research? What are some further advantages?

2. In 1976, the Food and Drug Administration (FDA) banned the use of FD&C No. 2 commonly known as Red Dye No. 2. This came after a Russian study found a link between the substance and cancer. Later studies in the U.S. using rats found that excessive amounts posed some risk, a Time magazine article at the time reporting that a human would have to consume “7,500 12-oz. cans of soda pop containing Red No. 2 every day for there to be to reach the rats’ level of consumption.” The popular candy M&Ms stopped producing red M&Ms at the time even though they did not use any Red Dye No. 2 in their products. Given the qualitative and quantitative evidence available, why didn’t the company that produced M&Ms use a quantitative argument and continue to produce red M&Ms? At what points does quantitative data or research not become as effective at persuasion?

3. Any research choice is a rhetorical one in which you consider audience, purpose, and your own position as writer. Consider the following rhetorical situations. What quantitative evidence would each of the audiences be interested in:

| The effectiveness of a new ADHD drug. | - Doctors/psychiatrists
- Parents of children with ADHD
- Public in general |
|--------------------------------------|----------------------------------------|
| Proposed changes to a kitchen line at a restaurant to decrease the time it takes for an order to be prepared. | - Chef and cooks
- Owner/manager
- Customers |
| Focus group results about a new product that a company wants to release to market. | - Company Research and Development
- Investors
- Public in general |
| Music preferences in the 1930s. | - Historians
- Musicians
- Record companies |
| Your library’s collection and circulation data. | - Librarians
- Students |
How is Quantitative Research Done?

Deciding whether to do quantitative research requires first that you understand what your audience and purpose expects from your argument. Sometimes your assignment in a class is dictated by the teacher who expects that you follow a specific method, but in many situations outside school, you will have to decide whether numbers as evidence are the best way to persuade your audience. If they are, you have to make two big decisions: how will you design your research and how will you carry it out?

In quantitative research, there are methods or ways of collecting the numbers, but there are also overall research designs which determine what the numbers or quantities represent. For example, earlier in this chapter, we referred to a comparison of Google and CDC flu data as well as a marketing survey on an MP3 player—in both cases, these would be descriptive designs—they are only describing what has occurred in the past. This data was also obtained from real-life activities without a researcher interfering, so it is considered non-experimental. The MP3 player survey was conducted outside of a carefully controlled environment, and it collected only responses to the questions and made no other predictions. After all, the people surveyed might already have an MP3 player they are happy with, and they may not be looking to buy another one any time soon. On the other hand, people who expressed dissatisfaction with certain features might still buy the product when it is released. The flu data from Google and the CDC were not collected from a questionnaire like the MP3 survey, so they used a different method, but their research design was similar—to show trends and descriptions of a phenomenon.

Alternatively, you can design a survey and manipulate the results mathematically to make a prediction. This type of design is called an inferential study. In such a study, results of previous surveys can be compared to the current survey to predict what survey responders will or have done. Another type of inferential study is one showing a relationship or correlation between two variables. There are many variations on these types of studies, and many quantitative studies can combine multiple methods to describe, infer, and correlate the results to provide evidence for claims. Depending on your major or field of study, you will learn many different methods for collecting and using quantitative research as you continue on in college as well as after you graduate.

What Are Some Appropriate Quantitative Research Designs?

With quantitative research, the first decision is in the design of the study, whether the research is descriptive or experimental in nature.

Descriptive studies often do just that—describe a quantity of a phenomenon. For example, a questionnaire might ask people in a community what types of restaurants they would like to
see in that community, and even whether the people might visit a specific restaurant if it were to open there. There is little predictive value to such a survey since people are only describing their current attitudes and beliefs to the questionnaire. Furthermore, the researcher isn’t intervening or interfering into the respondents’ lives except to ask questions and gather answers. It is only a collection of descriptive responses to a series of questions.

Descriptive study design is also commonly associated with collecting data that exists regardless of the researcher. For example, movie box office amounts, student GPA, baseball batting averages, traffic accidents, and music sales are all based on a descriptive design that collects what occurred in the past in a descriptive way.

**Experimental study** design looks to test whether changing some condition or aspect has an effect on another condition or aspect. There are a few types of experimental design that cannot all be covered in this textbook, but we are going to talk about the most common. A pure experimental design looks to isolate most if not all variables. A variable is a condition that might influence the result of the experiment. The condition can be age, sex, income, and education—they influence how a person responds to a question. Ideally, in a pure experiment, you want to isolate the independent variables so that you can study the dependant variables. A dependent variable is a result of one or more independent variables. A dependent variable is also the variable that is being measured in the study. The independent variable(s) act on or influence the dependent variable in the study. It can be confusing to tell the difference between the two types of variables sometimes, and even trained researchers have been known to confuse the two. To put it into better perspective, think of a baby. A baby is dependent on his or her parents for everything. Everything the parents do to the baby has an effect on the baby. In other words, parents are manipulating the independent variables to have an effect on the baby, who is the dependent variable in this example. But this relationship happens in reverse too. For example, the baby learns to manipulate an independent variable by crying, which in turn leads to a parent coming to the baby, the dependant variable.

As you may recognize, especially in doing many experiments, you cannot control all of the variables. Outside of Petri dishes in a carefully controlled lab, many real-world experiments are, at best, **quasi-experimental designs**. That means that the research is experimental in that the researcher is intervening by manipulating some variables, but that not all the variables in the environment can be carefully controlled, so it is only partially- or quasi-experimental. Independent variables may or may not have an effect, so you attempt to capture as many as you can to isolate which ones are influencing the dependent variable. For example, let’s imagine you were studying a new drug. You select a random sample of people, old and young, male and female, vegetarians and non-vegetarians, and the list goes on of potential variables. Once you consider as many possible variables as you can, you conduct your experiment to see if the drug has the intended effect or dependant variable. However, even if the drug has the intended effect, this effect actually might be a result of some other variable that the researcher couldn’t control for—these are called **confounding variables**.
As you can see, experimental or quasi-experimental designs differ from descriptive designs based primarily on whether the researcher is interfering or intervening to change something from its natural state. In a descriptive design, you want the responses from the participants or the frequency of a phenomena as it occurs naturally. If you look at Chapter 7 on qualitative research, the intention there is to observe or interview people in their natural state without you, the researcher, interfering or somehow influencing the response. However, descriptive quantitative research differs from qualitative research because you are quantifying responses or behaviors and therefore limiting the options so as to precisely measure the amount or degree of an effect.

A third design is **inferential statistical analysis**. We have already discussed inferential statistics as a source of data, but fully developing an argument with that data requires a particular study design. This design can use new or already published data to infer or predict a future effect or phenomenon. **Inferential designs** are also used to look at **correlations and causations**. The simplest statistical tests are used to compare a sample to a larger population to see if the researcher can infer that a phenomenon that he or she has seen in a study also appears outside of the study. More complicated tests look at correlations or relationships between two variables. If you wanted to find out if the number of hours a person plays videogames affects his or her GPA, you would statistically measure a correlation between the two variables (video game hours played and GPA). Notice this isn’t causation. **Causation** means that a particular independent variable (let’s call it A) always or usually leads to a dependent variable (B). In our videogame/GPA study, the researcher cannot control which one comes first. It could be that these two conditions are related, but maybe the number of hours played leads to lower grades or lower grades leads to more hours played—there’s no way to tell which one comes first. The best the study can do is argue that these two phenomena are or are not related (hence, the term correlated, literally meaning “together related”); it cannot determine which one causes the other.

**Discussion and Practice**

1) In a real-life setting/context, is it possible to conduct a truly experimental study?
2) Why is it usually impossible to create a study that studies causation outside of a laboratory?

**What Methods Can You Use to Carry out your Research?**

In addition to overall research designs, in quantitative research there are also many methods that a researcher can use to collect data. The most common methods for collecting data are questionnaires, testing, and systematic observations:

**Questionnaire/poll/survey** – Sometimes called a survey, a questionnaire is a series of questions that a person answers to provide descriptive data for a researcher. Polls usually focus on one question, such as whom you might be voting for in an upcoming election. Questionnaires are used primarily for descriptive designs, but the results are often used for inferential statistical analysis also. Questionnaires are a low-cost and effective way to collect precise data from a
large sample of people who can remain anonymous. Questionnaires are not very good for collecting detailed information, however. Their questions can be misunderstood and there is no way to clarify a question or response, so there is only one chance to get it right. Additionally, because they are anonymous, there can be problems with reliability and validity if the person taking the survey doesn’t take it seriously and doesn’t answer honestly.

**Testing** – Testing refers to measuring the effect of one or more independent variables. Testing is more commonly used in the sciences to see if changing some environment or conditions will change the outcome or effect of another condition. The point of testing is to look for difference between one group and another. One form of testing you may be familiar with as a student is an exam. A professor gives you an exam to see how much you have studied, read, or paid attention during a lecture. What is presumed in an exam is that if you were given the exam before the material was presented, you wouldn’t do very well. Exams are an imperfect testing mechanism because if everybody does poorly on the exam, then maybe it has nothing to do with number of hours studied but in how well the lecture was given (or it could just mean that nobody studied). A more careful, experimental approach in educational research, both in the corporate world and in schools, is the use of pre-tests and post-tests that look at whether a particular presentation or training seminar was effective. In these cases, the test is given before the material is presented, then again after, and the difference is compared to see what effect the presentation had. Of course, testing more commonly refers to measuring the before and after effects of a variable or collection of variables in an experiment. Testing is best used when there is a manipulated variable, which is the usual method for experimental designs. Although we have emphasized that testing is more appropriate for experimental and inferential designs, you can use testing in a descriptive fashion as well. Think back to the example about exams. Most exams that you take in a university setting are, in fact, descriptive tests. There are intervening variables (e.g. lectures, reading, studying), but these are independent, which is to say that they are voluntary and not controlled for.

**Systematic observation** – Systematic observation refers to the careful counting of a phenomenon in a natural or laboratory setting. It is systematic because terms are defined beforehand as to what the researcher is looking for, and it is quantitative rather than qualitative because the researcher is counting the frequency or the degrees of change of the variables observed. For example, if you wanted to look at whether gender was a variable in where students sit for class, you would count what row students were sitting in and what gender they were in multiple classes. Because observational research can be overwhelming due to the amount of data that there is to observe (see Chapter 7), it is important to establish a system before you conduct such research. One way to systematically conduct such research is by using a rubric, which is a list of predetermined variables or objects that you will count when doing your systematic observation. If you wanted to study how students were using computers in a computer lab on campus, you might classify computer use and create a rubric with items such as writing, reading, watching videos, gaming, and email. When you conduct your study, you would just walk around with your rubric and mark off what the various students were doing. Systematic observation usually leads to descriptive data, but it can be used in experimental and inferential research as well. For example, one common type of systematic
observation is sports statistics. In baseball, what counts towards a batting average is based on a rubric of hits divided by at bats. Note that walks and strikeouts count the same negatively, and singles and home runs count the same positively. You can later take this data and make statistical predictions or inferences about how well a team or player will perform in a particular situation, and in fact, sports videogames are based on computations of these inferential statistics.

Each of the methods we just described consists of two parts: a protocol and a research instrument. A protocol is a series of systematic steps that must be followed to test and gather results. What’s important is that the protocol needs to be determined BEFORE you begin the study. Many times, you will even write the protocol steps in the methods section of your research report, explaining how you conducted your study. We discuss this step at length in the section “How Do You Write About Quantitative Research?”

The research instrument is the mechanism for recording data. When writing, you would refer to a questionnaire, a systematic observation rubric, or a scale as a research instrument. Each method has associated with it a particular instrument or collection of instruments, so we will discuss further the specifics of each method, specifically creating a quantitative instrument that you can use to record quantitative data.

How Do You Conduct a Survey or Administer a Questionnaire?

When creating a questionnaire instrument, you want to design your questions first to generate data from your participants that will help you answer your research question. Oftentimes, a questionnaire is used with a descriptive design, and thus, a hypothesis isn’t that important because predicting the results doesn’t change what the data reveals. For example, if you were asking participants who they were voting for in an upcoming election, hypothesizing that one candidate will win over another doesn’t add to the argument. Nevertheless, if you are dealing with multiple variables, such as whether gender or age influences candidate selection, then a hypothesis is necessary. There are four stages of creating a good questionnaire: question creation, question wording, visual design, and study conduct.

Creating Questions

- Questions should be connected to your hypothesis or research question – Ideally, you are attempting to respond to a hypothesis or a research question. Your questions should provide data so that you can answer that research question in your final report. You don’t want to flat-out ask your study participants your research question, though. Even if there is no way around directly asking your participants the research question, you want to hide it with other questions. The reason for the subterfuge is that many studies have shown phenomena called demand effects. This is a fancy way of saying that people who fill out questionnaires will often try to answer with what they think the person asking wants to hear. If there is only one question, people will “guess” the answer based on the context rather than give an honest response. In fact, some studies
have even shown a pressure-to-answer effect, which means that even if given fake options or questions, people will answer them because they think they are supposed to.

- **Select either open or closed questions where appropriate** – Simply put, an open question is a short answer, write-in response that allows the participant to answer in any way he or she sees fit. A closed question provides a predetermined, multiple-choice, set of options. Either can be used in a questionnaire design, but if you are doing quantitative research, you will have to code all of the open questions using nominal numbers (except those open questions that are numbers to begin with such as age, hourly wage, etc.). Open questions that are a number should be left open because these numbers will offer more precise data. For example, if you asked a participant about how much they made an hour, and offered the options, $6, $7, or $8, you would leave out some important options—it would have been easier just to ask as an open question, “how much do you make an hour at your job?” When creating closed questions to put on a questionnaire, you should try to create a pattern so that multiple questions share similar response options so the participant can easily follow the pattern.

- **Ask questions that will give you data that you can use** – Quantitative research relies on quantifying responses to a predetermined set of questions. If you ask a lot of open questions, then you will be more likely to get a varied response so that you won’t have anything that is comparable for your final study. Ordinal and interval data is much better than nominal data when conducting quantitative research. Thus, you should rely on using a Likert-type scale for many questions about attitudes and beliefs. Likert-type scales work by providing a statement, usually a “positive” attitude (e.g. “I like ice cream”) and having participants indicate whether they strongly agree (5) or strongly disagree (1) with the statement. See Box 8.2 for more about Likert scales.

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**BOX 8.2 Likert Scales**
The Likert scale is often used in social sciences and with questionnaires that ask people about attitudes, beliefs, and self-reported behaviors. Likert scales allow a participant to select a predetermined response to a question that is easy for the researcher to quantify the degree of agreement, frequency or preference:

**Agreement**
Always disagree / sometimes disagree / neither agree nor disagree / sometimes agree / always agree

**Frequency**
Never / Occasionally / Often / Always / Don’t Know

**Preference**
Highly dislike / dislike / neither dislike nor like / Like / Highly like / Don’t Know
Likert scales are particularly effective because the ratings can be manipulated using measures of central tendency to reveal a general attitude or belief about a topic. The true Likert scale is a 5 item scale, but scales of any size can be used. The typical Likert scale looks something like the following:

Q1. I like ice cream
   1. Strongly Disagree
   2. Disagree
   3. Neither agree/disagree
   4. Agree
   5. Strongly Agree

There is some debate as to whether a mid-point (3. Neither agree/disagree) is useful or not. On one hand, if a participant is tired or in a hurry, they might just select the mid-point to be done with the survey and not have to think about it. On the other, it gives participants an option if they aren’t familiar with a particular question or option. Many times, your context will determine when or how to use a mid-point question. When computing a general attitude or response from a Likert scale, you can combine two options—after all, strongly agree and agree are both measures of agreement. In the ice cream example, even if 15% of the people said they “strongly agreed” and 63% said they “agree,” you could write in the final report, “in a survey of college students, 78% responded that they liked ice cream.”

You will also note that some Likert scales use a “Don’t Know” option. This might be useful to exclude data about a topic that a participant might not have had any experience with. For example, being indifferent to a feature on an iPhone is different than a survey participant who doesn’t have an iPhone and doesn’t really know. Whether to include a “Don’t know” response will depend on the question and research you are conducting.

Likert scales also allow you to more easily compare two or more variables by comparing the means (i.e. averages) of different Likert questions. For example, imagine the following three questions on a questionnaire:

How often do you ride public transportation to school? (never-sometimes-always)
How often do you drive your own car to school? (never-sometimes-always)
How often do you ride with somebody else to school? (never-sometimes-always)

This is then translated in the final report to the following useful piece of information:
In a group of college students surveyed on how they got to school, participants indicated that they were more likely to drive their own cars \( (M = 2.3) \) than to ride with somebody else \( (M = 0.65) \) or use public transportation \( (M = .97) \).

**Discussion and Practice**

1. Design a brief survey using a Likert scale to measure people’s attitudes and beliefs.
   a. Take, for example, a survey on how students rate the food on your campus. Remember that a good Likert-type scale provides some freedom of response (i.e. “don’t know”) for certain questions that a participant may not have had experience with. Also, a good survey using a Likert scale is layered so that
you are asking about comparable elements. Think of 3 or 4 questions that ask about price, quality, or availability, all on a Likert-type scale.

b. Once you have your brief survey, either one survey for the entire class or a few surveys, have each member of the class take the survey. Based on your experiences writing and taking such a survey, what are the disadvantages and advantages of Likert-type scales?

c. You might further develop this activity into a class-wide project in which each student is responsible for handing out a certain number of surveys that you have developed as a group. You can later use this data in writing your own report.

- **Limit the number of questions you ask your participants** – The rule for most simple surveys is that ten questions are about the limit. After ten questions (or about 2 minutes) people get anxious and suspicious of what you might do with all this information. Additionally, limit the responses offered. People don’t like complex grids reflecting “if...then” or “either/or” probabilities, so avoid them in your survey unless it is appropriate (see Visual Design for more information). If you are asking for short answers or “other” responses, then be very clear as to what you are asking. Ideally, for all surveys, three to five major questions—major questions don’t include demographic questions—can make for a useful survey with more information than you could possibly need.

- **Ask more than you think you’ll need (if possible)** – While you may just care initially whether people prefer A or B, adding demographic (i.e. gender, age, location) questions will reveal some interesting differences that you may have not thought of. For example, asking whether people prefer Coke or Pepsi might generate a simple percentage split (50/50). However, if each of your surveys has data such as college major, age, gender, vehicle owned, you can come up with some rather interesting relationships (i.e. 80% of the people surveyed who like Pepsi were women who drive Hondas). Not only will this give you more to write about, it will show you are aware of potential correlating variables. However, remember that you are testing your hypothesis, so make sure the questions you ask are relevant towards that goal.

Always keep in mind that your survey data will only be as good as the questions you are asking.

**Wording Questions and Options**

- **Keep it simple** – The questions you ask should be very simple and unambiguous. Avoid confusing sentence constructions and double negatives. Use a level of vocabulary that is appropriate for your audience. You don’t want to talk down to your participants, but the intention is that you want the participant to be able to answer the survey without having to ask you for clarification of a question. For example, imagine you wanted to ask a question about study habits on a survey. If you asked, “Is there not a day when you don’t study?” the participant may not understand directly what you are asking.
• **Keep it clear** – Even people from the same background will interpret words differently. In particular, adverbs showing possibility or potential (e.g. would, could, maybe) have different interpretations. Avoid using them in questions, and let the answer options provide the participant with a way to indicate their potential or possible agreement/disagreement with a question. For example, if you asked, “Do you usually wash your hands before cooking?” the “usually” could mean once every two meals or five times every ten meals. It would be better to ask a clear question, “How often do you wash your hands before cooking?” and then provide the potential or possibility in the answer options (i.e. “Always, often, sometimes, never”). These ordinal responses still are not very precise, but as a researcher, you can count the responses more reliably. The reason that the washing hands question might not work as an open-ended, write-in-the-number response is because most people don’t keep track of how many times they specifically wash their hands. The best you can hope for is an approximation.

• **Don’t give away your biases** – When wording your questions, you want to hide any research biases you have so that a participant can answer based on what he or she wants to tell you and not what they think you want to hear. Consider the previous hand washing question in the last point. If you were to ask the question as, “How often do you handle food with filthy, unsanitary hands?” you are guiding your audience to respond in a particular way. Remember the demand effects described earlier? A research participant will try and figure out what you want if you don’t word your question as neutrally as possible. Sometimes these biases are difficult to track down, so it helps to peer review or test your questionnaire with a small group to get feedback on questions that you may not notice are revealing some of your research biases. Consider a survey that asks 5 questions specifically about Apple’s iPod, but also has a question that asks who makes the best MP3 player--Apple, Creative, Microsoft, or SanDisk. The bias here is for Apple’s iPod even if you don’t recognize it at first.

• **Recognize freedom of response** – Freedom of response means that the participant is able to answer a question appropriately, truthfully, and to the best of his or her knowledge. Do not word a question in such a way that the participant cannot answer. For example, consider the following question: “When did you stop cheating on exams?” The participant has to either answer that he or she still cheats, or used to cheat regularly in the past. There is no freedom of response for a participant who has never cheated. Binary questions, questions in which there are only two options, are often susceptible to a lack of freedom of response. Think about questions of race and ethnicity, and look at the following question:

Q1. What is your race? (please select one)
   - Asian
   - Black
   - Latino
   - White

Because there are four options, you might not immediately see the problem. As you may notice on closer examination, responding to any race category is a binary decision,
either Y(1) or N(0), and by selecting one, according to the question, you are not allowed to answer another. In fact, this very issue came up in the United States census in 1997, and it was changed to allow people freedom of response—to select multiple categories. Furthermore, many social and political arguments have freedom of response problems. Consider questions of pro-life and pro-choice. If a question asks, “are you pro-life?” how would you answer this? The “no” response means that you are “anti-life” just as a “no” response to “pro-choice” is “anti-choice.”

Visual Design

- **Begin with instructions and IRB information** – Every survey should begin with instructions for completing the survey and IRB information that tells the participant how the information will be used. Your professor and IRB guidelines at your school will require certain information be included in the introduction to your survey, but usually it will consist of a sentence telling what the survey is for, that the information will be anonymous, and that participation is voluntary. For example, this might be a typical survey introduction:

  Please answer the questions of the following survey by circling your response. By completing this survey, you are granting consent for this information to be used in a class project I am doing on college eating habits. Your responses will be anonymous, and your participation is completely voluntary.

  As always, talk with your professor or your school’s IRB before writing the introduction to your survey.

- **Order your questions appropriately** – Always start with simple questions. These early questions should ask demographic information that people can easily answer (e.g. college major, gender, age) followed by more complex questions later. The final questions on your survey should be reserved for more personal information (e.g. salary).

- **Order your answer options appropriately** – Within each question, options to respond should be ordered appropriately. There are **serial effects** with regard to positive and negative response options and the number of response options. In the Western world, people tend to consider lower numbers on the left as a negative response, higher numbers on the right, as a positive response. As a general rule, however, the most important thing is to be consistent. Do not change your scale in the middle of a questionnaire unless you provide additional instructions for how to read the new scale.

- **Design a survey to be easy to use** – Make sure the font is easy to read, there is enough space to write in short answers or circle a response, and that questions are clearly separated.

Conducting the Survey
• **Be cordial, kind, and professional** – Dress like you want to be taken serious. This doesn’t mean a suit and tie, nor does it mean torn shorts and a tank-top that reads “Get me a beer!” When participants are filling out the survey, don’t hover or read over their shoulders; wait patiently until they are done. When a participant hands you a response, place it in a folder or underneath the stack so that you assure him or her the response will be kept private. Always respect the participant’s right to refuse to answer one or more questions and his or her right to not want to take the survey in the first place. Finally, be sure you aren’t a variable that affects the participant’s behavior (e.g. don’t yell, "Hey you, I hate my job, how about you?").

• **Randomize your sample** – For many surveys, you want to get as close to a random sample for your data as possible. Of course, this depends on your writing and research situation, but generally speaking you want to decide on a process of selecting a variety of people to complete the questionnaire. Asking every person on your dorm floor about their music likes and dislikes won’t give you a very valid picture of college student music preferences; however, if your study was looking at music preferences in just one dorm on campus, it would be one way to pick participants. Pay careful attention not to exclude any person on the basis of gender, age, race, or ethnicity. Refer to Box 8.1 for more about participant selection.

For some types of surveys, you might consider using an online survey tool. For example, SurveyMonkey (http://www.surveymonkey.com/) will allow you to set up a free survey (no more than ten questions) to be administered online, and it will tabulate your responses when you are ready. The problem with such websites is that the people tend to forget to fill out the survey or they may have trouble finding the URL. Additionally, you can have one person fill out the survey multiple times if they use a different computer each time (say, every computer in the library). The free version of SurveyMonkey has other disadvantages as well. SurveyMonkey is only good at asking questions that need percentages. SurveyMonkey automatically finds these percentages for you and gives you aggregate data but does not give you access to your raw data. This also makes looking at particular relationships in your data impossible, such as demographic data like age or gender. However, you can pay for an account on SurveyMonkey that will allow you to organize your data in more productive ways.

**After the Survey**

• **Tabulate, reflect, write it down** – Immediately after you have conducted your survey, you should tabulate the data. You should also write down environmental factors such as location of your survey, time of day, weather, and any other external details you think might be relevant. If in reading the surveys, you find a few that are not completely filled out, you can still use the data that is there, as long as you report it in your final report (e.g. “of the 27 subjects surveyed, 21 responded that they liked Facebook, 3 responded that they hated it, 2 were undecided, and 1 failed to respond”).

**Surveying Ethically**
A questionnaire might seem like it doesn’t produce stress or create harm to the person filling it out, but in fact, you can rarely know for sure. The best precautions you can take are to inform the person taking the survey beforehand of how the information is going to be used, that their answers are anonymous, and that they should not feel obligated to answer every question. As we discussed in the section on visual design of the survey, you should begin the questionnaire by informing your participant of these three major concerns.

If participants refuse to answer a question or even take your survey, then be cordial and respect their wishes. If you realize only after compiling your data that a question wasn’t answered, then you can leave that participant’s response out of your final data. Similarly, if you find in your analysis peculiar responses or extreme outliers on the questionnaire, you can leave those out as well. In both cases, you should discuss these problems in your Discussion section so that your audience is aware of these issues.

Discussion and Practice

1. Create a questionnaire using closed questions, which gives results that can be counted. Consider the following research question: What is the relationship between GPA and favorite type of music?
   a. Create a questionnaire that asks students their GPA and their favorite type of music. Make sure to include clear categories for the different types of music, including a few sample bands as examples on your questionnaire to make the categories of music as clear as possible for your participants.
   b. What other relevant questions might help you create this survey? Type of high school they went to? Whether they are musicians or not? Think of some different questions that may help you get more out of your survey than a simple 2 or 3-question survey. You might even think about some Likert-type questions
   c. Peer review the survey with your class. Consider these options:
      • Is it simple and easy to follow?
      • Are any of the questions biased or assume knowledge of the participants?
      • Do the questions allow freedom of response?
      Is the visual design professional? Are instructions and IRB information provided at the top?
   d. Once you get feedback, work on revising your questionnaire to be administered to students as per your IRB requirements on campus.

2. Every ten years, the United States government administers a census of the entire population. In addition, every year a smaller sample of citizens answers additional questions, currently called the American Community Survey. The rhetorical purpose is to provide the government information about the ethnic, gender, and age of the population in given areas for purposes of voting and funding of local and government programs. Consider the following two questions and design from the American Community Survey in Figure 8.1 below. These rhetorical purpose of these specific questions are as follows:
• Employment – Information about industry, occupation, and class of worker is important for creating jobs as companies use these data to decide where to locate new plants, stores, or offices. Agencies use these data to plan job-training programs for seniors. Federal agencies use these data in litigation where employment discrimination is alleged.

• Social Services – Data are used to estimate the demand for staff in health care occupations and their geographic distribution based on these data. (U.S. Department of Commerce, 2010, p. 34)

1) Based on this purpose, what are the benefits and drawbacks of these two specific questions?

2) Would you change anything in the design or wording of these two questions?

How Do You Conduct a Systematic Observation?

Systematic observation is a type of observational research in which researchers are following a particular protocol or system for measuring a phenomenon. Although researchers doing qualitative research (see Chapter 7) are often doing observational study, their motivation is in collecting data with an open mind, to be analyzed later. Qualitative research is often reactive, in that the researcher is waiting for something to happen before categorizing it. Systematic quantitative observation, on the other hand, requires a list of pre-determined items that are to be found before the research site is observed. Although systematic observation can be conducted in qualitative studies, the nature of quantitative research makes pre-established criteria for observing behavior more appropriate. These criteria are often written as a rubric, or a pre-determined list or categories of behaviors. What follows are further details for developing a systematic observation protocol.

Conducting a pilot study

In conducting a systematic observation, you will probably want to conduct a pilot study first. A pilot study is a short or small study that you can conduct before a larger study to give you a sense of what to look for in that larger study. The way you do research in the larger study doesn’t have to be the same as the pilot study. The pilot study is mainly for your own purposes—the data from such pilot studies is not meant to be seen by an outside audience. If
using a systematic observation method, you will want to determine your criteria or list of phenomena before you do your actual study. If you don’t have a good sense of what you are categorizing or no previous study has been done on the topic, then the best approach is to do a pilot study using a qualitative approach (see Chapter 7). You would list as many items or instances of a phenomena in a small scale study (maybe 10% of what you intend to eventually study), then categorize them for your rubric. Pilot studies should be described in your method section to indicate how you came up with your categories, but you wouldn’t necessarily list the data from these small studies. Mentioning your pilot study only lets your audience know your reasons for focusing on your final criteria or categories.

Creating a rubric
As we have indicated, a rubric is a pre-determined list of behaviors, phenomena, or items. As a researcher, you will observe behaviors and indicate on the rubric whether a particular behavior is observed. See figures 8.2 and 8.3 for an example of two different rubrics looking at how people use library space. The rubric in figure 8.2 is better at capturing aggregate data, and the rubric in figure 8.3 is better at capturing raw data. You probably have noticed from these sample rubrics that one of the guiding principles is efficiency. If you are observing something, you want to spend the majority of time actually observing and not flipping through pages, reading, or filling out a rubric. Leave yourself plenty of room to indicate a number; in some instances, having predetermined numbers makes it easy to complete. Also, leave space to write in issues that your pilot study did not find. Having an “other” category with a line to write in information that you observe is useful. Although a systematic observation rubric is designed around quantitative research, not everything that appears on the rubric has to be a number. Letters and codes can later be used as nominal data and computed as if they were quantitative data. For example, in the case of a rubric, you might list a person’s sex as M, F, or Cannot be Determined (CBD) as in figure 8.3.

Doing the observation
While doing observations, you should be aware of two important concerns. The first is what is called the Hawthorne effect. The Hawthorne effect says that people will act differently if they know they are being watched. In other words, if you are standing over somebody with a clipboard, marking down some mysterious code every time they do something, they will act differently than if you weren’t there. The second related issue is one of ethical research behavior. Hiding in the bushes outside somebody’s dorm while observing is more apt to get you hauled off to jail than to provide good observational data. The rule, then, is to hide in plain sight. Pretend you are doing something else while doing your observation. This might involve having your rubric in a notebook or on your laptop as you observe. It might involve walking around, counting in your head two or three observations, then stopping to write them down when nobody is looking.

Of course, we have focused much of our attention to the systematic observation of human behavior. The major rule for all observations is that you want to focus on the phenomena and minimize distractions. Whether you are in a lab or observing a natural setting, you want to turn off your cellphone and iPod. You want to try and forget your personal stresses and just try and
focus on the observation at hand. For more information on how to conduct observational research, refer to the chapter on qualitative research.

Observing Ethically
Because you often do not interact with others while observing, it is not usually necessary to inform participants of your observation or get their consent. The only exception to this is if you intend to record your observations using video or audio; then, you do need to obtain your research participants’ consent. You should never secretly record an observation using video or audio. However, even if you are not recording, still check with your school’s IRB before you conduct any observational research, especially if you intend to fully interact with the people you are observing. Remember, you want to hide in plain sight when doing observations.

Discussion and Practice
1. Design and conduct a systematic observation consisting of counting occurrences; this differs from qualitative research because it simply consists of counting without description. Imagine you wanted to research the types of drinks certain people order at a local coffee shop.
   a. Begin by thinking about your assumptions of who orders what type of drink at a coffee shop. Do women order smaller drinks than men? Do older people order more complicated drinks than younger people? Briefly create a rubric similar to the library ones in figures 1 or 2. Think broadly about the many options available at a coffee shop. How many people order plain coffee? How many people order cappuccinos? How many people order lattes? How many people order frozen mochas? How many people order espresso? How many people order other types of drinks such as soda or juice? You can also create other categories for your drinks. What time of day does any of this occur?
   b. Visit the most popular coffee shop near campus and count how many people order certain types of drinks based on what you have determined is important on your rubric. Remember, hide in plain sight. Don’t hover around the counter and don’t stand there with a clipboard.
   c. Once you have your data, write a brief paragraph about this data for two audiences: 1) the coffee shop owners or marketers (depending on if it is a locally owned establishment or a large chain), 2) researchers or professors who are interested in studying the cultural phenomena of coffee shop ordering.
Library Observation Rubric

Date: ____________   Time: ____________

Non-Computer Use

- __________ Reading/studying
- __________ Socializing
- __________ Writing
- __________ Other

_______________________________________________________________________

_______________________________________________________________________

Computer Use

<table>
<thead>
<tr>
<th>Laptop Computer</th>
<th>Activity</th>
<th>Library Computer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Email</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social Networking (Facebook, Twitter)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Watching Videos</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reading webpage/articles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Playing games</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Writing/word processing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Using Library catalog/website</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Instant Messaging</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

Figure 8.2 Library observation rubric for systematic observation, aggregate data
Library Observation Rubric

Date: ____________   Time: ____________

S: M / F / CBD   NC: R   S   W   C: E   SN   V   R   G   W   L   IM   O:
_________________________________
S: M / F / CBD   NC: R   S   W   C: E   SN   V   R   G   W   L   IM   O:
_________________________________
S: M / F / CBD   NC: R   S   W   C: E   SN   V   R   G   W   L   IM   O:
_________________________________
S: M / F / CBD   NC: R   S   W   C: E   SN   V   R   G   W   L   IM   O:
_________________________________
S: M / F / CBD   NC: R   S   W   C: E   SN   V   R   G   W   L   IM   O:
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S: M / F / CBD   NC: R   S   W   C: E   SN   V   R   G   W   L   IM   O:
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S: M / F / CBD   NC: R   S   W   C: E   SN   V   R   G   W   L   IM   O:
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S: M / F / CBD   NC: R   S   W   C: E   SN   V   R   G   W   L   IM   O:
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S: M / F / CBD   NC: R   S   W   C: E   SN   V   R   G   W   L   IM   O:
_________________________________
S: M / F / CBD   NC: R   S   W   C: E   SN   V   R   G   W   L   IM   O:
_________________________________
S: M / F / CBD   NC: R   S   W   C: E   SN   V   R   G   W   L   IM   O:
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S: M / F / CBD   NC: R   S   W   C: E   SN   V   R   G   W   L   IM   O:
_________________________________
S: M / F / CBD   NC: R   S   W   C: E   SN   V   R   G   W   L   IM   O:
_________________________________
S: M / F / CBD   NC: R   S   W   C: E   SN   V   R   G   W   L   IM   O:
_________________________________

Codebook

<table>
<thead>
<tr>
<th>S</th>
<th>M</th>
<th>F</th>
<th>CBD</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>=</td>
<td>male, F = female, CDB = cannot be determined</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NC</th>
<th>Non-computer use</th>
<th>R = reading, S = socializing, W = writing</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Computer use</td>
<td>E = email, SN = social networking, V = watching videos, R = Reading, G = gaming, W = writing, L = Library catalog/database, IM = instant messaging.</td>
</tr>
<tr>
<td>O</td>
<td>Other [open-ended]</td>
<td></td>
</tr>
</tbody>
</table>

Figure 8.3. Library observation rubric for collecting raw data through systematic observation, with codebook.
How Do You Conduct a Test?

Testing is a method for studying how introducing one variable influences another variable. It is a method common to quasi-experimental, experimental and inferential studies.

Some testing protocols involve the use of other methods as well, such as a questionnaire given before and then after an event, or systematic observation of both a control group and a test group. What separates testing as a method from the other two is that it is a protocol for studying difference. For our purposes, we will focus on doing testing of human behaviors and not bacteria, sequoias, or heavy metals. Although the concerns are the same for all testing protocols, we want this textbook to be practical for you and your writing class, and human behavior is plentiful and easy to come by.

Most testing methods actually follow closely the composing strategies we will describe later, specifically beginning with a research question and a hypothesis. We will cover some further specific concerns of testing protocols here.

**Determining your participants/sample**

Because testing is used to study difference, your protocol will have to take into consideration the selection of two groups or conditions. A before/after protocol has participants measured before the introduction of a variable introduced by the researcher, followed by another measurement after. In a control/treatment protocol, one participant group (the control) is measured while another group (the treatment) is exposed to a variable introduced by the researcher and then measured. The reason that determining your participants is an important first step of the protocol is because you have a number of potentially confounding variables here. In the before/after group, you cannot be sure that the participants have ever been exposed to the introduced variable. In the control/test groups, you cannot be sure that the groups are comparable. To minimize confounding variables, you have to be systematic in making your groups as equal as possible. Because you are studying difference, pre-research differences are far more important to understand. For these reasons, in protocol design, you should strive for random sampling and descriptive data.

Random sampling means that every attempt has been made to select participants who are representative of a population. Refer to Box 8.1 for more about sampling.

Descriptive data, often gained from an additional descriptive measure, allows you to collect information that may or may not influence your test results. This usually involves a questionnaire before or after a test protocol to learn about your participants. For example, if you were doing a test to see whether people’s attitudes and beliefs changed after reading or watching a particular news story, you might need to ask them first whether they have heard of the news story to begin with (you could ask it after the test as well, or even as part of the test).

**Designing your intervention**
Testing involves looking for difference after you, the researcher, have intervened, so the next step is in designing this intervention. An intervention can be almost anything. You might measure people’s attitudes and beliefs about some phenomenon before and after you inform them about that phenomenon. You might drop your books in front of two different groups of people to see if either group helps you. There are two types of intervention test situations. The first intervention test is control/test. In this case, you would intervene with one group of participants but not with the other group, which would be the control group. The second intervention test is the before/after test. In a before/after test, you would test the participant group before the intervention and then again after the intervention. For instance, the intervention could be the use of certain lecture techniques to present information on global warming. In before/after conditions as well as control/test conditions, you want to make sure the questionnaire you use to ask questions about people’s attitudes toward global warming is the same for both groups. For example, in a before/after condition, participants should be given the same questionnaire testing their attitudes toward global warming before and after the lecture. In control/test conditions, the control group who did not hear the lecture on global warming should be given the same questionnaire as the group who did.

You need to carefully plan how and when you will carry out your intervention test. When designing other types of interventions, you want to make sure they are the same and the external conditions are as similar as possible. For example, if you wanted to compare people’s attitudes and beliefs about news stories, one on Fox News, another on CNN, and another on MSNBC, you would have to make sure that they were all presented to participants on the same day in case further information about the story was revealed later.

**Designing procedures for data collection and analysis**

The last step of your research protocol is designing the procedure for data collection and analysis. Data collection can come in the form of either a written questionnaire or some other form that a participant fills out, or as a systematic observation that you are completing. We have already discussed in detail questionnaire and systematic observation design, so refer to either for specific help. In either case, because you are looking at quantitative measures of difference, your data analysis should focus on these differences and what will constitute a significant difference. In statistics, there are three common tests for determining whether a significant difference between two measurements exists, depending on the number and type of variables tested: Student’s t-test, ANOVA, and chi-square. If you are only doing a descriptive study, such measures aren’t really necessary because a difference of 1 or 2 on a Likert scale is enough to make an argument for some writing situations. That being said, your audience will be more likely to find more precise measurements more credible, and statistical analysis of difference is a far more precise measure than just saying that 1 is smaller than 2. As such, these statistical tests of difference should always be used when doing inferential data analysis and if the writing situation demands it. A statistics textbook or the Internet can provide you with more information on these measures.

**Testing Ethically**
Another important concern in test design is being aware of research ethics. You should respect participants’ rights and personal well-being in any research endeavor, but especially in testing protocols. You never want to put them in danger, either emotionally or physically.

Your first concern is that you are not creating a situation that might lead to harm to the participants’ social, mental or physical well-being. That means you should not place people in awkward social situations that would have them conduct themselves in ways that they normally wouldn’t. You should also not ask them to do anything that they are uncomfortable with.

Most testing situations require additional IRB approval, so you should research any requirements before designing or conducting such research. In any case, you should always inform your participants about how the data you collect will be used, that their identities will be kept confidential, and that they can refuse to participate at any time during the study.

<table>
<thead>
<tr>
<th>Method</th>
<th>Descriptive</th>
<th>Experimental</th>
<th>Inferential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questionnaire</td>
<td>- Census</td>
<td>- Data collection to normalize or randomize</td>
<td>- Correlation/Causation between attitudes and</td>
</tr>
<tr>
<td></td>
<td>- Attitudes and Beliefs about a topic</td>
<td>participant selection</td>
<td>beliefs and self-reported behaviors</td>
</tr>
<tr>
<td></td>
<td>- Self-reported behaviors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systematic Observation</td>
<td>- Observed behaviors</td>
<td>- Observed behaviors with researcher intervention</td>
<td>- Correlation/Causation between self-reported and</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>actual observed behaviors</td>
</tr>
<tr>
<td>Testing</td>
<td>- One-time Exams</td>
<td>- Pre-test/post-test comparisons</td>
<td>- Meta-analyses</td>
</tr>
<tr>
<td></td>
<td>- Personality, Intelligence tests</td>
<td>- Control/Test comparisons</td>
<td>- Correlation/Causation between one variable and</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>another</td>
</tr>
</tbody>
</table>

Table 10.1. Common uses of designs and methods

**Discussion and Practice**

1. In a semester or quarter long class in school, you often don’t have the resources or time to conduct certain types of study designs and methods. Consider the following research questions and answer the following:
   a. What quantitative design and method might you be able to do as a student in a couple week’s time?
   b. What quantitative design and method might a professor or business want to use given that they have more time and resources?
      - Do college students have greater self-esteem than in previous generations?
      - Are there demographic (age, gender, education, etc.) trends to who buys concessions at movie theaters?
      - What sports are most popular among college students?
      - Do clothing or style of dress affect whether you are hired by a company or not?
• How often do students text, IM, or Facebook during class?
• Can small businesses provide health care for their employees?
• What is the most efficient menu design for a particular computer application?
• Do students learn more in small classes or large classes?
• What type of fertilizers work best for growing indoor house plants?

2. Designs and methods depend a great deal on the rhetorical and research situation.
For collecting quantitative data, what are the major advantages and disadvantages for each of these methods?
   a. Online questionnaire or survey
   b. In-person questionnaire or survey
   c. Systematic observation
   d. Testing

What Do You Do with Quantitative Data Once You Collect it?

As we have indicated previously, raw data provides the most options for analysis, but you cannot just present plain, raw data for an audience because they would be overwhelmed. Instead, you will have to manipulate the numbers in some way to make an argument. The end step before writing out your results in quantitative research is the use of numbers in your data as evidence in an argument. How you manipulate those numbers is very important in quantitative research. You probably recognize this if you have taken a statistics course or have studied statistics in your math courses. Ultimately, your study design and method will place some limits on what is possible with your raw data, but generally speaking, you don't have to be a math major or have a great deal of experience with statistics to use numbers to make an argument. For our purposes, we are going to use some tools to help us compute basic descriptive and inferential statistics for your research so that you don't have to worry too much about the formulae.

What Are Some Tools You Can Use?

Although it can be helpful to learn the written formulae for computing statistics because it gives you a better understanding of what these formulae are doing, most scholars use software to do statistical analysis because of its ease of use and precision. The most popular piece of software is SPSS. If you are a student, you can get SPSS for under $100, but the tool usually runs over $600. A much easier solution is to use Microsoft Excel or the freely available Open Office Calc. All formulae here are the same in both Excel and Calc, so use what tool you have available to you. Everything inside the brackets is typed into an empty cell in the program, with the range selected with the mouse or cursor keys.

What Are Descriptive Statistics?

As the name implies, descriptive statistics describe what was found in this one instance on this one day. People are generally consistent, but without more advanced statistical measures, in
any descriptive study, you can only refer to the numbers collected in the past. Questionnaires and surveys are useful descriptive methods since they provide a reasonable collection of what those surveyed were asked about. However, such an argument often relies on aggregates of those surveys and not each individual survey. In descriptive studies, the most common manipulation of raw data into aggregates is through what are called measures of central tendency. They provide averages and variations from the average of a given collection of data.

**How Do You Compute Measures of Central Tendency?**

Measures of central tendency give you a sense of where the middle of a set of data is. As we described earlier, there are different definitions of middle.

- **Mean** (M) is the arithmetic average of items or values \[ =\text{AVERAGE(range)} \]
- **Mode** is the most frequently occurring item or value \[ =\text{MODE(range)} \]
- **Median** is the item or value of which 50% are greater and 50% are less \[ =\text{MEDIAN(range)} \]

Which statistical measure you pick is based a great deal on your research question and what you are trying to discover for your audience and purpose.

**Standard Deviation** (SD) is a measure of the spread of items or values in a series. Understanding the variation can help you see how close a particular item or value is to other numbers \[ =\text{STDEV(range)} \]

The combination of mean and standard deviation tell you a lot about the numbers, but sometimes computing the mode and median is helpful too. Let’s look at two datasets, one for number of hours a person played games during the week, and the other for how many hours that person worked during the week:

1. **Number of hours participant played games this week:**
   - 8, 0, 0, 3, 2, 10, 0
   - Mean = 3.29, Mode = 0, Median = 2, SD = 4.11
2. **Number of hours participant worked this week:**
   - 8, 8, 8, 8, 6, 6, 5
   - Mean = 7, Mode = 8, Median = 8, SD = 1.29

As you can see, the variation in the first set \( SD = 4.11 \) helps us read the mean \( M = 3.29 \) differently than we would otherwise. It explains that although, on average, the participant played games a little over 3 hours a day, this fluctuated a great deal (over 4 hours). In the second dataset, the average of 7 hours a day is less varied (only 1.29 hours), so that we might imagine that the 7 hours indicated was a more common occurrence each day of the week.

Ratio and interval data and certain ordinal evidence can be computed using measures of central tendency. Things like GPA or time can be used as a measure, but also Likert scale measures are commonly computed by their M and SD. If you have nominal data or even qualitative data, you can also count how many of each instance by using a feature called **COUNTIF** \[ =\text{COUNTIF(range,“value”)} \]. Say you have 100 participants, and you have their gender listed. You want to count how many males and how many females. In an empty cell, you would write
=COUNTIF(A1:A100, “male”). This will count every cell looking for the word “male” and then give you a total. COUNTIF also can find one or more words in a sentence.

**What Are Inferential Statistics and How Do You Compute Them?**

Inferential statistics “infer” (i.e. conclude) relationships between a sample and a population, or “infer” past, present or future results of a sample/population based on the data. Rarely is Excel or Calc used in more advanced researchers to perform inferential statistics, although this software can perform those calculations. In academic and professional settings, SPSS/PASW is more commonly used.

**How Do You Write about Statistics in Your Report?**

Most academic writing styles use similar codes for referring to statistics. Although you should consult APA or MLA style manuals when writing a document for publication, the more common abbreviations follow:

- Population = \( N \)
- Sub-population = \( n \)
- Standard Deviation = \( SD \)
- Mean = \( M \)

Statistics are often written in parentheses after an item that the statistic refers to. The abbreviation should be italicized, and symbols and numbers should be separated by a space, but not italicized. In the first example from a student paper, the \( M \) here is referring to the mean of a Likert scale response to a question.

In a survey of college students, participants \((N = 100)\) responded that money was more important \((M = 4.2, \ SD = .9)\) than experience \((M = 3.5, \ SD = .76)\) in selecting a summer job.

In this second example, the data is from an article about computer game addiction in the *Journal of Computer-Mediated Communication*:

- Female players play slightly more hours per week than male players (Females \( M = 29.31 \) hours per week; Males \( M = 25.03 \))

**Discussion and Practice**

Consider a survey of 20 students that collected the following information—gender, GPA, and hours per week engaged in the following activities: reading for fun, reading for school, writing for fun, writing for school. Consult table 8.2 for the raw data.
1. Create a quantitative research question around this data.
2. Compute measures of central tendency, including standard deviation. Include any other statistical measures needed to answer your research question.
3. What audiences might be interested in this data?
   a. List at least five.
   b. Select two of those audiences to write a short paragraph about one or two findings in a style appropriate for that audience. For example, if writing for researchers, you will have to use the codes for M and SD, but if writing for a newspaper, you will need to explain the data differently. There are many potential arguments here. As a hint, consider separating the data by gender or GPA, or possibly looking at trends in GPA and reading for fun.

### How Do You Write about Quantitative Research?

Conducting research is quite fun and interesting, but the point of doing research is to share it with an audience. We have discussed a number of different research methods and ways of collecting data, but ultimately, you need to focus your methods and design toward a particular
rhetorical research goal. What follows are the steps for completing and presenting a written quantitative research project.

How Do You Develop a Quantitative Research Question?

Simply put, for research to be appropriate for quantitative study, it has to have a research question that is quantifiable or that can be answered through an analysis of numbers. Ultimately, what will decide what research design you use is based on your research question, but some designs are better at asking some questions than others. For a descriptive study, you would want to ask a research question about how many, how often, if X exists (this is a binary question), or what is X. For experimental studies, you would ask a question such as, “does the introduction of X affect Y?” For inferential studies, you want to ask questions about correlation or causation. “Does X lead to Y, are X and Y related, and what influences X to exist?” are all inferential questions.

When formulating quantitative research questions, you might also consider how multiple research questions might be used to respond to the same phenomena. Whereas in qualitative and text-based research, you might use a number of sources and types of evidence to respond to a research question, your overall research question is designed so that these multiple sources can inform it. However, in quantitative research, questions that are looking for prediction or relationship require inferential methods whereas questions that ask whether a phenomenon exists are descriptive. Therefore, you might have to create two or more research questions. For example, answering a descriptive research question requires different methods than answering an experimental research question. Imagine you wanted to look at what influenced college students to buy a cell phone (what influences X to buy Y). This is an inferential research question. However, if you don’t have the data on college cell phone buying habits to begin with, you have to answer that question first. Thus, you would have two different research questions: what are cell phone buying habits for college students and what influences their decision to buy them? Let’s say you wanted to know if students’ employment had an influence on their GPA. You would have to craft both descriptive and inferential research questions: what are the employment habits of students? And, do employment habits affect student GPAs? You will often see in larger studies multiple research questions that follow this line of reasoning.

The second thing to consider in coming up with a research question or questions is that you want a question that will provide new insights or a new argument. You may have heard about studies that look at really obvious things, for example, that mothers of twins get less sleep than mothers who have only one child, or that businesses present merchandise in appealing ways to encourage sales. In some ways, it is nice to get a definitive answer to some of these questions, but generally speaking, given that research takes a lot of time, and in many cases, a lot of money, you want to ask a question that is less obvious. For example, you might be interested in surveying college students about exams. A research question that wouldn’t be interesting is asking whether students like exams or not. You could probably guess the answer to that. What would be a better research question about exams that would help both students and professors
better understand student attitudes toward exams? Some better questions might be answered through a descriptive design that asked about preferences for when or how often exams are given or an inferential design that asked about study habits and exams. This doesn’t mean you shouldn’t consider questions or observations that address simpler issues; it just means that your research question should not be solely focused on a commonsense issue. Thinking back to the exam research question we just talked about, you might have questions about liking/disliking exams on a questionnaire or survey, but they wouldn’t be the only question.

Whether you are coming up with a descriptive, experimental, or inferential research question, keep in mind that you want a precise question that can be answered given the method or design you want to use. Although this may sound obvious, it can be tricky in practice. You might be interested in studying political attitudes and beliefs of college student athletes compared to non-athletes, but this is too general a question to get at quantitatively. If you didn’t want to do a qualitative study on the issue, you would have to assemble a number of smaller research questions to get at this larger issue. For example, you would need to ask what attitudes college student athletes had towards politics, but also what their beliefs were. And then you would need to do the same for the non-athletes. Finally, you could ask the question as to whether there is any comparison. Alternatively, you want to avoid too specific of a research question that could be answered with little effort.

Research questions are a type of invention in quantitative studies and they are sometimes not included in the final write-up of the report or argument because the hypothesis, a requirement in most quantitative research, both reflects the research question and suggests a possible answer to that question. However, generally speaking, including your research questions won’t hurt.

**How Do You Develop the Hypothesis?**

A hypothesis is possible in quantitative research because the precision of numbers, even nominal numbers, allows for a definitive answer to a research question. A hypothesis, simply put, is the best guess answer to the research question given what previous experience, research, or trends have shown in the past. A hypothesis is usually stated in one sentence. If you have multiple research questions, multiple hypotheses are often seen in a written report. The hypothesis is written as a declarative statement: “College students at Pacific State University are more likely to work off campus than on-campus.” Notice that the hypothesis is not a question. You wouldn’t say, “Do more people work on campus or off of campus?” That is a poor hypothesis—although it is a fine title for the overall report, and it may even be an interesting research question. In your hypothesis, you aren’t predicting exact results—you wouldn’t say, “I hypothesized that 57.0265 percent of people feel part-time work contributes very little to helping a person get a job after college.” Instead of “57.0265 percent of people,” you would just say “more people.”

Your hypothesis is decided before you begin conducting your research. You never want to modify your hypothesis to fit your results after you are done with your study. The significance
of your research is not a result of a correct hypothesis. If you’re wrong, you’re wrong. The purpose of any research is to advance knowledge. By making a bad guess, you eliminate the need for another researcher to come along after you and test the same hypothesis or make the same guess (although they may test the same topic with another hypothesis).

Some descriptive designs don’t require a hypothesis. For example, much of the quantitative research available at the Bureau of Labor Statistics, the National Center for Educational Statistics, and the United States Census Bureau are not driven by a hypothesis—these places are simply collecting aggregate data. However, if you are doing an experimental or inferential study design, not only will you need a hypothesis, but often you will need to develop a null hypothesis as well. Null means “without value,” so a null hypothesis is often the negation of a hypothesis. In an experimental study, a hypothesis might be that a particular drug has an effect on the growth of a tumor—the null hypothesis would be that the drug has no effect on the growth of a tumor. Because the level of significance is decided by the researcher, a null hypothesis is really what is being tested—that a level of significance isn’t met means that the null hypothesis is confirmed. In descriptive studies, the need for a null hypothesis is not important because you aren’t testing anything against some level of significance; it is only when the treatment or manipulation of a variable is involved do we see the need to have a null hypothesis.

**Discussion and Practice**

1) Think of a hobby or interest you have.
   a. What are some of the unanswered questions you have about that hobby or interest? List a few. Select one that might be studied through quantitative research. Construct a quantitative research question about it. Remember, a quantitative research question asks how many/often/different or whether a phenomenon exists or not. Also remember that this should be a new question and not one that can be easily answered.
   b. Based on your experience, what is your best guess at the answer—in other words, what do you hypothesize?
   c. Briefly state what your design (e.g. descriptive, experimental, inferential) and method (e.g. questionnaire, systematic observation, test) would be.
   d. After constructing your research question, switch research questions with a classmate and peer review it.

Peer Review. In giving your classmate advice on how to better revise his or her research question, answer the following questions:
   - Is the research question something that can be discovered through a quantitative research using a questionnaire, systematic observation, or test?
   - Is the research question as narrow and precise as possible?
   - Did your classmate pick the best quantitative research methods to answer the research question? Does the research question accurately reflect the research methods being used?
• Is the research question doable in the time-frame of the assignment?
• Is the research question asking for new knowledge? In other words, will it provide some new insight about the topic?
• Does the hypothesis follow from the research question?
• Are there any problems with the research question? Is it biased? Is it too obvious?

   d. After answering these questions, if you think that any part of the research question needs to be changed, make sure to offer specific suggestions for revision along with your critique.
   e. Switch research questions with your partner and go over your feedback with each other.
   f. Revise your research question after hearing your partner’s feedback.

Chapter Project: Step 1
As we have shown in chapter 5 and in this section of chapter 8, coming up with a research question can be difficult. Ideally, you want a research question that is interesting. Using the previous steps on researching a hobby or interest, or using guidelines for a research project your professor would like you to conduct, come up with a research question that you would like to develop into a final study and report.

Organizing Your Research Report: What is IMRAD, and Why Is It Useful?
Once you have devised a research question and hypothesis, you will conduct your quantitative research project based on one of the designs and methods presented earlier in this chapter. Because a great deal of scientific research uses quantitative designs and methods, one of the more common approaches to organizing a report of quantitative research is called IMRAD, which stands for Introduction, Methods, Results and Discussion. IMRAD organization is expected in practically all scientific writing situations today and is a very easy way to organize any type of systematic research, including qualitative, quantitative, and mixed methods research. You will see IMRAD organization in chemistry, biology, psychology, and education, and this standardized use helps researchers easily find the relevant details in a research study.

Because such research doesn’t have a narrative structure (as in a novel or story), the IMRAD format facilitates reading because it allows readers to find parts of the study that most interest them. The sections also separate the steps of the research process and allow the writer to provide depth to the various steps. For these reasons, when writing in IMRAD format, you should always include the section headings so your readers can easily find the information they are interested in.

A final note about IMRAD composing is that you shouldn’t feel limited in writing each section in the order that they finally appear in. In fact, you might begin by writing your method section before you even conduct your study to help you think through issues that might get brought up during the study. Even though you will most likely be writing the method section like all the
other sections in the past tense, writing a draft of the introduction or method before you conduct your study can help you conduct and write a better study.

What Goes in each IMRAD Section?

Abstract
Even though it will appear first, you should write your abstract last. The abstract introduces the topic and the hypothesis in 1-2 sentences, followed by a 1 sentence method and 1-2 sentences about the results. You may also talk about your discussion section, but sometimes researchers will often use a phrase such as, “implications of these results and future research are discussed” in the abstract. Abstracts are sometimes optional, and they aren’t an integral part of the research and writing process, hence, why they often aren’t in the IMRAD acronym.

Discussion and Practice
1. Who is your primary audience for an IMRAD research report? Why?
2. How does the IMRAD structure help the primary audience better read about research?
3. How does the abstract help the primary audience read scientific research?
4. Abstracts are basically summaries that devote space to the most important elements of a study. Many years ago, The Kansas City Chemist published a collection of abstracts as if written about common nursery rhymes. Can you figure out what nursery rhyme this one is?
   A research team proceeded toward the apex of a natural geologic protuberance, the purpose of their expedition being the procurement of a sample of fluid hydride of oxygen in a large vessel, the exact size of which was unspecified. One member of the team precipitantly descended, sustaining severe fractural damage to the upper cranial portion of his anatomical structure: Subsequently the second member of the team performed a self-rotational translation oriented in the direction taken by the first team member.
5. Using the organization presented and the nursery rhyme abstract as a model, write an abstract for a movie that you have seen.

Introduction
Your introduction begins by briefly explaining the importance of the topic, followed by previous research or experience that leads to a clear explanation as to why you came up with your hypothesis. In writing your introduction, you will have to provide some details as to what made you come up with your hypothesis. The purpose is to lead your reader to your hypothesis.

In most scientific reports, the introduction would include an extensive review of the literature. Simply put, a literature review is an examination of a number of peer-reviewed research articles in sources similar to the one you are writing for to show what other researchers have done on your topic and what still needs to be done.
All research builds upon previous scholarship. So, while the literature review is a summary of previous research on your topic, it is also an argument for how your research question is answering something new that has not been studied before. In other words, the literature review summarizes previous research in order to show how your own research is new and needs to be conducted. Explaining how your own research is new is called creating a research gap. You point out something that previous research has not done, and suggest how your new research will fill this gap and add to our understanding of the phenomenon being studied.

Usually, the beginning of the literature review summarizes the previous research related to your research question and explains how it relates to your study. However, remember that in summarizing this previous research you are also building a case for why your own research is new, different, and relevant. The statement of the research gap often comes at the end of the introduction. Here you want to explain in a clear and concise statement what your research contributes to the ongoing investigation of the topic.

Here are some strategies to help you develop your research gap and differentiate your study from the previous research you have found:

• In what ways might your research extend previous research or take it to the next step? For instance, you could design a quantitative study that is similar to a previous quantitative study but also does something more and goes further in certain ways.
• Are there any problems with how the previous research was conducted that you could do better in your own study?
• Was there interesting research that was conducted on one particular population that has not been conducted on another population before?

In some situations, a literature review is less extensive when few studies have been published on your topic. Also, in lab reports, there is no need to write out an extensive literature review for a systematic study that has been conducted the same way hundreds of times in the past. In some situations, a lab report might need to be based on a previous lab report, and such information should be shared in the introduction.

Sometimes Introductions have section headings such as Literature Review or Background—it will depend on your writing situation how you label these. If you are unsure on what headings to use for a paper in a class, ask your professor.

**Discussion and Practice**

1. Think of how an introduction works rhetorically. What role is it serving for its audience, and how does a good introduction best accomplish this in quantitative research?

2. Introductions can rely on personal experience in developing a hypothesis and background for the topic. Because experienced researchers have written and read a lot about their interests and topics, they can more readily draw from published sources, but in many research endeavors, not a lot has been written about a topic. Look at the following list of topics and decide whether personal experience or
published sources would be preferable in developing your introduction and hypothesis. In some cases, you might want both.

- Music preferences on your campus
- Eating habits of college students in general
- Test anxiety in high school and college students
- Ant pheromone differences
- Temperature effects on carbon nanofibers
- Harmonic and melodic preferences in popular music
- Student purchasing trends on your campus

Chapter Project: Step 2
Like all good research, quantitative research benefits from having a good plan. Most of the research plan can actually become part of an introduction. Return to your research question that you developer earlier in this chapter. Begin to further develop it by doing the following:

The easy introduction
1. Using the library or the Internet, look for one or more sources that are about your topic in general.
2. Find a source that might support your hypothesis or is about your specific research question. Note, you may have to triangulate the sources (see Chapter 3). As you have seen, for some research question you might have to use personal experience a way to discuss your topic or hypothesis. If appropriate, think of how personal experience can help you in your topic or hypothesis.
3. Your draft might begin by writing about the topic, citing the general source you found previously, followed by another section that leads to your source about your hypothesis, and ending with your hypothesis.

The complex introduction
In larger and more complex projects with a lot of sources, it might benefit to begin with an annotated bibliography first, then move to crafting your introduction:

Annotated Bibliography
1. Find five academic, peer reviewed sources that are related in some way to your research (for a refresher on what a peer reviewed source is refer to Chapter 3).
2. Include the end-text reference or works cited citation of each source in either APA, MLA, or Chicago for each of your five sources. Ask your professor for guidance. (Also, refer to Chapter 10 for more information on how to cite end-text citations.)
3. Underneath each citation, summarize the article. Make sure to be careful in your summary and either quote or use your own words while paraphrasing.
4. Make sure to clearly explain how each of your five sources relates to your research question

**Literature Review.**
Using the five sources you found for your annotated bibliography, write a one-two page literature review. In your literature review, remember that you are writing an argument for how your research is new—defining your research gap. So, in your literature review, you will clearly explain how your research is adding something new that the previous research did not mention or building upon the previous research.

**Methods**
The purpose of the method section is to describe every step you performed to gather your data. Everything from coming up with your experiment or questionnaire to performing your experiment to tabulating your data needs to be recorded so that future researchers, if they follow your exact steps, should find similar results. Everything that appears in your method section should be described explicitly. When writing a method section, think of writing directions to somebody you have never met on how to do what you did in your study.

Depending on the type of research question, the method section also serves these functions for your audience:
- **Replicability** – future researchers might need to do your experiment again.
- **Validity** – future researchers need to see if any potential variables might have led to your measurement not actually measuring what it says it is measuring.
- **Context** – future researchers need to understand your particular context and setting of your study

A method section should do the following if you haven’t addressed these items in the introduction already:
- **Determine your measurement unit** – What you are measuring needs to be outlined as well as how you are measuring it. You could measure a person’s ability to navigate a grocery store by either asking him or her or actually observing him or her. There are two different measurement units. Are participants reporting their attitudes and beliefs about a topic using a Likert scale on a questionnaire? Are you measuring the time it takes to shop for groceries in an unfamiliar store?
- **Define terms and variables important to the study** – Terms that are important to your study should be defined as early as possible. Many researchers define terms in their introductions, but you might also have to define some terms including periods of time or definitions of participation in your method.
- Describe the collection and analysis of your data – you want to describe each step from collecting the raw data to aggregating the data to how you analyzed the data, as well as what you were comparing it to in responding to your research question and hypothesis.
- Define your level of significance – Remember that significance in quantitative research is decided by the researcher. In some descriptive studies, any difference could be significant as long as you argue this in your method. However, in most studies, significance is decided through statistical measurement, and some audiences will have a very specific expectation if you use the word significance in your report.

Many researchers will separate their method section tasks into sub-sections so that a method section might have up to five different parts. The most common are as follows:
  - Participants/Subjects – who are the people being studied and what information did you gather (e.g. race, sex, age)? Although you see “subjects” in older studies, when dealing with people, the current research term is “participant.”
  - Design – how did you design your study to gather your data?
  - Setting – where did your study take place? What variables of the study influenced it?
  - Equipment – what did you use to gather your data? Questionnaire? Rubric?
  - Procedures – what steps did you follow to gather your data?

For many low-stakes, descriptive studies, such separation might not be necessary and can lead to repetition or be too simple to be meaningful for your audience.

**Discussion and Practice**

1. As with other sections, methods sections in quantitative research rely on certain rhetorical appeals. Consider logos, ethos, and pathos—in what ways does a method section make each of these appeals?
2. What is the purpose of separating the methods section into subsections for certain types of studies? Why could these subsections be important for the audience?
3. You might have done the scientific method task in school before where you had to make a method for creating a grilled cheese or peanut butter and jelly sandwich. Working with one other person, devise a method for some common function in your lives. This can be anything from playing a video game, brushing your teeth, arranging the perfect workout playlist, etc. Write out the details of this activity to be followed by another person who you have never met. Share this method with another pair of students. What are the most common problems that you run into trying to figure out somebody else’s method? How can you prevent this when writing a research method?
4. There’s an old saying in research that goes, “Friends read your abstract, colleagues read your results, and enemies read your method.” Why do you think this is the case?

**Chapter Project: Step 3**
Return to your research question and newly drafted introduction from before. Begin working on a method section for your study. Once you have a draft, share it with a peer for feedback.

Results
The purpose of the results section is to report the aggregate and inferential data or results of your experiment. You would start this section by answering whether you supported or refuted the hypothesis. Next, you would present data and percentages (or, in some cases, ratios) of your data. Finally, you report what the results mean in relation to your research question and hypothesis. You would also report the rest of your survey responses in this section, but make sure you separate your primary hypothesis from these other results so it is clear. In reporting your results, it is important to maintain your stance as an external observer and avoid inserting your own reactions, interpretations, or biases. The results section is “just the facts;” you should save additional commentary for the discussion section that follows.

Many times, Results sections use pie charts, graphs and tables to show trends or descriptive data, but in every case, you also have to describe with words how to read the table or figure. You don’t want to describe all of the data in the table, but you should describe noteworthy data—just let the visual representation do the work for you. Every figure and table should be labeled and numbered. You should refer to the figure or table by that label and number in your text. For example, you might write something like, “note in table 3 the differences between figures and tables in APA style.” For more information on using tables and figures, refer to Chapter 11: Visual Representations of Data.

Table 3
Differences between figures and tables in APA

<table>
<thead>
<tr>
<th>Label / Label abbreviation</th>
<th>Figure</th>
<th>Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>-consists of</td>
<td>Graphs, diagrams, maps, images</td>
<td>Text organized in columns and rows</td>
</tr>
<tr>
<td>Label location</td>
<td>Below the figure</td>
<td>Above the table</td>
</tr>
<tr>
<td>Caption</td>
<td>With label, below figure, describes figure</td>
<td>Below table, optional, describes abbreviations</td>
</tr>
</tbody>
</table>

Discussion and Practice
1. Results sections often rely on visual representations of data via tables and figures. What are the advantages and disadvantages of capturing quantitative data in tables and figures for your audience?
2. Those new to this style of writing often make the mistake of dumping all the quantitative information on the page rather than crafting a specific report of findings. Why do you think this is the case? Why is it important to craft a reporting of the data in the Results section?
3. Refer back to Table 5.2 that contained data for short survey on student writing and reading habits. With a peer, write a short Results section for that data. How would you represent the data visually? What would you focus on in reporting using text?
Chapter Project: Step 4
If you have continued to work on your own research question, and have data, begin working on your results section. Share your results with a peer.

Discussion
The discussion section is for the researcher to describe the significance, implications, and limitations of the results, and finally offer some suggestions for future research. In the discussion section, you answer the “so what?” question. You analyze and discuss the results by addressing the following:

• What do these results mean outside of your study?
• What use is the information for researchers or non-researchers?
• Did anything happen you didn't expect? How did that influence the results?
• Did you mess up the method or analysis?
• Did you forget to address some variables?
• Do you have suggestions for future researchers?

Remember: you cannot redo the research. If it’s a disaster, say so, and say why.

Implications should both address what your research results mean, as well as suggest avenues for further research. The discussion section is the place for you to speculate about why you found what you found. This might involve comparing your results to those of previous studies or interpreting your data based on sources from your literature review. Imagine you were studying mobile phone habits of college students. Your findings might support a hypothesis that students spend more time texting than using making voice calls. However, you might have found a trend that students text friends more, but make voice calls to family more—a finding you hadn't accounted for in your introduction and literature review. Thus, you might seek out some other research or discuss why this might be the case in this section. The discussion can also include any other pertinent content that doesn't belong in other sections of the report.

Differences in the discussion and results section might seem confusing at first. To separate them better, think of it this way. Results are what you found and how it was related to your hypothesis, and the discussion talks about what the results mean beyond the study, beyond the hypothesis, and for the future. As a researcher, you will report in the results and interpret in the discussion.

Discussion and Practice
1. How do the results and discussion sections differ rhetorically for your audience? As you consider this, think of how approaches to constructing a persona may be different in these two sections.
2. What are the benefits and drawbacks of writing about any mistakes you made in the discussion section?
3. Why do you think suggestions for future research is so important as the last part of the discussion section?
4. In the Results Discussion and Practice, we asked you to write a short Results paragraph about Table 5.2. Write a short discussion about these findings, mainly answering what the limitations, implications and significance of the findings were. You obviously cannot discuss any mistakes in the method, but based on the data, there are some limitations.

Chapter Project: Step 5
If you have continued to work on your own research question, and have data, begin working on your discussion section. Share your results with a peer. Your peer might use the following peer review questions for the Discussion section (even though these are yes/no questions, peers should add suggestions for how to improve each part):

- Does the Discussion begin by discussing the overall findings of the study?
- Does the Discussion draw on additional sources or refer to the introduction or previous findings?
- Does the Discussion cover the significance or importance of the findings?
- Does the Discussion refer to the implications for the findings, considering what it could mean outside the setting or in future instances?
- Does the Discussion cover any limitations to the study, or any mistakes that may have been made that influences the results?
- Are suggestions for future research given?

Appendices
Appendices are additional documents that help other researchers who are reading your study either consider your results more carefully or help them create future research questions. Such things as raw data, questionnaire or observation rubric research instruments, or artifacts that were analyzed are often included in appendices.

References
Past research that you cited in your report or study should be included in a references section. Refer to Chapter 10 for more information on how to cite and format this research.

How Do You Select Tense or Voice in Writing about Quantitative Research?
As we have indicated thus far in this chapter, quantitative research methods and writing strategies are often seen in the sciences. These writing situations generally require the researcher and writer to use a certain writing style. When a researcher is writing for other scientific researchers, he or she will use formal and precise language, in third-person, past-tense, making the final thing the researcher is writing about seem to exist independently of the researcher’s observation.

The use of past tense is used to tell the audience that the researchers, on this past particular day, using these methods, found this particular thing. Past tense tells a future audience that it may not find the exact same thing. Past tense is very common because there is never a
guarantee that a study will find the same thing again. However, there are some phenomena that exist in an unchanging state. In these research instances, you may find that you can use present tense (specifically, present habitual tense), when studying something that exists habitually or persistently (e.g. a celestial body or the number of “thees” in Shakespeare’s Hamlet). Sometimes researchers who are looking at persistent phenomena will use present tense.

Generally speaking, using past tense for your research is most common, except, obviously, when suggesting future research. However, voice is different. What we mean by voice is whether you refer to yourself in the research as “I/we,” refer to yourself as “the researcher” or refer to yourself passively, “the research was conducted.” The voice you select depends on the audience you are writing for, but in all cases it is important to be consistent. If you pick first person, active verbs, then use such a voice throughout your piece. Thus, there are two important rules to keep in mind: (1) follow the example of previous writing in similar rhetorical situations; and (2) always be consistent. That being said, let’s talk about why you may or may not read or use these different voices in research:

- Passive voice foregrounds the data/study and backgrounds the researcher. By saying, “A questionnaire was handed out to participants at a local college campus,” what is important is the instrument and the participants. We don’t care who handed out the survey.

- Third person, active voice places the writer as an objective recorder of the study. In certain instances, this is actually a reality—in some collaborative projects, the person writing the final report might not have conducted one or more tests or procedures, so it is easier to just explain, “the researchers added a dye to the solution.” However, this voice is also used when only one researcher is conducting the study and writing it up.

- First person, active voice places the researcher as active creator of the study and results. In reality, the researcher is the creator of the study, and a recent trend in scientific discourse is to allow first person voice. An example would be, “Using a digital body fat caliper, I measured the body fat percentage of the participants before and after the ten week treatment.” However, you may still find instances where the proceeding style might not be accepted in the sciences.

Admittedly, these are commonly practiced style conventions, and they are not hard and fast rules. After all, despite the “objective” sounding third person or passive voice, the researcher is always the creator of a study, and it is from his or her perspective that the introduction, method, results and discussion are written. Although there is an attempt to be an objective observer of phenomena or an experiment, this, in fact, is impossible.

**Discussion and Practice**

Consider the writing styles of the following abstracts:

*Abstract Example #1*
The authors examined how an applicant's handshake influences hiring recommendations formed during the employment interview. A sample of 98 undergraduate students provided personality measures and participated in mock interviews during which the students received ratings of employment suitability. Five trained raters independently evaluated the quality of the handshake for each participant. Quality of handshake was related to interviewer hiring recommendations. Path analysis supported the handshake as mediating the effect of applicant extraversion on interviewer hiring recommendations, even after controlling for differences in candidate physical appearance and dress. Although women received lower ratings for the handshake, they did not on average receive lower assessments of employment suitability. Exploratory analysis suggested that the relationship between a firm handshake and interview ratings may be stronger for women than for men.


Abstract Example #2

The relationship between the social composition of top management teams and innovation adoptions was examined in a sample of 199 banks. The following characteristics of top management teams were examined: average age, average tenure in the firm, education level, and heterogeneity with respect to age, tenure, educational background, and functional background. In addition, the effects of bank size, location (state of operation), and team size were assessed. Results indicate that more innovative banks are managed by more educated teams who are diverse with respect to their functional areas of expertise. These relationships remain significant when organizational size, team size, and location are controlled for.


Abstract Example #3

Identifying binaries among runaway O- and B-type stars offers valuable insight into the evolution of open clusters and close binary stars. Here we present a spectroscopic investigation of 12 known or suspected binaries among field and runaway OB stars. We find new orbital solutions for five single-lined spectroscopic binaries (HD 1976, HD 14633, HD 15137, HD 37737, and HD 52533), and we classify two stars thought to be binaries (HD 30614 and HD 188001) as single stars. In addition, we reinvestigate their runaway status using our new radial velocity data with the UCAC2 proper-motion catalogs. Seven stars in our study appear to have been ejected from their birthplaces, and at least three of these runaways are spectroscopic binaries and are of great interest for future study.
1. What are the similarities and differences in the voice and tense used in these examples?
2. Briefly scan the scholarly, student and public/popular examples in Chapters 6, 7 and 8. What are the similarities and differences in the voice and tense in those articles?
3. Is it possible to be completely objective when doing quantitative research? Why?

**How Do You Write about Quantitative Research for a Popular or Public Audience?**

There are many rhetorical situations in which quantitative research will need to be presented to an audience who is unfamiliar with many of the concepts that we have discussed here. Most audiences can understand simple percentages and explanations of probability if given a common frame of reference, but beyond that, audiences can get bogged down in advanced statistical procedures. It is important to recognize the limits of what can be expressed not only when writing but reading quantitative research in popular publications.

Most quantitative research that appears in public spaces is heavily revised. Sometimes the original researcher revises a study to secure funding from another agency or revises some part of a study for a press release that helps communicate an important finding to the public at large. At other times, a corporation or agency will contract a research firm to conduct a study that they then will publish. This process can get really confusing sometimes. Take, for example, the article at the end of this chapter, “Survey Shows New Media Can Be Compatible with Old.” MTV Networks hired a research firm called Audits & Surveys Worldwide to do a study on media. MTV most likely received a report that was probably dozens if not hundreds of pages, so they revised one or two important details into a press release, which Billboard magazine probably received. Don Jeffrey revised the whole story to include comments from the MTV Networks and data from the original survey.

Although we cannot cover every rhetorical situation, we want to cover a few basics of writing about quantitative information for a popular audience.

*Focus on one important finding*

One of the advantages of quantitative research is the multiple layers and relationships that numbers can provide. Imagine the amount of data that a simple survey could generate just by asking GPA, music and movie preferences, amounts listened to/watched, gender, and college major. However, you cannot present all of this because an audience who is reading a newspaper or magazine would become overwhelmed. Instead, select one key or important finding. As we indicated earlier, this is a rhetorical choice. If writing about movies, then focus on how two factors interact—movies and college major. If writing for a college newspaper, then spend more time discussing GPA and preferences in general. If you are writing to get funding for a campus-wide online music subscription, then focus on GPA and music.
Sometimes, your research question can be the key to providing the one point you want to make. Other times, the results of the research might reveal some new insight.

*Use visuals and tables*
Visually representing quantitative information is an important part of revising for a public audience. That does not mean complex matrices and three-dimensional data models—instead, provide simple tables or graphs. Present one finding that is also described in the text of your story. As we discuss in the visual design chapter, people can only process a limited amount of information at a given time. A popular publication simplifies this even more because people expect to see at a single glance what a chart or graph means. Admittedly, you are going to have to leave a lot of information out, but that is common practice.

*Avoid statistics or math that you have to explain*
Even the most basic statistical measures, whether Student’s t-test or standard deviations, are usually meaningless to your audience. In fact, standard deviations are often converted to measures of standard error or confidence intervals that can be expressed more simply as plus/minus a certain number from an average that is presented. You may have seen this in political polls in which a prediction of the vote is given as a percentage followed by the error (e.g. 34% +/- 3%). Of course, this is only useful for presenting inferential data. Usually, descriptive data simply states the percentages much like Jeffrey does in “Survey Shows New Media Can Be Compatible with Old.” If you ever need to describe some statistical measure that is important to your study, make sure to use terms and concepts that might be familiar to your audience.

*Explain the methods and source of your data*
Although you want to avoid the specific details of your original study, you do need to provide for your audience a description of how the data was collected or study was conducted. This description is often 1-2 sentences for most studies. Furthermore, you should provide any relevant details about where the original study came from or where it will appear if it is to be published.

**How Do You Write a Press Release?**
The purpose of a press release is to report on information that the writer thinks is important to an audience. A press release is a newspaper story written by a company, organization, researchers, or some other group of people to inform the public about something that any of these people did. Whether Apple is releasing a new computer or researchers at your university discovered a specific genetic locus for ADHD, it will usually be accompanied by a press release.
Press releases are written from the point of view of an observer, like a newspaper story, in hopes that a major news source either reprints the release or delves further into the topic through an interview or follow-up. Press releases, even those written by a study’s authors, are written in third person, as from the perspective of an objective reporter, providing essential details for a public audience. They can sometimes include quotes from the study authors or the company employees, as if interviewed. Press Releases are written in journalistic style, for a public audience, so any technical language, jargon, or company/university specifics should be written as simply as possible.

Writing the Press Release
There are a few variations in press releases, so this can depend on the practices of your company or university. Despite these variations, your release should cover the following:

1. Paragraph 1: Begin with what your release is about, answering the questions: Who, What, Where, When, and How
   Variation: Some press releases begin with a catchy lead or hook. Keep this simple and brief—1-2 sentences at the most.

2. Paragraphs 2+: Further details about the study/topic. The most important information should come early on, mainly a specific finding. Follow this with your method, where your study will appear, and any other findings that might seem relevant.
   Variation: Some press releases use quotes that are appropriate to the topic, either from the study authors, experts, or from people the findings might affect.

3. Last Paragraph: You should finish your press release with information about the researcher, university, or company the release is from. If this is a company press release, provide background about the company. If this is a study or survey, provide relevant background about the researchers.

Formatting the press release
A traditional press release follows the format in figure 1. Top headings, contact and release info is all single spaced. The rest is double spaced without any extra spaces.

1. Company/Institution Logo/Letterhead
2. FOR IMMEDIATE RELEASE or FOR RELEASE MAY 24, 2010 (all caps, aligned right)
3. Contact: Contact information (email or phone)
4. TITLE (all caps, centered)
5. End the page with ###. Alternatively, you can write –30–, an older version of the press release end-of-story indicator. This originated from the days of the telegraph and wire reporting in which the person sending the story would indicate that he or she was taking
a 30 minute break. If your press release is more than one page, then the bottom of the first page should have a –more– with the final page showing the ###.

**Discussion and Practice**

1. Read through the Scholarly Example in this chapter, “Leisure Time Boredom: Issues concerning College Students” by Benjamin D. Hickerson and Brent A. Beggs. Write a press release as if you were on the research team, sharing one key finding of the study for a popular audience.
**Scholarly Example**

"Leisure Time Boredom" appeared in the December 2007 issue of the *College Student Journal*, a peer-reviewed, academic journal published by Project Innovation, Inc. The journal publishes qualitative, quantitative and text-based research on college students’ attitudes, behaviors and values, and has been around since 1963. It has a wide range of articles on topics such as the representation of students in the movie *Animal House*, gender differences in seating arrangements, and perspectives on materials posted outside faculty offices. Benjamin Hickerson was a graduate student at North Carolina State University in the Parks, Recreation, and Tourist Management program when this was written. Brent Beggs is a professor at Illinois State in the School of Kinesiology and Recreation.

Full Citation: Hickerson, Benjamin D., Beggs, Brent A. Leisure Time Boredom: Issues concerning College Students. *College Student Journal* 41.4(B) (Dec. 2007): 1036-1044

**Leisure Time Boredom: Issues concerning College Students**

Benjamin D. Hickerson, North Carolina State University
Brent A. Beggs, Illinois State University
*College Student Journal*

**Abstract**

Students who do not have leisure skills, cannot manage leisure time, or are not aware that leisure can be psychologically rewarding are more likely to be bored during leisure. This study examined the impact of boredom on leisure of college students in relation to gender, level of education, and activity choice. Subjects at a Midwestern university completed the Leisure Boredom Scale and a modified version of the Leisure Activities Blank. No significant differences were found between overall levels of leisure boredom and the three independent variables. However, examinations of individual Leisure Boredom Scale items indicated specific differences. Examples of the findings included that males were more likely than females to agree that they became highly involved in what they did during their leisure and that they were very active during their leisure. Females were most likely to select passive activities as their activity of choice. Students who chose passive leisure activities were less likely to agree that they were very
active in their leisure than the other three activity groups. From these differences, implications were constructed for the development and maintenance of campus recreational programs.

Introduction

For many young adults, the college years are a period of expanding freedoms and focusing interests (Gitelson & Thomason, 1992). College is seen as the last stage of formal education for most people and it is also one of the last structured opportunities for individuals to form leisure time behavior patterns before they move into the workforce (Cheng et al., 2004). The college environment has a unique influence on leisure behavior, including different patterns of free time availability and the acquisition of new activities. Leisure participation in college students has long-term ramifications as it molds attitudes and behaviors leading to continued recreation participation in later life (Gordon & Catalbiano, 1996; Hultsman, 1993).

During this formative period, many college students display positive leisure behaviors. However, some may exhibit negativity or deviance in their leisure. These deviant behaviors can be caused by a lack of leisure skills and the presence of leisure boredom (Gabriel, 1988) noted that if boredom is a problem in critical development periods of leisure behavior, individuals may seek relief from the unpleasantness of this repression by entertaining various methods of deviant or negative behaviors. The purpose of this study was to examine boredom of college students during their leisure.

Background

Iso-Ahola and Weissinger (1990) defined leisure boredom as, "A negative mood or state of mind that reflects a mismatch between optimal experiences that are perceptually available to an individual" (p. 4). Feelings of leisure boredom can be created by meaningless leisure or
multiple constraints. Additionally, people who do not have leisure skills, cannot manage leisure
time, or are not aware that leisure can be psychologically rewarding are more likely to be bored
during leisure (Iso-Ahola & Weissinger, 1990).

Numerous instruments have been conceptualized to measure boredom during leisure,
including the Zuckerman Boredom Susceptibility Scale (Zuckerman, Eysenck, & Eysenck,
1978), Boredom Proneness Scale (Farmer & Sundberg, 1986), and the Free Time Boredom Scale
(Ragheb & Merydith, 2001). However, the most utilized measurement tool of leisure boredom is
the Leisure Boredom Scale (LBS) created by Iso-Ahola and Weissinger (1987).

Iso-Ahola and Weissinger (1987) first used the LBS to examine perceptions of leisure as
boredom. Six psychological factors including leisure ethic, work ethic, leisure repertoire,
awareness, constraints, and self motivation were measured and accounted for 60% of the total
variance of leisure boredom. A major finding in these results was that awareness of leisure
opportunities accounted for more than one-half of this variance. Sociological variables such as
age, gender, race, income, and employment status were also examined. Only gender and income
were found to be statistically significant.

Iso-Ahola and Crowley (1991) used the LBS and found that adolescent substance abusers
were more likely to experience leisure boredom than nonsubstance abusers. An unexpected
finding in this study was that on a separate measure of activity participation frequency, substance
abusers participated more frequently in leisure activities. A hypothesized explanation for this
phenomenon was that many of the substance abusers were of the arousal seeking personality
type. Due to the fact that they were seeking arousal, they may have participated in leisure
activities more frequently in order to try and alleviate boredom. Patterson, Pegg, and Dobson-
Patterson (2000) found no significant relationships between leisure boredom, alcohol usage, and
self-determination among young people in rural and urban areas in Australia. However, results did indicate that the rural females were significantly more bored with their leisure than any of the groups.

Weissinger, Caldwell, and Mobily (1992) examined the leisure perceptions of college recreation majors versus non-majors. The results indicated that majors had a more positive perception of leisure in terms of boredom, ethic, and motivation, but not satisfaction or participation. Weissinger (1995) studied the effects of leisure boredom on self-reported health in college-aged students. Students who were more bored with their leisure reported that they were not as healthy mentally or physically as those who were less bored. While many variables related to boredom have been examined, leisure boredom based on the types of activities that college students participate in has not.

Multiple variables concerning leisure participation have been examined. Beggs, Elkins, and Powers (2005) found that females were more likely to participate in non-competitive recreational sports programs and activities in which they could avoid conflict. Previous research has also indicated that level of education is not a factor in recreational pursuits (Beggs et. al, 2005; Weissinger, 1995). Iso-Ahola (1989) noted that participation in recreational activities is used as a mechanism to cope with constant demands in college. These activities play an important role in helping students balance and improve the quality of their lives. Direct correlations have been made with participation in recreational sports programs and positive behaviors including community service, avoiding smoking, and attending religious services (Downs, 2003). Downs also indicated that three potential benefits of recreational sports are improved emotional well-being, reduced stress, and improved overall happiness. Ellis, Compton, Tyson, and Bohlig (2002) found that those who participated more frequently in campus
recreational activities had more positive levels of health and quality of life. Overall, campus recreational sports have shown significant amounts of importance to college students.

The purpose of this study was to examine boredom of college students during their leisure. The demographic variables gender and level of education were examined as well as the types of activities that students participated in. Activity participation included four categories: active outdoor adventure activities, active competitive team sports, active individual sports, and passive activities.

Methods

This study utilized survey research methods and consisted of a convenience sample of 474 subjects enrolled in undergraduate courses at a Midwestern university. Courses were selected using criteria that they were representative of overall university enrollment in regards to gender, level of education, and major concentration.

The survey instrument consisted of 20 items that were divided into three sections. The first section consisted of the LBS and was used to measure leisure boredom. A modified version of the Leisure Activities Blank (LAB) by McKechnie (1975) was used to identify the category of activities that the subject was most likely to participate in. The last section consisted of demographic items including gender and level of education.

The LBS is a 16 item, Likert-type scale containing questions about perceptions of leisure and leisure time usage. The reliability for the scale was reported at .85 (Iso-Ahola & Weissinger, 1990). In the instructions of the instrument, leisure time is defined as all non-work hours. This study modified the statement to define leisure time as all non-work and non-school hours due to the sample. Subjects responded from 1 (strongly disagree) to 5 (strongly agree) to indicate their feelings about the items. Reverse coding was used on eight items with positive leisure
connotations and direct coding was used on eight items with negative connotations. An overall mean score was tabulated from all 16 items. Higher scores indicated greater levels of leisure boredom.

The LAB consists of 120 popular leisure activities each divided into six separate categories. The groups are mechanics, crafts, intellectual, slow living, sports, and glamour sports. The six groups items' included on the LAB have reliability measures ranging from .76 to .94 (McKechnie, 1975). The LAB has been modified because of time duration, lack of necessity for items, and outdated activities (Lounsbury & Hoopes, 1988; Ragheb & Griffith, 1982). For this study, the LAB was modified to consist of four categories instead of six: outdoor adventure activities (e.g., climbing, geocaching, and mountain biking), active competitive team sports (e.g., basketball, hockey, and football), active individual sports (e.g., golf, running, and tennis), and passive activities (e.g., dining out, scrap booking, and television). Subjects selected one of the four categories to indicate which type of activities they were most likely to participate in. Examples that fall in each of these categories were derived from the LAB and a panel of experts to establish content validity. In addition, a pilot study (N = 63) was conducted to determine instrument reliability. Cronbach's alpha reliability measure of the pilot was .92, establishing the instrument as a reliable measure.

The survey was administered to subjects by the principal investigator in classrooms in April 2005. T-tests and ANOVA procedures were conducted to examine differences between groups concerning leisure boredom. To account for multiple comparisons a modified Bonferroni adjustment was applied, reducing the significance level to .003.

Results
Students in this study reported moderate to low levels of leisure boredom. Overall, the average score for students on the leisure boredom scale was ($M = 2.14$). The items on the LBS that students indicated the greatest levels of leisure boredom were "I waste too much of my leisure time sleeping" ($M = 2.52, SD = 1.12$) and "In my leisure time, I want to do something, but I don't know what to do" ($M = 2.49, SD = .87$). The items with the lowest scores on the LBS were "Leisure time is boring" ($M = 1.71, SD = .83$) and "I am excited about leisure time" ($M = 4.27, SD = .76$). Leisure boredom was further analyzed by gender, level of education, and activity choice.

**Leisure Boredom and Gender**

Fifty-eight percent of the subjects were female ($N = 276$) and 42% were male ($N = 197$). Results from t-test analyses indicated no significant differences between overall leisure boredom scores and gender (Table 1). However, significant differences were found between the groups on four of the individual LBS items. Males ($M = 3.84, SD = 0.84$) had significantly higher scores than females ($M = 3.61, SD = 0.78$) on the item "During my leisure time, I become highly involved in what I do." Males ($M = 4.18, SD = 1.02$) also had significantly higher scores than females ($M = 3.65, SD = 1.14$) on the item "If I could retire now with a comfortable income, I would have plenty of exciting things to do for the rest of my life." In addition, males ($M = 3.66, SD = 0.88$) had significantly higher scores than females ($M = 3.40, SD = 0.83$) on the item "I am very active during my leisure time." Females ($M = 2.05, SD = 0.78$) had significantly higher scores than males ($M = 1.79, SD = 0.87$) on the item "I do not have many leisure skills."
Leisure Boredom and Level of Education

Ten percent \((N = 45)\) of the respondents were freshmen, 25% \((N = 113)\) were sophomores, 30% \((N = 139)\) were juniors, and 35% \((N = 160)\) were seniors. Results from ANOVA procedures indicated no significant differences between overall leisure boredom and level of education (Table 2). However, significant differences were found on two specific LBS items. Seniors \((M = 3.84, SD = 0.82)\) scored significantly higher than freshmen \((M = 3.40, SD = 0.78)\) on the item, "During my leisure time, I become highly involved in what I do". Seniors \((M = 4.12, SD = 1.07)\) also scored significantly higher than freshmen \((M = 3.40, SD = 1.21)\) on the item "If I could retire now with a comfortable income, I would have plenty of exciting things to do for the rest of my life."

Comment [RC28]: Like a t-test, an F score, ANOVA is comparing whether two items or in this case, two sets of items are similar, different, or statistically significantly different.
Leisure Boredom and Activity Choice

Fifteen percent ($N = 68$) of the subjects chose active outdoor adventure activities, 27% ($N = 120$) chose active competitive team sports, 22% ($N = 99$) chose active individual sports, and 36% ($N = 164$) chose passive activities. Results from ANOVA procedures indicated no significant differences between overall leisure boredom and activity choice (Table 3). However, significant differences were found within three specific leisure boredom items. On the item, "Leisure time gets me aroused and going", the active outdoor group ($M = 3.90, SD = 0.79$) scored significantly higher than the passive activities ($M = 3.46, SD = 0.79$) group. The active outdoor group ($M = 4.13, SD = 0.83$) also scored significantly higher than the passive activities group ($M = 3.65, SD = 0.80$) on the item, "I like to try new leisure activities that I have never tried before". In addition, each of the three groups including outdoor ($M = 3.69, SD = 0.87$), team sports ($M = 3.66, SD = 0.87$), and individual spots ($M = 3.68, SD = 0.87$) scored
significantly higher than the passive activities group \((M = 3.17, SD = 0.77)\) on the item, "I am very active during my leisure time."

### Table 3

<table>
<thead>
<tr>
<th>Activity Choice</th>
<th>Outdoor</th>
<th>Team</th>
<th>Individual</th>
<th>Passive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leisure time drags</td>
<td>1.69</td>
<td>1.90</td>
<td>1.90</td>
<td>1.90</td>
</tr>
<tr>
<td>Highly involved</td>
<td>3.75</td>
<td>3.90</td>
<td>3.77</td>
<td>3.86</td>
</tr>
<tr>
<td>Leisure time is boring</td>
<td>1.57</td>
<td>1.72</td>
<td>1.83</td>
<td>1.83</td>
</tr>
<tr>
<td>Retire now, things to do</td>
<td>4.06</td>
<td>3.98</td>
<td>3.10</td>
<td>3.14</td>
</tr>
<tr>
<td>Spinning my wheels</td>
<td>2.13</td>
<td>2.20</td>
<td>2.69</td>
<td>2.09</td>
</tr>
<tr>
<td>Don't like leisure</td>
<td>1.82</td>
<td>1.92</td>
<td>1.84</td>
<td>1.76</td>
</tr>
<tr>
<td>Aroused and going</td>
<td>3.90</td>
<td>3.76</td>
<td>3.87</td>
<td>3.52</td>
</tr>
<tr>
<td>Important to quality of life</td>
<td>4.41</td>
<td>4.14</td>
<td>7.77</td>
<td>4.08</td>
</tr>
<tr>
<td>Excited about leisure</td>
<td>4.01</td>
<td>4.10</td>
<td>3.06</td>
<td>4.08</td>
</tr>
<tr>
<td>Don't know what to do</td>
<td>2.38</td>
<td>2.93</td>
<td>3.26</td>
<td>2.41</td>
</tr>
<tr>
<td>Waste leisure time sleeping</td>
<td>2.56</td>
<td>1.07</td>
<td>1.68</td>
<td>2.23</td>
</tr>
<tr>
<td>Like to try new leisure</td>
<td>4.13</td>
<td>0.83</td>
<td>3.80</td>
<td>3.77</td>
</tr>
<tr>
<td>Very active leisure</td>
<td>3.69</td>
<td>3.87</td>
<td>3.66</td>
<td>3.87</td>
</tr>
<tr>
<td>Leisure does not excite</td>
<td>1.65</td>
<td>1.78</td>
<td>1.86</td>
<td>1.78</td>
</tr>
<tr>
<td>Do not have leisure skills</td>
<td>1.87</td>
<td>1.78</td>
<td>1.94</td>
<td>1.94</td>
</tr>
<tr>
<td>Always something to do</td>
<td>3.91</td>
<td>3.89</td>
<td>3.63</td>
<td>3.80</td>
</tr>
<tr>
<td>Overall leisure boredom</td>
<td>2.01</td>
<td>0.50</td>
<td>2.07</td>
<td>0.51</td>
</tr>
</tbody>
</table>

Note: Outdoor \((n = 86)\), Team \((n = 120)\), Individual \((n = 74)\), Passive \((n = 144)\).

* \(p < 0.001\)

### Discussion

The results of this study specified no significant differences between overall leisure boredom and gender, level of education, and activity choice. However, further data analysis indicated significant differences between specific items of leisure boredom and each of the independent variables.

The findings of no significant differences between overall leisure boredom and gender support previous research by Weissinger et al. (1992) and Weissinger (1995). Further analyses of the data indicated significant differences between groups on specific items regarding gender. Males were more likely to agree that they would have plenty of exciting things to do if they could retire now with a comfortable income. Males were also more likely than females to agree that they became highly involved in what they did during their leisure time and that they were

Comment [RC29]: The lead paragraph outlines the major findings that will be discussed. The discussion, then, looks at the significance, implications, and limitations.

Comment [R30]: The details of the findings are further explained in more detail. However, only pertinent findings are discussed. The entire study is not discussed exhaustively. So, in your discussion sections, figure out first which findings have the greatest relevance and discuss those in detail, also explaining why you got those results. Notice that in the discussion the study’s findings are compared with previous studies.
very active during their leisure time. These findings may be explained by the differences in the types of activities that males and females participated in. Active competitive team sports was selected as the preferred leisure activity by 69% males ($N = 84$) and 31% females ($N = 37$). Passive activities were selected as the preferred leisure activity by 78% females ($N = 130$) and 22% males ($N = 36$). These findings agree with Beggs et al. (2005) results that females are more likely to participate in non-active recreational sports. In addition, females were more likely to agree that they did not have many leisure skills. Shaw, Caldwell, and Kleiber (1996) indicated that adolescent females may participate in some leisure activities to please others rather than themselves. At times, especially during the developmental adolescent period, females may be participating for different reasons than males and this could contribute to their lack of development of leisure skills and feelings of leisure boredom. Future research is suggested to support this statement. The findings concerning gender suggest that females may be more affected by certain facets of leisure boredom than males.

The results of this study also indicated no significant differences between overall leisure boredom and level of education. This supports the findings of Weissinger (1995). However, some significant differences existed between groups on specific LBS items and level of education. Seniors were more likely than freshmen to agree that they became involved in what they do during leisure and that if they could retire now with a comfortable income, they would have plenty of exciting things to do. These differences may be explained because seniors have furthered the formation of their leisure time behavior patterns by experiencing the college environment. Gitelson and Thomason (1992) determined that the college years are a time of expanding freedoms and focusing interests and Cheng et al. (2004) determined that the time spent in college allows for the development of leisure behavior patterns. Therefore, seniors are [Comment [R31]: Notice that here the researchers are attempting to analyze why they have got the findings they did.]

[Comment [R32]: Again the researchers are bringing in other studies to support their findings.]

[Comment [R33]: Here the researchers are bringing in other studies to not only support their study's findings but also further explain them. This is a great example of how to use results from other studies to analyze the results of your own study in the discussion, even if you are doing quantitative research.]

[Comment [R34]: Notice that the researchers here are suggesting possible avenues for future research on the topic of leisure time.]

[Comment [RC35]: In this and subsequent significance paragraphs, the researchers are using previous research to support what they found. This use of text-based, past research to validate their own findings helps corroborate their claims.]

[Comment [R36]: Here again there is more analysis of why the researchers may have gotten these results. However, notice the use of the word "may" that indicates a certain degree of uncertainty. The researchers are theorizing about the reasons for these findings but they don't know for sure.]

[Comment [R37]: Here again the researchers bring in other studies to offer further support for their analysis.]
more likely than freshmen to have established their patterns of leisure behavior. These specific differences could also be accounted for based on differences in awareness of perceptually available leisure opportunities between seniors and freshmen. The greater the level of awareness, the less likely a student is to experience boredom (Iso-Ahola & Weissinger, 1987).

No significant differences were found between overall leisure boredom and leisure activity choice. However, there were significant differences between groups on specific leisure boredom items and activity choice. Subjects who chose outdoor adventure activities were more likely to agree that they became aroused during their leisure and liked to try more new types of leisure than the subjects who chose passive activities. Previous research has shown that participants involved in high-risk adventure activities are more likely to be sensation seekers than those who participate in other types of activities (Breivik, 1995; Kajtna, 2004). Sensation seekers have been defined as seeking immediate gratification, thrills, and impulsivity (Wood & Cochran, 1995). This study supports previous research that has indicated that sensation seekers become involved in more new activities than nonsensation seekers and become greatly aroused during participation (Iso-Ahola & Crowley, 1991; Rowland, Franken, & Harrison, 1986).

Another finding related to activity choice was that subjects who chose passive leisure activities were less likely to agree that they were very active in their leisure than the other three groups. Of the four groups, the activities provided for the passive group are the least vigorous in terms of physical activity. This finding suggests that those pursuing passive leisure activities are the least physically active of the college students in this study.

The findings of this study have implications for leisure service providers in a university setting. University programs concerned with student life and campus recreation need to offer a wide range of programs and activities that cater to males and females of all levels of education in
active competitive team sports, active competitive individual sports, outdoor adventure, and passive leisure to meet different leisure aspirations. By providing a wide array of programs, participants will be more likely to find activities that reduce the opportunity for leisure boredom. In addition, by being aware of activity differences based on gender, providers will be able to develop programs that meet the leisure needs of males and females.

Additional research regarding leisure boredom is necessary. Future research should continue to address both leisure boredom and activity choice. Few studies have been conducted concerning leisure activity choice (Barefoot, Strickland, & Housch, 1981; Gratton & Taylor, 1986). In addition, further research should be conducted to explore differences in selection of leisure activities by gender. In this study, the activities selected by males and females were different. The passive activities group had many more females than males and the active competitive team sports group had many more males than females. The results of this study found that females were more likely to participate in passive activities and more likely to be bored with aspects of their leisure. To further understand these differences between males and females, other instruments or methods could be used that examine leisure boredom differently. By understanding the activity choices and leisure boredom of males and females, researchers may be able to determine the links between gender, activity choice, and leisure behavior.

The college years are an important developmental period for students. During this period, lifetime leisure pursuits are often determined. By providing a wide range of quality leisure opportunities, leisure service providers in the college setting can meet the needs of students and play a positive role in their developmental process.

References


Scholarly Example Reading Questions

Writing Strategies

1. Abstract
   a. What is the purpose of the abstract for academic readers?
   b. While thinking about the purpose of the abstract, what do you think is the most important part of the abstract? Why?
   c. What do you think is the least important part of the abstract? Why?
   d. What is the most detailed part of the abstract? Why?
   e. What is the least detailed part of the abstract? Why?

2. Introduction/Background. The purpose of the literature review or background is to create context for your research. It establishes what research related to your own has been published in the past. However, most importantly, the literature review is also an argument. By establishing what has been published in the past, the literature review also gives you room as the writer to argue for ways in which your own research is new, original, and badly needed. Arguing for how your research is new is also called creating a gap.
   a. What is the gap(s)?
   b. Why is it important in writing and then publishing your research to establish a gap?
   c. Does the study have a hypothesis? Why or why not?

3. Methods
   a. Why is including a methods section important to academic readers?
   b. What are important things to mention in a methods section? Why?
   c. Based on the method section, what would you say the study design and method is?

4. Results
   a. How important is the first sentence in the Results section?
   b. Why do the tables of data appear in this section?
   c. A number of abbreviations appear in the Results section (e.g. N, n, M, SD). What do they stand for?
   d. Sub-headings appear in the Results section. Why are headings important in showcasing certain data?

5. Discussion
   a. The discussion argues for the significance, implications, and limitations of the research. In other words, the discussion very clearly answers the question “So what?” Why is it important for academic readers to see the significance of the research at the very end of the article?
   b. How important is the first paragraph of the Discussion section? Does it confirm what the first paragraph in the Results section says?
   c. Why are additional sources introduced in the Discussion section? How were sources used to interpret the data? Was the data interpreted effectively? Why or why not?
   d. Why is including the limitations of a study important to academic readers? What were some other potential limitations for this study that were not mentioned?
Students as Scholars
Karin Hart played lacrosse at the University of Denver and Dustin Jackson played hockey at the University of Denver. As athletes, they were interested as to whether student athletes go out as much as non-athletes. They used results from a survey of 54 students at their university to study their phenomenon as part of an assignment their first year writing class. Their final report, “Do Athletes Go Out?” was completed after 4 weeks of study design, drafting, and revision.

Do Athletes go out?
Karin Hart and Dustin Jackson
University of Denver

Abstract
In this study we would like to find out if student-athletes go out as much as regular students at the University of Denver. Our hypothesis is: student-athletes at the University of Denver go out as much as regular students. Our methods to finding this hypothesis true or not, were to send out a survey to the students at DU through SurveyMonkey.com. After gathering our participants’ results from our 54 surveys, we analyzed them and interpreted their answers. There was a very even split between student athletes, athletes, gender, and age. Our findings revealed that student athletes indeed go out as much as regular students.

Introduction
Do student-athletes go out as much as regular students at DU? From personal observation as student-athletes, we believe the answer to this question is yes. Although student-athletes have greater responsibilities than other students at DU, we believe they do not factor that into their party life. Every student wants to experience the “true” college life and we propose that being an athlete does not drive an athlete away from experiencing the “true” college life. We are interested in finding who is going out, why they go out, who they go out with, and where they go out to. These questions are vital to answer to find our
hypothesis true or false. These are very important question to answer because going out is a popular social activity at the University of Denver, and also an important issue for the majority of colleges across the nation. Student-athletes are looked up to on campuses, and are given many privileges, and it would be interesting to see if their higher status above the regular student population, sways their decisions, specifically their decision to go out.

Method

Our method of research was through a survey. We set up the survey through SurveyMonkey.com, a webpage that is easy to organize a survey and analyze the results. Our survey consisted of 10 “single and multiple answer” questions that related to our research.

Participants

We sent the survey out to our classmates and friends at the University of Denver in order to receive as much variety of participants as possible. We asked a total of approximately 100 students to complete our survey, of which 54 responded.

Materials

To conduct our study, we used surveymonkey.com to create our survey. We distributed the survey by sending the link to our survey through Facebook and email. After we sent the link to our participants, we could use Survey Monkey’s results page to easily check on our findings.

Design

The dependent variable in our study is how much our groups (students and student athletes) “go out”. The independent variable in our study is the number of student versus student-athletes. We are trying to find out if student-athletes go out as much as regular
students at the University of Denver. Our terms in our survey were aimed toward the students attending DU. We did our best to keep them simple and direct.

Procedure

Our study investigates student year, gender, student or student-athlete, where they go out, who they go out with, why they go out, their thinking behind their decision to go out, and how often they actually do go out. We designed our study like this so we could thoroughly understand who goes out and why. Our survey asked specific questions to our participants regarding who they go out with, when they go out, where they go out, and why they go out. Each participant that filled out our survey answered ten simple questions that furthered our knowledge of whether or not student-athletes go out as much as regular students. Our questions were: Are you a Student-Athlete at DU? What gender are you? What is your year at DU? How often do you go out during the week? Do you factor responsibilities (such as sports or homework) into deciding to go out or not? If you did go out, would you receive any repercussions from any level of authority important to you? What time do you usually return home from going out? What is the reason for returning home at the time you stated above? Who do you usually go out with? (Refer to appendix for complete list of survey questions.)

Results

A total of 54 students at DU filled out our survey. We found that 63% of the students who took our survey were student athletes. Out of everyone who took the survey, 46% were male and 54% were female. 61.5% (32 people) were freshman, 21.1% (11 people) were sophomores, 13.5% (7 people) were juniors, and 3.8% (2 people) were seniors. More than 77% (42 people) of the participants admitted that they go out 1-3 times per week,
while 11.1% (6 people) said they go out more than 4 times a week, and 9.3% (5 people) never go out, while 1 out of the 54 marked they go out almost every night. Of all the participants, 98% (53 people) said that they do factor their responsibilities into “going out” or not. It was a close split between participants when asking if they would receive punishment from authority figure if they went out, almost tied at 43.4% (23 people) who said yes, and 56.6% (30 people) who said no. The majority of the participants, 63% (34 people), said they return from going out between the hours of midnight and 2am. While only 35.2% (19 people) said they returned later than 2am, and a mere 1.9% recorded they return between 10pm and midnight. When we asked for the reasoning behind why the participants return from going out, we found that the top two answers were: personal preference and the combination of class the next day and sports. 13% (7 people) said they returned home for class the next day, 11.1% (6 people) said they returned at the hour they stated for sports, 38.9% (21 people) said the returned because of personal preference, 29.6% (16 people) stated they return because of both class the next day and a sport, and only 7.4% (4 people) stated they returned home at the time they marked because of another reason than we made available. Most students admitted that they most commonly go out to bars near DU. This is ironic since most of our participants were freshman, and most likely underage to drink. Following going out to bars near DU racking up a whopping 59.3% (32 people), was going out to house parties at 44.4% (24 people), downtown Denver at 35.2% (19 people), other 14.8% (8 people), and a combination of all the choices 24.1% (13 students). When we asked who our participants go out with, 53.7% (29 people) said they go out with teammates, 74.1% (40 people) said they go out with friends at DU, and a mere 18.5% (10 people) said they go out with their girlfriend or boyfriend.
Discussion

After collecting all the data through Survey Monkey, we did prove our hypothesis that student athletes go out as much as regular student athletes. We based this off of the fact that 63% of our participants were student-athletes, and 90.8% say they go out. It is clear athletes are taking up a part of this number. After interpreting these results we found the data was not skewed because the split between regular students, and student athletes was evenly split. Based on the gender, student athlete, and age differences and even split, we could determine our hypothesis is in fact true. By investigating further into our results we found even more surprising information about going out at DU.

The answers we collected through our survey can be interpreted into meaning to find our answer. Our hypothesis was proven; being a student-athlete did not change how much you go out. The first of our ten questions helped us have confidence that the responses for the rest of our survey would be fairly split between students and student athletes. The 25 male/29 female split of gender was also close, so gender did not have a huge influence on our results. Of our participants, 32 were freshman, while all the other years added up to 20. This may have skewed our data, but also shocked us with results revealing where students were going out to. It was a shock to see that the majority of the participants were going out to bars near DU since the bulk of freshmen are under the legal drinking age. This could be an issue because there are no fun activities or facilities for underage students near DU. The most popular answer to how many nights they go out is 1-3, which makes sense for DU because the weekend starts on Thursday because there are not many classes on Fridays. Overall, we found that being a student athlete, having
responsibilities (such as class or a sport), and age or year did not alter the decision to go out or not.

Almost everyone showed some signs of responsibility answering that they consider their responsibilities into going out or not. For the people who said they did go out, 23 to 30 said they would get into trouble from some level of authority. Since the person who student-athletes would get into trouble with would be their coach, or even the Athletic department, this number is surprising because it showed most students did not factor getting in trouble into going out or not. This may be because many coaches ignore the fact their athletes are going out as long as it did not influence their ability to perform. When we asked what time our participants got home from going out, it followed along accordingly with the closing times of bars near DU.

Our results yielded the results that student athletes do indeed go out as much as regular students. There were more student athletes than students (34/20) who took our survey, meaning our numbers were not quite evenly derived from both groups. Most of our participants stated they returned home at the time they stated because of personal preference, or the combination of class and sports. This is a good example of the split between students and athletes, because most athletes would want to return because of sports or class, while a student may just prefer to head back at the hour of which they choose. In addition to this split between students and student-athletes, the two top choices of who our participants go out with were teammates and friends at DU. This makes sense because most athletes will go out with teammates, while the majority of students will go out with friends.
We think that many students answered the question to when they go home from going out between 12-2am because that is the times the bars close around DU, and that was the most popular place for people to go out to. Another correlating piece of information we interpreted in our survey was the relationship between the year of the students who responded, and where they go out. Like we stated above, the majority of students go out to bars, which is ironic because most freshman are underage to be getting into bars. We have both personally experienced the lack of security checks at the bars near DU, but believed they are ignored because of the income the bars make from allowing underage drinking to happen.

The limitations on this study were the lack of participants, the range in participants, and survey questions. The lack of participants in our study was definitely a setback because we cannot see what the actual reality to our investigation from the 54 students we questioned. In addition to lack of participants, the range in our participants lacked. We would have liked to have seen a greater range in year attending DU. The greater this range is, the greater perspective we can obtain. Our results may be skewed because of this since the majority of participants (32 people) were freshman. Also, the survey questions limited us for two reasons: a. because we only asked 10 questions and b. because they may have been asked in a biased way. An example of a biased question on our survey can be found in the very first one, where we asked whether or not the participant was a student-athlete or athlete. This is biased because there are also club and intramural teams at DU, not just two general groups (student-athletes and students).

Our research could be improved upon by creating a more detailed survey, asking a greater number of students at DU, and having unbiased questions. Being able to ask more
questions and figure out what specifically students and athletes do separately, could help
further investigation. Having unbiased questions will be helpful to not limiting the
participants opinions and answers to our questions.

Our research is socially relevant because at many colleges going out is a popular
social thing to do, and the aspect of this research is important to student-athletes because
student-athletes are idolized at schools and are held to a greater standard of moral and
status. Student-athletes, unlike normal students, have many privileges and a higher status,
and with that come great responsibilities. Many people think since they are given these
privileges, they would not go out as much. It would be interesting to see if our hypothesis is
ture across a greater number of colleges. It would be a very interesting social study.
Survey

By completing the following questions, you are also granting consent for this information to be used as part of a research exercise that I am completing for my writing class. Your participation is completely voluntary. The information you provide may be used in a class project. While profile information may be included in my essay (i.e. your age, sex, class standing, etc.), your name will NOT be used.

1. Are you a Student-Athlete at DU?
   Yes / No

2. Gender
   Male / Female

3. Year
   Freshman / Sophomore / Junior / Senior

4. How often do you go out during the week?
   1-3 times a week
   More than 4 times a week
   Almost every night

5. Do you factor responsibilities (such as sports or homework) into deciding to go out or not?
   Yes / No

6. If you did go out, would you receive any repercussions from any level of authority important to you?
   Yes / No

7. What time do you usually return home from going out?
   a. between 10-Midnight
   b. Midnight-2am
   c. 2am-later

8. What is the reason for returning home at the time you stated above?
   a. class the next day
   b. sports
   c. personal preference
   d. other:________________________________

9. Where do you usually go out?
   a. House party
   b. Fraternity/Sorority party
   c. Bars near DU
   d. Downtown Denver
   e. other:________________________________

10. Who do you usually go out with?
    a. teammates
    b. friends made at DU
    c. yourself
    d. girlfriend/boyfriend
    e. other:________________________________
Students as Scholars Reading Questions

1. As we have shown in the scholarly example, annotate (describe what the author is doing and how) the article.
2. As a student piece, you might recognize that the actual audience for this research is the teacher. Who do you think is the intended audience?
3. What is the research question and the hypothesis?
4. This study does not have a literature review. Write a brief literature review for this study using three other studies from academic, peer-reviewed journal articles. What is the gap in the research here? What evidence was used to define this gap? Was this effective use of evidence?
5. What is the study design and method? Was it an effective design/method for their hypothesis?
6. The researchers used SurveyMonkey, an online survey tool to collect their results. What are the benefits and drawbacks of using this tool to conduct surveys?
7. Was their method section effective? Why or why not?
8. They indicate the results of all their survey questions in their Results section. Was their presentation of this data effective? In what ways could they have improved sharing their data?
9. In their Discussion section, they clearly describe the implications, significance, and limitations of their study. Based on what you have read here, can you imagine some further implications and limitations to this study? What would they be?
10. Considering their limitations and those you have generated yourself, if you were going to conduct a new study, what would be the major ways that it would be different?
Popular/Public Example
"Survey Shows New Media Can Be Compatible with Old" appeared in Billboard magazine in 1998. Billboard began in 1894 as a professional trade publication for people posting signs about popular entertainment such as Buffalo Bill Cody’s Wild West Show. It wasn’t until the 1930s that the magazine began focusing more on music and musical entertainment. Today, Billboard’s audience is both popular and professional—it has features on popular artists such as Nickelback and Jack Johnson, but it also has industry news for music professionals including producers, artists, and executives. You may be familiar with Billboard’s Hot 100 and Top 200 charts that keep track of music sales. Don Jeffrey was a senior writer at the magazine when this appeared and later became one of Billboard’s managing editors.

Survey Shows New Media Can Be Compatible with Old
Don Jeffrey
Billboard

NESTLED in their home fortresses, kids and teens are increasingly likely to be simultaneously listening to a CD, playing a video game, watching television, and keeping an eye on the Internet. This confluent use of media may have profound implications for the home entertainment industry of the future.

That’s one conclusion drawn from recent research unveiled by MTV Networks. The cable programmer—whose channels include MTV, VH1, Nickelodeon, and M2—commissioned a study to find out what people are doing in their leisure time, and executives say they were surprised by the findings.

The survey, conducted by Audits & Surveys Worldwide from November 1997 to February 1998, sampled 8,000 people, 4,000 of whom filled out time-usage diaries that tracked their daily activities.

To make sure the survey included enough kids and teens, who make up a large share of MTV and Nickelodeon viewers, Audits & Surveys at first over-sampled the younger demographics. The sample then was “rebalanced” so that its demographics match those of

Comment [RC40]: The first part of a news article is called a lead. It is designed to hook a reader’s attention with some interesting, surprising, or well-written idea. Jeffrey uses the image of kids hiding inside their bedrooms, surrounded by media.

Comment [RC41]: Besides hooking a reader’s attention, a lead also answers the journalistic questions who, what, where, when, and how. Here, the author answers the who and when, and then follows in the next paragraph with the how.
Nielsen’s studies. But the researchers say the concentration of multichannel [cable, satellite TV] and computer households is “slightly higher” than the norm.

Betsy Frank, executive VP of research and development for MTV Networks, says the programmer was seeking “a snapshot of how people are using all the media and entertainment forms and vehicles available to them, and what, if any, trade-offs they are making.”

The “big idea” from the research, she says, is that contrary to common opinion, “new media are co-existing with, rather than cannibalizing, the old.”

She relates this to assumptions held during the early days of MTV. “Some were predicting that MTV would kill, or at least weaken, radio. But consumers who wanted their MTV wanted their radio, too, and the radio business today is stronger than ever.”

For instance, the survey shows that 32.6% of all teens aged 12-17 are heavy radio listeners, vs. 36% who are heavy cable users and radio listeners. This indicates that heavy cable users are 10% more likely than the average teen to be big radio fans.

MTV and VH1 viewers are “highly music involved,” says Frank. Besides listening heavily to radio, they are more likely than the average person to spend money on CDs and tapes (see accompanying chart), own their own stereo equipment, belong to music clubs, and go online.

Similarly, the researchers find that people who go to the movies a lot are also heavy renters and buyers of videos and viewers of films on cable TV. And Net surfers are also more likely to be book readers than the average consumer.

“A medium never really disappears,” says Frank. “Consumers integrate it into their lives in meaningful ways.”

Comment [RC42]: Before the half-point, another feature of news writing is the nut graf. It is the “point” of the story. Here, the nut graf is just a quote by Betsy Frank. The nut graf is then further supported in subsequent paragraphs; in this case, Frank interprets the major findings of the study data.
She adds that people are “finding new ways of using media.” Using them simultaneously, for one thing.

Teenagers’ rooms, she says, are often “fortresses” with a TV, a PC, a stereo, and a phone.” (Another survey shows that of the 12- to 17-year-olds who have their own rooms, two-thirds have a TV in it.)

A popular term used to describe the future of home media and entertainment is “convergence.” This could mean, for instance, that your TV, computer, radio, and telephone will be operating out of the same box. With the simultaneous use of media, Frank says, “for kids and teens, the convergence of behavior is already here.”

Another conclusion MTV draws from the research is the importance of the brand name. “It points very strongly to the need for brand building,” says Frank. “People are a lot more places than before, accessing a lot more media. Brands help people navigate through the complexity.”

The next part of the work is to “assimilate data” from the international part of the study—in Germany, Italy, and the U.K. “We’ll look at how the overall media are similar and different and how our brands are perceived in other parts of the world,” says Frank.

MTV plans to reprise the study later this year, using the same methodology and sample. “We’ll see how much it’s changed,” says Frank. “If it’s a great deal, we’ll do it semiannually. We see the study as a benchmark.”

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<td>Spent $50+ on Prerecorded music in past 3 months</td>
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Comment [RC43]: Towards the end of news stories, you will notice what are called kickers. These can be resolutions to surprises presented earlier, repeated ideas, or ideas to leave the reader thinking. In this and the next paragraph, the author quotes Frank who talked about fortresses and convergence—the same images the author used to begin his article.

Comment [RC44]: Public and popular examples often use very simple tables and graphs to present data. In visual design, the concept of appropriate knowledge says that a reader can only interpret what he or she has experience with. Correlation coefficients, ANOVAs, and other measures that a more academic audience would expect would not be understood by the audience here (and it can be assumed that Audits & Surveys Worldwide did such analyses), so the author uses a simple percentage of population table.
Popular/Public Reading Questions
1. Billboard is marketed as a magazine for industry professionals, but it is available for more public audiences as well in supermarkets and bookstores. Who do you think this specific article is targeted at? What evidence confirms this audience?
2. At first glance, the article is reporting quantitative data supported by Betsy Frank’s interpretation of that data. Considering its audience, what do you think is the primary purpose or argument of this report?
3. MTV Networks hired a company called Audits & Surveys Worldwide to conduct this research. Why do you think they did this?
4. Based on what is presented here, what do you think their research design was? What was their method? Do you think the description of the method is extensive enough for you to conduct your own study on the topic? Why or why not?
5. The article includes extensive interpretation by Betsy Frank. Why do you think she was quoted so extensively rather than just paraphrased? Why were her comments included at all?
6. This survey is over ten years old. Do you think the findings would still be true today?
7. Imagine you were an employee of Audits & Surveys Worldwide today. If you were to conduct your own version of this study, what would be your research question and your hypothesis? Write a detailed methodology given what you know of quantitative research.
Quantitative Cases

A. Using Data – The General Social Survey

The General Social Survey is a research project that has collected data about social attitudes, behaviors, and beliefs of the United States population since 1972. The data is collected from a survey instrument administered through face-to-face interviews by the National Opinion Research Center at the University of Chicago. It is a descriptive study that currently has over 50,000 responses and has tracked 5,000 variables. It is a source rich in aggregate, quantitative data that can be used to both formulate new research questions and bolster current research projects. All of the data can be accessed via the web http://www.norc.org/GSS+Website and is sorted by time, topic, and question. As you might imagine, 5,000 variables and 50,000 responses is an immense amount of data, so before you begin working with it, you should visit the website, familiarize yourself with the interface, and browse some of the categories to get a better sense of what is available. If using the data management functions are difficult, you can also download the most current codebook with the data organized by question (it is over 2,000 pages long): http://www.norc.org/GSS+Website/Codebook/. Before looking at some of the data, we are going to go over some information about the GSS.

The first point to recognize is that not every question was asked every year. When looking at the data, even though there are over 50,000 responses collected, certain questions were only asked during one year’s survey, of the hundred or couple of thousand respondents asked that year. Read the numbers carefully, and a NAP (Not Applicable) or NA (Not Answered) response means that there is no data from those listed next to that code. A DK means the participant Didn’t Know.

Another issue is that the data management tool that you use on the website has aggregate data for all years the survey was administered if sorted by question/topic. A question like, “Should a self-identified communist be allowed to teach at a university?” has a greater variety of responses throughout the 30 years of the survey. The data says that 47.7% said he/she should be fired, but this includes data from the 1970s and 80s when communism was a more pressing social issue—in 2006 alone, only 37% thought such a person should be fired.

The first case involves a question about people’s attitudes and beliefs about science. Question 1073 specifically asks respondents their opinion on how scientific a field of study is (see figure 8.5). They ask about sociology, physics, history, accounting, biology, economics, medicine and engineering. You will note in figure x, we have included responses to four of these: sociology, history, medicine, and engineering. The question was only asked in the most recent survey in 2006, so you don’t have to be concerned with past opinions on this particular question. The actual protocol is included in this data, such as Hand Card B20. Also note the VAR: HISTSCI or VAR: MEDSCI—this is just the code
researchers use to track the question variable, so they don’t have to write it out every time. If using SPSS, Excel, or a database, these codes are much easier to sort by.

1. Look over the data from Q1073 of the GSS. When working with quantitative data, you can ask new research questions of old data. In this case, because this is a descriptive study, the research question will be more general. Using the data from Q1073, create one or more new research questions. Although you might be tempted to ask why question, you don’t have the evidence to respond to those questions. You are mainly asking what questions. Based on this new research question, what are some potential answers/hypotheses based on this data?

2. Using evidence from the survey, respond to the research question for two different purposes and audiences:
   a. Write a short news story or press release for a local print or web-based news source.
   b. Write an abstract of the data and your research question finding for an academic journal devoted to a topic or academic field of your choice.

3. Now that you have considered this old data, create a new research instrument and protocol for researching a related question to this data. Using the data from Q1073 in your literature review/introduction, create the methods and survey for a new study.
A. Sociology. Is sociology very scientific, pretty scientific, not too scientific, or not scientific at all?

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C. History. Is history very scientific, pretty scientific, not too scientific, or not scientific at all?

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G. Medicine. Is medicine very scientific, pretty scientific, not too scientific, or not scientific at all?

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H. Engineering. Is engineering very scientific, pretty scientific, not too scientific, or not scientific at all?

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Figure 8.5 Results for GSS Survey Q1073
Once you have worked with the GSS survey some more, consider investigating further questions using the data from the GSS. You might look at changes over time for those questions that have been asked in multiple years, or you might work with one or more questions to create a new study or protocol for investigating a topic further.


### B. Analyzing Data

On the following pages there is a questionnaire research instrument and raw data from a survey conducted in 2007 at a private university. The instrument was designed around a research question that asked whether part-time work interfered with school work. The researchers primarily looked at the variables of work hours, study hours, GPA, and gender. Before working with this data, consider your own research questions.

**About the Questionnaire**

1. Question #5 on the questionnaire was only asked of those people who had a job. Do you think this is the best approach? Why or why not?
2. The researchers used ranges (e.g. 0-5, 5-10) for their work and study time responses. What are the advantages and disadvantages in doing such an approach for this study? In thinking about this question, consider the ease of completing the questionnaire by its audience, the precision of the results for the researchers, and the ease of which the researcher will be able to manipulate the data.
3. Based on the questionnaire, label the apparent independent and dependant variable or variables. What are some possible confounding variables?

**About the data**

1. Input the data into a spreadsheet or computer program for organizing numerical data. The first and often easiest way to look at general trends in data is sorting by variables. For example, sort by gender, or sort by GPA to see if there are any trends that might be interesting
2. Compute measures of central tendency for the quantitative data
   a. What is the mean and standard deviation for GPA for the two datasets?
   b. The researchers used ranges for hours worked and hours studied. These ranges aren’t true quantitative data yet. Consider ways that you could make these ranges into quantitative data. What is gained and what is lost? How would you compute measures of central tendency with these ranges?
3. Based on the measures of central tendency, do you see any possible relationships between work hours, study hours, and GPA? How would compute a statistical relationship between these two variables?
Research Questionnaire

By completing the following questions, you are also granting consent for this information to be used as part of a research exercise that I am completing for my university writing class. Your participation is completely voluntary. The information you provide may be used in a class project, although your information will be anonymous.

1) What is your class standing? First-Year  Sophomore  Junior  Senior  Graduate
2) What is your gender?  Male  Female
3) Do you have a part-time job? (If no, skip to question #6)  Yes  No
4) How many hours per week do you work?  0-5  5-10  10-15  15+
5) Do you feel your job interferes with your academic success?  Yes  No
6) What is your GPA?  ________
7) How many hours per week do you spend on school work and studying?  0-2  2-5  5-10  10+

Questionnaire Raw Data (N = 100)

Dataset #1: Those who indicated they did not have a part-time job (n = 51)

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**Dataset #2: Those who indicated they had a part-time job (n = 49)**
C. Making Data

In the previous two cases, you have seen data that has already been collected on a given topic with one or more research questions. When you are making your own data, you will have to spend more time in creating a research design and method that will help you answer your research questions.

1. Consider the preceding cases, the GSS views of science, and the relationship between work, studying and GPA. Based on these findings, how would you conduct your own study on either topic? Write out a new research question, create a questionnaire, and research protocol. You might consider carrying out your research protocol and write up a report of your findings following the IMRAD writing strategies listed in this chapter.

2. The previous two cases were primarily descriptive using a questionnaire method. Based on your sense of the research questions for either study, what are some possible other research designs and methods that could be used to test these research questions?
   a. Write up a research protocol for either the GSS or the work/study/GPA research reports using an inferential design.
   b. Write up a research protocol for either the GSS or the work/study/GPA research reports using observational or testing methods.

Quantitative Activities and Projects

Throughout this chapter, there have been a number of smaller activities or discussion topics that you might continue working on in developing your own quantitative project. What follows here are two large project ideas that incorporate a great deal of what this and other chapters have covered.

Survey project
Think for a moment about current issues at your college or in your community. How is the food selection on your campus? How much do people recycle? What form of transportation do people rely on the most? Pick something that interests you, and brainstorm one or more topics, issues and research questions about them. After you have selected a topic, issue and research questions, create a questionnaire or survey instrument that will help you answer that research question. Important things to keep in mind:

1. A good questionnaire collects demographic information first such as age and gender. You might also ask details important to your audience as well. For example, if writing about college students, major and GPA might be important and reveal some interesting trends. Do females recycle more than men? Are students with higher GPAs less likely to complain about the food on campus?

2. Asking yes or no questions usually neglects both freedom of response and a good source of data to make more sophisticated claims. For example, if asking about coffee preferences, it is better to use a Likert scale to measure how much or little a
person likes a particular type of coffee, and compare it to another Likert scale that measures perceptions of quality, taste, or value.

After you have handed out and compiled your survey data, write it up as an IMRAD report, using the IMRAD writing strategies discussed previously in this chapter. You should then revise this report as a press release for a local newspaper. This project can be helpful to complete in a group since it can take a lot of time and energy to complete. Also, you do not want to overwhelm your community with 20 or 30 separate surveys.

The Writing Project
This is primarily a quantitative project with a number of steps that also use mixed methods research. The goal is to produce a final report that primarily relies on quantitative data, but as with any good research project, the process will require multiple research and rhetorical skills. The six steps here reflect a common research process, but recognize that research processes, like writing processes, will vary from person to person, experience to experience, context to context.

In a nutshell, what you will be doing is beginning to interrogate your own experiences with writing and coding those into a more generalizable and quantitative study of writing of those similar to or different from yourself. By following these steps, you will more fully understand your own writing habits and produce a larger study that will contribute to the research conversation on writing habits in general.

1. Literacy autobiography – Think for a moment about how and why you write the way you do. Reflecting on these qualitative questions is the first step. Write a short autobiography about your writing and reading processes. Where did you learn to write? What are the most important skills that you learned? What things do you think about when you are writing? How do you write?

2. Generating a research question – Working with one or more peers, compare your literacy autobiographies. What are some general similarities and differences? Did your peers focus on different issues of writing, for example, processes of writing or histories of writing instruction? You might also work with your teacher and begin compiling and categorizing these similarities, differences and issues. Maybe one category is writing processes. What are some general trends in writing processes? A table with these categories might help you generate an issue to study further. Individually, begin generating research questions that could be studied quantitatively about one or more issues that might be interesting for an audience outside of the class you are in.

3. Annotated Bibliography – once you have selected an issue on the topic of writing studies, begin doing text-based research on that issue. Are you looking at writing instruction? Are you looking at writing processes? Are you looking at writing anxiety? Using your own experiences and the experiences of your peers, search for previous studies on the topic and generate an annotated bibliography using at least 5 sources. Remember to write a summary for each source and why it might be relevant for your study.
4. Create a Protocol – remember that a research protocol is how you will go about studying your topic. Although there are many qualitative options, you have probably noticed by now that a lot of qualitative studies of writing already exist. We want you to add some quantitative data to the research conversation. Consider protocols that can be measured using numbers. For example, questionnaires using Likert scales, testing using interventions from the researcher such as differing writing prompts to participants, and observations counting behaviors of writers in action in the writing center or library. Remember that all of your research should abide by research ethics at all times. This includes obtaining permission for observations, informing participants how the information you are collecting will be used, and informing them that they are not obligated to complete any part or all of your study. See our chapter on Research Ethics for more information.

5. Write a review of the literature – once you have a draft of your protocol and an annotated bibliography, you can begin crafting an introduction to your study. As we discussed in Chapter 3, writing a literature review means that you are synthesizing past studies to create a gap in the research that your research question is attempting to fill.

6. Conduct your study and compose a research report of your findings – Once your literature review draft is underway, conduct your study and write up your results in a style appropriate to your audience. This might be in IMRAD, in which case your literature review and protocol description can become your Introduction and Method. Or, your results might lead to a proposal or other professional document to change how writing is taught at some level. Your findings might become a poster presentation that you and your peers present to the campus community. You might work with your professor to create a rhetorical situation in which to share your research findings.