

Primary Research for Design Projects

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1. What is primary research?



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Introduction

How research is defined varies widely from field to field, and as you progress through your college career, your coursework will teach you much more about what it means to be a researcher within your field. For example, engineers, who focus on applying scientific knowledge to develop designs, processes, and objects, conduct research using simulations, mathematical models, and a variety of tests to see how well their designs work. Sociologists conduct research using surveys, interviews, observations, and statistical analysis to better understand people, societies, and cultures. Graphic designers conduct research through locating images for reference for their artwork and engaging in background research on clients and companies to best serve their needs. Historians conduct research by examining archival materials – newspapers, journals, letters, and other surviving texts – and through conducting oral history interviews. Research is not limited to what has already been written or found at the library, also known as secondary research. Rather, individuals conducting research are producing the articles and reports found in a library database or in a book. Primary research, the focus of this essay, is research that is collected firsthand rather than found in a book, database, or journal.

Primary research is often based on principles of the scientific method, a theory of investigation first developed by John Stuart Mill [1] in the nineteenth century in his book *Philosophy of the Scientific Method*. Although the application of the scientific method varies from field to field, the general principles of the scientific method allow researchers to learn more about the world and observable phenomena. Using the scientific method, researchers develop research questions or hypotheses and collect data on events, objects, or people that is measurable, observable, and replicable. The ultimate goal in conducting primary research is to learn about something new that can be confirmed by others and to eliminate our own biases in the process.

Following are some common types of primary design research, and some important guidelines for cultivating an ethical and equitable research practice. In the next section, you'll read about setting the foundation for reaching your research goals. In Section 3 you'll find useful information about conducting different types of research such as interviews, observations, and surveys. And, finally, you'll read about presenting your research as reliably as possible, by analyzing (Section 4) and documenting (Section 5) it.

Common types of primary design research

Primary research plays an essential role in building the empathy and understanding needed for user-centered design. Developing a first-hand understanding of a user's experience requires thought and planning. Users communicate their needs verbally, and also nonverbally, through facial expressions, demeanor, and other unconscious means. Users will often readily communicate a solution they have in mind, though they might not have a clear and complete analysis of the problem. Each user's experience indicates universal needs, and is at the same time entirely unique. In order to make the most of your primary research in the context of user-centered design, it is essential to identify and knowledgeably apply the most suitable research method(s) for the target user population and design goals.

Observations

There are multiple types of observation. For example, in naturalistic observation, the researcher observes an activity in the setting where it would normally occur, without any involvement themselves. In a controlled observation, the researcher may arrange an activity and invite people to participate, and then observe what they do. This may or may not be in the natural setting. There are also types of observational research in which the researcher might play an active role. In each of these, the focus of the researcher is on watching, with an open mind, and capturing details of what they see. This may include body language, facial expressions, body position, specific interactions with products or other participants, moments of hesitation, and so on.

While many types of observation are qualitative (results are textured and descriptive), behavioral observation is a quantitative method (results can be measured). Using this method, the researcher codes or tallies certain specific behaviors over time. For example, a researcher interested in students' eating habits might code students' lunch purchases during two-hour observations conducted at a specific cafeteria every Monday over the course of a year. The researcher could then analyze their data to see patterns such as popularity of specific items and changes in purchases over time.

Observations have the advantage of enabling the researcher to see what someone actually does, as opposed to what they say they do, which might not be the same thing for a variety of reasons. Drawbacks to observations can include limited access for observing the desired activity in as real a setting as possible, and of course, if there is no discussion with the person being observed, it isn't possible to fully understand their underlying needs or motivation. Something to keep in mind is that the researcher observes and acts through their own worldview and using their own experiences, and should therefore be aware of the potential for bias and cultural assumptions in their observation.

Interviews

Interviews can be used to establish rapport, develop empathy, and get a better understanding of someone's thoughts and actions as well as their underlying needs or motivation. Like most observations, interviewing is generally qualitative.

Design researchers may conduct interviews with a target user, as well as with other stakeholders, and subject matter experts (SMEs). Interviews can be done by email, phone, video call, or in person. When done by email, interviewees have more time to think about and compose their answer, and can answer at their convenience, but the interviewer is not able to ask follow-up questions. Video or in-person interviews are preferable to phone interviews because the researcher can ask follow-up questions as well as look for non-verbal communication such as facial expressions.

Phone, virtual, and in-person interviews permit the researcher to ask “why” – this simple, one-word question is a powerful tool for unpacking users’ experiences and worldview. Two ways to reduce researcher bias in interviews are to craft questions that invite the user without leading them, and to listen with an open and empathetic mind.

Contextual inquiry

Contextual inquiry (also referred to as an in-depth interview) is an approach that combines observing people in their natural environment with an interview. Instead of just passively watching the person, you also ask questions to better understand underlying motivations, beliefs, and emotions that may be influencing their actions. For example, if you are observing someone who has carpal tunnel syndrome as they write a note, you will be able to see some of the challenges they experience and any adaptations they have found to make it easier for them (referred to as “workarounds”). In contextual inquiry, you can also ask them about *why* they developed that approach, what else they have tried and what were the results, what is still problematic about what they do now, and so on. In this approach, it is important to apply the same guidelines for both effective observations *and* for effective interviews.

Textual analysis

Textual analysis is an approach for drawing insights from qualitative, textual data by looking at the content and structure of that data, and understanding the historical and cultural context that existed when the data was created. Datasets can include transcripts from interviews, survey results, product reviews, social media posts, and much more. Within textual analysis, there are many specific analytical tools that can be applied, such as looking at word frequency, word collocation (groups of words that frequently appear together), coding and tagging groups of text by topic, and others. Textual analysis is most often used for research projects involving large data sets of unstructured data, and there are many software tools that can be used to help conduct that analysis.

Language is a powerful carrier of cultural assumptions and priorities. In order to reduce inadvertent bias, researchers who conduct cultural analysis must have a strong understanding of how their own worldview and use of language might interplay with their research goals and with their use of analytical tools.

Surveys

A survey is a set of questions posed without variance to many users, potential users, or stakeholders. Often the answer choices as well as the questions are limited to some degree, through methods such as multiple choice, rating, and ranking.

Since surveys are sent to multiple respondents and the resulting data is quantitative, they can yield patterns or tendencies across a group. This can be an important step toward reliability in research results because researchers are capturing a spectrum of experiences rather than a few individual anecdotes. For example, a researcher observing two people who recently recovered from carpal tunnel

surgery may incorrectly conclude that surgery is the primary treatment for carpal tunnel; a survey would reveal other treatments such as therapy, splinting, cortisone shots, and occupational/habit changes.

Surveys also have the advantage of yielding a relatively large amount of data with a relatively small expenditure of time and resources. That said, they do not yield the same depth of understanding or richness as qualitative methods. While surveys are a good tool for surveying a user group's habits and preferences, they are limited in their ability to reach the "why" of those habits and preferences, or for cultivating empathy. Two ways to mitigate potential researcher bias are to strive for a representative sample of respondents and to craft survey questions and answers with bias in mind.

One efficient method for making use of both qualitative and quantitative methods is to administer a survey and then select a few willing survey respondents for qualitative follow-up (make sure your survey contains a question asking for volunteers).

Focus groups

A focus group is a small group of people that a researcher assembles in order to gather qualitative information from a variety of voices at once. It is more common to use focus groups to gather feedback on concepts and prototypes than to use them at the beginning of the design research process, since observations and interviews would be less practical in a group setting. Because there are multiple users represented in a focus group, the focus group cannot take place in the user's natural setting. A focus group might be held in an office setting, or at a location that is similar to the natural setting. The main advantage of a focus group is the ability to hear from different perspectives in a single session. However, there can be significant limitations; for example, people who are more introverted might be hesitant to share their opinions, and people with strong personalities could dominate a conversation and even sway others to their point of view. The focus group should be designed to create a non-threatening environment and structured to encourage equal participation from all users. Many of the strategies behind designing effective interview and survey questions, discussed in Section 3, can also be applied to focus groups.

Ethics of primary research

As Earl Babbie writes in *The Practice of Social Research* [2], throughout the early and middle parts of the twentieth century researchers took advantage of participants and treated them unethically. During World War II, Nazi doctors performed heinous experiments on prisoners without their consent, while in the U.S., a number of medical and psychological experiments on caused patients undue mental and physical trauma and, in some cases, death. Because of these and other similar events, many nations have established ethical laws and guidelines for researchers who work with human participants. In the United States, the guidelines for the ethical treatment of human research participants are described in *The Belmont Report*, released in 1979. Today, universities have Institutional Review Boards (or IRBs) that oversee research. Students conducting research as part of a class may not need permission from the university's IRB, although they still need to ensure that they follow ethical guidelines in research. The following provides a brief overview of ethical considerations:

- *Voluntary participation.* *The Belmont Report* suggests that, in most cases, you need to get permission from people before you involve them in any primary research you are conducting. If you are doing a survey or interview, your participants must first agree to fill out your survey or to be interviewed. Consent for observations can be more complicated, and is discussed later in the essay.

- *Confidentiality and anonymity.* Your participants may reveal embarrassing or potentially damaging information such as racist comments or unconventional behavior. In these cases, you should keep your participants' identities anonymous when writing your results. An easy way to do this is to create a "pseudonym" (or false name) for them so that their identity is protected.
- *Researcher bias.* There is little point in collecting data and learning about something if you already think you know the answer! Bias might be present in the way you ask questions, the way you take notes, or the conclusions you draw from the data you collect.

The above are only three of many considerations when involving human participants in your primary research. For a complete understanding of ethical considerations please refer to [The Belmont Report](#).

Guiding principles for racial and ethnic equity in primary research

Every research or evaluation project is unique in its approach. Each project seeks to answer a specific range of research questions; thus, there can be no universal prescriptive formula for how to embed a racial and equity perspective in research. However, foundational principles can guide each research project to intentionally embed a racial and ethnic equity perspective. Based on 34 interviews with researchers, funders, academics, community practitioners, and policymakers; a thorough literature review; and the deep research experience and expertise of Child Trends scientists, Andrews, *et al.* [3] developed five guiding principles on how to use this approach in every phase of research (from designing the study to reporting findings).

1. Researchers should examine their own backgrounds and biases.

Researchers strive to be neutral and objective; nevertheless, they have our own biases, values, background, and experiences that affect the way they conduct research. Bias affects the decisions made throughout the research process, including who asks the research questions, which questions are asked, whose input on the research is sought, how the data are gathered, how findings are interpreted and communicated, and which audiences and methods are selected for dissemination. Researchers should examine their own racial, ethnic, and cultural backgrounds, as well as their experiences (or lack of experiences) with racism and/or privilege, and consider how they influence the direction of research.

2. They should make a commitment to dig deeper into the data.

While recognizing differences in outcomes among racial and ethnic groups is a first step in identifying disparities, it does not address them. Addressing disparities requires researchers to move beyond simply documenting them: We must also identify the underlying systemic and contextual causes of disparities. This focus is especially critical for understanding outcomes in communities of color, where truths have historically been distorted or overlooked to perpetuate racist systems and beliefs. We should dig deeper to uncover whether data points to a legacy of racism or systemic inequities at the root of racial and ethnic differences in outcomes, rather than an intrinsic deficit of the population in question. To dig deeper into the data requires that we ask questions to uncover root causes of disparities, seek the involvement and perspectives of community stakeholders, and invest adequate time and money in designing and implementing the research. [4]

3. Researchers should also recognize that the research process itself has an impact on communities, and that researchers have a role in ensuring that research benefits communities.

Historically, researchers have employed practices that resulted in the inhumane abuse and exploitation of communities and people of color. Researchers have obtained data on communities and then left without addressing the issues of the people they studied. By doing so, researchers have reinforced a paradigm in which they enter a community and conduct research without giving back [5]; in this way, they have added to the abuse and exploitation that vulnerable communities already face.

Particularly in communities of color where there is a history of research that caused harm or mistrust, researchers should embed a racial and ethnic equity perspective to repair this relationship.

Ethical research must be reciprocal. The people who give researchers consent to use their data should receive something in return. For example, when conducting research with American Indian populations, researchers need to consider tribal sovereignty and data ownership.

Honoring a community also means acknowledging the often-overlooked power that communities of color hold. Research that incorporates a racial and ethnic equity perspective can help to reveal a community's power and dismantle power differentials that currently exist between researcher and communities of color.

4. Researchers should engage communities as partners in research and credit them for their contribution.

To incorporate a racial and ethnic equity perspective, researchers must authentically engage community stakeholders. The meaning given to data is influenced by who analyzes it. Community stakeholders – people who are experiencing the issue that researchers are interested in – can be engaged in the data analysis and offer a perspective that differs from that of researchers.

Researchers should genuinely work together with communities to accurately and effectively present information; this collaboration could include defining the issue of interest and brainstorming solutions to address it. Community-engaged research considers a community's culture, relationships, and policies. In this way, it is a mechanism for embedding a racial and ethnic equity perspective to research. Early community engagement is ideal and should continue through every stage of the research process. Community engagement is an acknowledgement of a community's contribution to the research and is important for promoting a true partnership.

5. Finally, they should guard against the implied or explicit assumption that white is the normative, standard, or default position.

Researchers typically make comparisons to white outcomes when they examine disparities. Such comparisons reflect the assumption that white outcomes are the standard, and that communities of color should aim to achieve that standard. These comparisons also apply positive values to cultural norms associated with whiteness and negatively measure people of color by those norms. Making comparisons to white people neglects the structural factors and root causes that may lead to disparities.

A racial and ethnic equity approach moves beyond looking at disparities or “closing gaps” and shifts the focus to better outcomes for all while acknowledging that tailored solutions are necessary.

Additional resources

The following links contain additional resources for understanding and addressing the principles described above.

- Using co-creation for greater inclusion and deeper understanding: [Systems of Inequity Have Been Designed by People, and They Can Be Redesigned.](#)
- A look at how aesthetics, such as urban gentrification, create or reinforce inequities: [Inequality by design? Why we need to start talking about aesthetics, design and politics](#)
- An overview of various forces of racism and bias that affect health outcomes: [Structural Racism and Health Inequities](#)
- How historical and present-day bias continues to reinforce sampling bias: [More than Tuskegee: Understanding Mistrust about Research Participation](#)
- A review of causes of underrepresentation in research studies: [A Systematic Review of Barriers and Facilitators to Minority Research Participation Among African Americans, Latinos, Asian Americans, and Pacific Islanders](#)
- An example of how bias affects experiences and outcomes: [Racial bias in pain assessment and treatment recommendations, and false beliefs about biological differences between blacks and whites](#)

Gender equity in primary research

Women and girls – their experiences, opportunities, bodies, and mental and physical health – have historically been marginalized or minimized in research contexts. Most researchers today do not set out with a goal of sidelining women and girls, yet this remains a widespread phenomenon today, for both structural and attitudinal reasons. Researchers must challenge themselves to identify and mitigate biases on individual, organizational, and structural levels

Your role as a designer is to ensure you are designing for all potential users. It is important to check your understanding of who your users are, respect their experiences and wishes, and resist prioritizing some users' needs or responses over others.

The following links offer resources for understanding and addressing gender bias in research and policy contexts:

- Women are included in medical studies less frequently than men: [Sex-Specific Medical Research Why Women's Health Can't Wait](#)
- A summary of the differing impact that new practices or treatments might have on women versus men tends to be downplayed: [SWHR: The Health Gap for Women](#)
- Women researchers face a variety of barriers to publishing and prestige: [Gender disparities in high-quality research revealed by Nature Index journals](#)

- Women's experiences in medical contexts, the workplace, and elsewhere are minimized or punished:
 - [Women and pain: Disparities in experience and treatment - Harvard Health Blog](#)
 - [Experts: Research Gap Stalls Improvements in Endometriosis Care](#)
 - [Quality of evidence revealing subtle gender biases in science is in the eye of the beholders](#)
 - [The Penalties For Self-Reporting Sexual Harassment](#)
- A discussion on how the dynamics women experience in the course of their lives tend to be overlooked in policy and design decisions: [Design Thinking in Business and Workplace Gender Bias](#)

This section contains material taken from:

- The first two paragraphs of the Introduction section, and the section "Ethics of primary research," were taken from [Introduction to Primary Research: Observations, Surveys, and Interviews](#) by Dana Lynn Driscoll, and is used under a [CC-BY-NC-SA 3.0 License](#).

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2. What are the goals of primary research and how do you reach those goals?



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Clarify the research question(s)

In her article, *Introduction to Primary Research*, Dana Lynn Driscoll (2011) [1] discusses primary research. Consider the excerpt from Driscoll's article below, taking note of how you might apply this information to your own research:

Primary research is often based on principles of the scientific method, a theory of investigation first developed by John Stuart Mill in the nineteenth century in his book *Philosophy of the Scientific Method* [2]. Although the application of the scientific method varies from field to field, the general principles of the scientific method allow researchers to learn more about the world and observable phenomena. Using the scientific method, researchers develop research questions or hypotheses and collect data on events, objects, or people that is measurable, observable, and replicable. The ultimate goal in conducting primary research is to learn about something new that can be confirmed by others and to eliminate our own biases in the process. [1]

Driscoll goes on to discuss Fred Leavitt's *Evaluating Scientific Research: Separating Fact from Fiction* [3], explaining that primary research is useful for questions that can be answered through asking others and direct observation:

[P]rimary research is particularly useful when you want to learn about a problem that does not have a wealth of published information. This may be because the problem is a recent event or it is something not commonly studied. For example, if you are designing a device for a particular user with carpal tunnel syndrome, which is a condition that affects people in different ways, you may not know exactly how this condition affects this user. You'll want to collect data about this user directly, perhaps through observation or interview. Or if you're

developing a website for teachers who are required to teach online during a pandemic, and you'd like to include information about developing lesson plans, you might want to survey a population of teachers to determine what information they'd find most necessary. [3]

Narrowing your topic

Just like the writing process, you should start your primary research process with secondary (library) research to learn more about what is already known and what gaps you need to fill with your own data. As you learn more about the topic, you can narrow down your interest area and eventually develop a research question or hypothesis, just as you would with a secondary research paper.

Developing research questions or hypotheses

As John Stuart Mill describes in his book, *Philosophy of the Scientific Method*, primary research can use both *inductive* and *deductive* approaches, and the type of approach is usually based on the field of inquiry. Some fields use *deductive reasoning*, where researchers start with a hypothesis or general conclusion and then collect specific data to support or refute their hypothesis. Other fields use *inductive reasoning*, where researchers start with a question and collect information that eventually leads to a conclusion. [2]

Once you have spent some time reviewing the secondary research on your topic, you are ready to write a primary research question or hypothesis. A research question or hypothesis should be something that is specific, narrow, and discoverable through primary research methods. Just like a thesis statement for a paper, if your research question or hypothesis is too broad, your research will be unfocused and your data will be difficult to analyze and write about. Here is a set of sample research questions:

Vague Research Question: What are the issues affecting people with carpal tunnel syndrome?

Revised Research Question: What muscles in the hand are specifically affected by carpal tunnel syndrome, and how does this affect people's use of pencils and other writing implements?

The first research question above is too vague as to what specific issues the researcher is interested in, and how those issues relate to the device the researcher is designing. The vague research question was also too broad, covering too much ground for a single project. The revised question narrows down the topic to muscles in the hand and their effect on writing. The research question could also be rephrased as a testable hypothesis using deductive reasoning: "Certain muscles in the hand, made weaker by carpal tunnel syndrome, have a direct effect on writing."

A final step in working with a research question or hypothesis is determining what key terms you are using and how you will define them. Before conducting their research, the researchers in the example above will need to define phrases such as "use of pencils" and "writing implements" in order to focus their research and determine how these things might be measured.

A Plan for Primary Research

The research you conduct in a user-centered design project requires that you learn about your identified users to understand the problems these users face and unmet needs they have. This, then, will help you determine the requirements for your design.

To develop your understanding about these issues, you'll conduct primary research. This research might take the form of observations, interviews, and surveys as discussed in Section 1. This section will provide you with several steps to develop a research plan.

Step one. Free write. For five minutes without stopping, write about the information you need to know. This information might be related to your user, your user's reasons for contacting you (i.e., carpal tunnel syndrome), your design, etc.

Step two. Review your freewrite from Step One. Develop research questions. Based on the information you need to know, develop questions to help you focus your research.

Step three. Identify which research methods you can use to help you discover the information you need to know. For example, observations enable you to learn more about your user by watching them in action; interviews help you learn more about your user by asking them specific questions, and surveys help you learn more about a larger population by asking them questions. Additional research methods were described in Section 1.

Step four. Compare the research questions you listed with the research methods you identified, and decide which questions you want to answer using which methods.

Step five. Develop a plan for research. Read Sections 3 and 4 for more details on how to complete your plan. For example, if you're conducting observations, you'll want to create a five-column chart. If you're conducting interviews or a survey, you'll want to develop specific questions.

Step six. Decide on a research population. Your population may consist only of one particular user, or several users, or others who can help you answer your questions. Decide who you will contact for observations, interviews, and/or surveys, and how you will contact them. Here, you'll want to be specific. If you want to interview people with carpal tunnel syndrome, for example, you may want to decide on age, gender, profession, how long they've had carpal tunnel, etc. This will help you to narrow your focus. You may also want to speak to occupational therapists or other experts who will have a different perspective.

Be open to new information

One thing to keep in mind as you conduct your research is that it's important to be open to new information. Each piece of research that you conduct will lead you to new information. This information may differ from what you've already learned about your topic(s), and/or it may lead you in new directions. Each time this happens, it means you're getting closer to your goal of uncovering the truth about your topic, inasmuch as that truth relates to the user's needs. The closer you get to the truth, the closer your design gets to matching what your user needs.

Whenever you uncover new information, ask yourself: How does this information relate to the information my team and I have already uncovered? It may do one of the following things:

Add to information

Your new information will add to information already uncovered if it provides you more details, but doesn't contradict the details you've already learned. In this case, be sure to add this information to your existing database of information. Also, ask yourself: Is there more we can learn from this information? If so, conduct additional research.

For example, let's say that you've already uncovered the fact that a user with carpal tunnel syndrome experiences pain in their hand as they write. Through additional research, you've also discovered that this user may experience numbness in their hand. In this case, you'll probably want to research what causes this numbness and what type of writing implement you might create in order to alleviate this symptom. The fact that carpal tunnel causes numbness doesn't contradict that it causes pain; it adds to the knowledge of symptoms your team has uncovered about carpal tunnel syndrome.

Contradict information

In other cases, you might realize that new information contradicts information your team has already uncovered. In this case, you'll want to conduct new research to check for accuracy. For example, if one resource claims that carpal tunnel affects Muscle X, while another resource claims it affects Muscle Y, and writing affects each muscle differently (so that this new information doesn't add, but instead contradicts), you'll want to discover which muscles are really affected by carpal tunnel syndrome so that you can take them into account when designing your prototype.

The bottom line

The bottom line is that as you and your team conduct research, you'll uncover important facts pertinent to your project. Keep an open mind as you uncover these facts, and use your research to bolster your knowledge to ensure the design works well with the user's needs.

This section contains material taken from:

- Parts of the section "Developing research questions or hypotheses" were taken from [Introduction to Primary Research: Observations, Surveys, and Interviews](https://wac.colostate.edu/books/writingspaces2/driscoll--introduction-to-primary-research.pdf) by Dana Lynn Driscoll, and is used under a [CC-BY-NC-SA 3.0 License](https://creativecommons.org/licenses/by-nc-sa/3.0/).

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3. Tips, models, and templates



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Observing

According to Driscoll (2011):

Observations have led to some of the most important scientific discoveries in human history. Charles Darwin used observations of the animal and marine life at the Galapagos Islands to help him formulate his theory of evolution that he describes in *On the Origin of Species*. Today, social scientists, natural scientists, engineers, computer scientists, educational researchers, and many others use observations as a primary research method.

Observations can be conducted on nearly any subject matter, and the kinds of observations you will do depend on [the purpose of] your research... [1]

Conducting observations

The Oxford Dictionary (2020) defines the term “to observe” in the following important ways:

1. Watch (someone or something) carefully and attentively
2. Take note of or detect (something) in the course of a scientific study [2]

When considering these definitions, a few things stand out:

1. An observer watches carefully and attentively
2. An observer takes note
3. An observer arrives at realizations by detecting, or considering, noted facts

In design thinking, these definitions play an important role. As you begin to consider the design, you’ll want to take note of several things. Such things may include what you’re being asked to build; the users you’re being asked to build it for; and why you’re being asked to build it for those users. Even deeper,

however, you'll want to actually go into the field and observe users to understand how the device you're being asked to build will have an impact on their lives, and why it's important that the users obtain such a device. In this way, you'll begin to understand what steps you need to take in order to build a design which benefits the users in the way intended.

If you are working on a project related to stroke rehabilitation, for example, you might observe a user at their physical therapist's office to get a sense of the kinds of things restricting them from doing what they enjoy. For example, if the user has carpal tunnel syndrome, they may be unable to hold a pen for a prolonged period of time. By observing them at their physical therapist's office, you get a sense of what's important to them and what's restricting them from engaging in these activities.

You might also observe a user as they use prototypes of the design you are developing. You might begin to understand how they interact with this design and what types of modifications you can make in order to make such interactions even more meaningful.

Of course, these are just a few of the observations you might conduct, and a few of the things you might discover when conducting these observations. In any case, you can apply the tips below to get the most from your observations. Remember to focus on observing, not interpreting! See Section 4 for how to capture your observations in a way to minimize bias.

Identifying observation topics through a task breakdown

If you are expecting to observe a particular activity, such as how to use a device or how to complete a task, it can be helpful to do a task breakdown prior to the observation. This can give you specific actions to track in your observations. For example, if you are designing a new device for peeling vegetables and you plan to observe someone doing this in their home, you could first identify the key steps: retrieve their peeler from its storage location, retrieve other tools used, get the vegetables, peel, chop, transfer the peeled and chopped vegetables, cleanup, etc. Creating a task breakdown can also help you identify interview or survey questions to ask.

What to observe

Clearly you will watch how the user performs the steps you identified in the task breakdown. As mentioned in the earlier section, *What is primary research?*, you should also look for workarounds, or adaptations that the user has made, often without realizing it, to make a particular product or situation work for them. Workarounds are a good indication that there is an opportunity to improve the user experience.

In addition to what the user does, take note of the environment and context, as they may impact the user's actions. Frameworks such as AEIOU and POEMS can be helpful reminders of what to observe. For each, the acronyms represent the types of data to collect, and that data is captured in a template. More information can be found in the links below.

- [AEIOU Observation Framework](#) - Activities, Environment, Interactions, Objects, and Users
- [POEMS Template for User Observations](#) - People, Objects, Environments, Messages, and Services

As you use one of these frameworks, or an alternate approach for capturing what you observe, a summary of what to pay attention to and take note is listed below.

- Facial expressions and body language (remember to consider cultural differences and context later in assessing the potential for bias)
- Body positions (such as gripping, leaning, stretching to reach something, etc.)
- Pausing or hesitation
- Unexpected actions or workarounds
- Environmental conditions (sound, lighting, weather, etc.)
- Measurements of space, devices, etc. (where practical)

At any observation, be prepared to capture photos, video and/or audio recordings. Note that you must first get permission before doing this. It is often possible to both capture pictures *and* protect the user's identity. For the carpal tunnel project example described earlier, you could take pictures or video of the user's hands as they write, without including their face or other identifiable features.

You should also be prepared to take measurements that might be relevant to the final design implementation. How big is the user's writing surface? Where might they store a writing aid and how much space is there? For some projects, it is not possible to take measurements. In these cases, you may be able to ask a project stakeholder for images, layouts, schematics, CAD files, or similar, or find some online.

Using online videos for observations

Watching videos, from sources such as YouTube, can be used as a supplement to your primary research, or in cases when it truly isn't possible to observe the people or activities desired for the research project. For example, if you are designing a new cooking surface, or an appliance to be used on a stove, you are likely to do a number of contextual inquiry sessions in people's kitchens, to understand how they interact with their cooking surfaces. You could also consider watching some online cooking videos for additional insights from a broader range of users than you might be able to visit in person.

Videos are better as a supplement to actual observation than as a replacement, as they might not tell the real story. Before making a video, someone might have created a specific setup, such as cleaning their cooking surface and arranging their kitchen to improve the video quality, as opposed to showing how their kitchen looks on a typical day. People also tend to edit videos before posting them, which could eliminate some important details. Have a plan for what you hope to learn, and consider what bias might be present. You might also be able to do some additional observations or interviews with real users to follow up on any insights from online videos.

Writing questions for interviews and surveys

Interviews and surveys are two ways that you can gather information about people's beliefs or behaviors. With these methods, the information you collect is not first-hand (like an observation) but rather "self-reported" data, or data collected in an indirect manner. William Shadish, Thomas Cook, and Donald Campbell argued that people are inherently biased about how they see the world and may report their own actions in a more favorable way than they may actually behave [3]. Despite the issues

in self-reported data, surveys and interviews are an excellent way to gather data for your primary research project.

Survey or interview?

How do you choose between conducting a survey or an interview? It depends on what kind of information you are looking for. You should use surveys if you want to learn about a general trend in people's opinions, experiences, and behavior. Surveys are particularly useful to find small amounts of information from a wider selection of people in the hopes of making a general claim. Interviews are best used when you want to learn detailed information from a few specific people.

Writing good questions

One of the greatest challenges in conducting surveys and interviews is writing good questions. As a researcher, you are always trying to eliminate bias, and the questions you ask need to be unbiased and clear. Here are some suggestions on writing good questions:

Ask about one thing at a time

A poorly written question can contain multiple questions, which can confuse participants or lead them to answer only part of the question you are asking. This is called a "double-barreled question" in journalism. See how the following poor question was revised to be more effective:

Poor question: What kinds of problems are being faced in the field today and where do you see the search for solutions to these problems going?

Revised question #1: What kinds of problems are being faced in the field today?

Revised question #2: Where do you see the search for solutions to these problems going?

Avoid leading questions

A leading question is one where you prompt the participant to respond in a particular way, which can create bias in the answers given:

Leading question: The economy is clearly in a crisis, wouldn't you agree?

Revised question: Do you believe the economy is currently in a crisis? Why or why not?

When asking questions in person or through virtual meeting software, be aware of your body language and facial expressions. Maintaining a sort of visible neutrality will help you avoid a type of response bias, where respondents adjust what they say based on perceived approval or disapproval from the interviewer or others.

Understand when to use open and closed questions

Closed questions, or questions that have yes/no or other limited responses, should be used in surveys. However, avoid these kinds of questions in interviews because they discourage the interviewee from going into depth. The question sample above, "Do you believe the economy currently is in a crisis?" could be answered with a simple yes or no, which could keep a participant from talking more about the issue. The "why or why not?" portion of the question asks the participant to elaborate. On a survey, the question "Do you believe the economy currently is in a crisis?" is a useful question because you can easily count the number of yes and no answers and make a general claim about participant responses.

Write clear questions

When you write questions, make sure they are clear, concise, and to the point. Questions that are too long, use unfamiliar vocabulary, or are unclear may confuse participants and you will not get quality responses. Consider your word choice carefully. Use precise words and review your questions carefully to ensure they can't be misinterpreted in some way. This is especially important with written questions, where you can't clarify or correct your question on the spot.

For surveys, just as important as question creating is answer choice creation. Answer choices must follow all the same guidelines as questions in terms of precision, neutrality, and clarity. They must also reflect options that will resonate with the entirety of your target user group, not just a subset of the group that most resembles your own demographic profile. This may seem obvious, but it can be quite difficult to recognize one's own assumptions.

If you find your list of answer choices is getting lengthy or unwieldy, you probably need to craft your question differently. See [Appendix A](#) for a comprehensive guide to planning and writing surveys. You can also see some additional examples in the blog, "[How to craft interviews for breakthrough insights](#)," by Jason Amunwa.

Face-to-face and virtual interviews

When interviewing, you have a choice of conducting a traditional, face-to-face interview or an interview using technology over the Internet. Face-to-face interviews have the strength that you can ask follow-up questions and use non-verbal communication to your advantage. Individuals are able to say much more in a face-to-face interview than in an email, so you will get more information from a face-to-face interview. However, the Internet provides a host of new possibilities when it comes to interviewing people at a distance. You may choose to do an email interview, where you send questions and ask the person to respond. You may also choose to use a video or audio conferencing program to talk with the person virtually. If you are choosing any Internet-based option, make sure you have a way of recording the interview. You may also use a chat or instant messaging program to interview your participant – the benefit of this is that you can ask follow-up questions during the interview and the interview is already transcribed for you.

In a qualitative interview, the researcher usually develops a guide in advance that he or she then refers to during the interview (or memorizes in advance of the interview). An interview guide is a list of topics or questions that the interviewer hopes to cover during the course of an interview. It is called a guide because it is simply that – it is used to guide the interviewer, but it is not set in stone. Think of an interview guide like your agenda for the day or your to-do list – both probably contain all the items you hope to check off or accomplish, though it probably won't be the end of the world if you don't accomplish everything on the list or if you don't accomplish it in the exact order that you have it written down. Perhaps new events will come up that cause you to rearrange your schedule just a bit, or perhaps you simply won't get to everything on the list.

Interview guides should outline issues that a researcher feels are likely to be important, but because participants are asked to provide answers in their own words, and to raise points that they believe are important, each interview is likely to flow a little differently. While the opening question in an in-depth interview may be the same across all interviews, from that point on what the participant says will shape how the interview proceeds. This, I believe, is what makes in-depth interviewing so exciting. It is also what makes in-depth interviewing rather challenging to conduct. It takes a skilled interviewer to be able

to ask questions; actually listen to respondents; and pick up on cues about when to follow up, when to move on, and when to simply let the participant speak without guidance or interruption.

As you might have guessed, interview guides do not appear out of thin air. They are the result of thoughtful and careful work on the part of a researcher. As you can see in both of the preceding guides, the topics and questions have been organized thematically and in the order in which they are likely to proceed (though keep in mind that the flow of a qualitative interview is in part determined by what a respondent has to say). Sometimes qualitative interviewers may create two versions of the interview guide: one version contains a very brief outline of the interview, perhaps with just topic headings, and another version contains detailed questions underneath each topic heading. In this case, the researcher might use the very detailed guide to prepare and practice in advance of actually conducting interviews and then just bring the brief outline to the interview. Bringing an outline, as opposed to a very long list of detailed questions, to an interview encourages the researcher to actually listen to what a participant is telling her. An overly detailed interview guide will be difficult to navigate through during an interview and could give respondents the misimpression that the interviewer is more interested in her questions than in the participant's answers.

When beginning to construct an interview guide, brainstorming is usually the first step. There are no rules at the brainstorming stage – simply list all the topics and questions that come to mind when you think about your research question. Once you've got a pretty good list, you can begin to pare it down by cutting questions and topics that seem redundant and group like questions and topics together. If you haven't done so yet, you may also want to come up with question and topic headings for your grouped categories. You should also consult the scholarly literature to find out what kinds of questions other interviewers have asked in studies of similar topics. As with quantitative survey research, it is best not to place very sensitive or potentially controversial questions at the very beginning of your qualitative interview guide. You need to give participants the opportunity to warm up to the interview and to feel comfortable talking with you. Finally, get some feedback on your interview guide. Ask your friends, family members, and your professors for some guidance and suggestions once you've come up with what you think is a pretty strong guide. Chances are they'll catch a few things you hadn't noticed.

In terms of the specific questions you include on your guide, there are a few guidelines worth noting. First, try to avoid questions that can be answered with a simple yes or no, or if you do choose to include such questions, be sure to include follow-up questions. Remember, one of the benefits of qualitative interviews is that you can ask participants for more information – be sure to do so. While it is a good idea to ask follow-up questions, try to avoid asking "why" as your follow-up question, as this particular question can come off as confrontational, even if that is not how you intend it. Often people won't know how to respond to "why," perhaps because they don't even know why themselves. Instead of "why," I recommend that you say something like, "Could you tell me a little more about that?" This allows participants to explain themselves further without feeling that they're being doubted or questioned in a hostile way.

Also, try to avoid phrasing your questions in a leading way. For example, rather than asking, "Don't you think that most people who don't want kids are selfish?" you could ask, "What comes to mind for you when you hear that someone doesn't want kids?" Or rather than asking, "What do you think about juvenile delinquents who drink and drive?" you could ask, "How do you feel about underage drinking?" or "What do you think about drinking and driving?" Finally, as noted earlier in this section, remember to keep most, if not all, of your questions open ended. The key to a successful qualitative interview is giving participants the opportunity to share information in their own words and in their own way.

Surveys

Other than the fact that they both involve asking people questions, interviews and surveys are quite different data collection methods. Creating a survey may seem easy at first, but developing a quality survey can be quite challenging. When conducting a survey, you need to focus on the following areas: survey creation, survey testing, survey sampling, and distributing your survey.

Survey creation: length and types of questions

One of the keys to creating a successful survey is to keep your survey short and focused. Participants are unlikely to fill out a survey that is lengthy, and you'll have a more difficult time during your analysis if your survey contains too many questions. In most cases, you want your survey to be something that can be filled out within a few minutes. The target length of the survey also depends on how you will distribute the survey. If you are giving your survey to other students in your dorm or classes, they will have more time to complete the survey. Therefore, five to ten minutes to complete the survey is reasonable. If you are asking students as they are walking to class to fill out your survey, keep it limited to several questions that can be answered in thirty seconds or less.

Use closed questions to your advantage when creating your survey. A closed question is any set of questions that gives a limited amount of choices (yes/no, a 1–5 scale, choose the statement that best describes you). When creating closed questions, be sure that you are accounting for all reasonable answers in your question creation. For example, asking someone “Do you believe you eat healthy?” and providing them only “yes” and “no” options means that a “neutral” or “undecided” option does not exist, even though the survey respondent may not feel strongly either way. Therefore, on closed questions you may find it helpful to include an “other” category where participants can fill in an answer. It is also a good idea to have a few open-ended questions where participants can elaborate on certain points or earlier responses. However, open-ended questions take much longer to fill out than closed questions, and generate results that are more difficult to analyze.

Survey creation: testing your survey

To make sure your survey is an appropriate length and that your questions are clear, you can “pilot test” your survey. Prior to administering your survey on a larger scale, ask several classmates or friends to fill it out and give you feedback on the survey. Keep track of how long the survey takes to complete. Ask them if the questions are clear and make sense. Look at their answers to see if the answers match what you wanted to learn. You can revise your survey questions and the length of your survey as necessary.

Sampling and access to survey populations

“Sampling” is the term used in research to refer to the group of people who will be included in your survey, interviews, or other research activities. You need to identify both your target population and how you will reach them, and also consider how likely they are to respond to your survey. You might choose to use physical survey forms in a classroom or building entrance, or create an interactive scenario, such as passers-by dropping a token into one of three bins representing which issue concerns them the most, or you might create an online survey. The number and diversity of respondents will vary greatly across these approaches.

Each of these methods for selecting a sample population introduce bias. Watch [this brief video](#) to learn more about common sampling bias pitfalls, and [this one](#) for some ideas on avoiding these pitfalls. You might not be able to eliminate all bias in your survey sample. This is fine in the context of your

undergraduate course; it is hard to do even for professional researchers. But it is important to be aware of the bias present in your sample selection, not only so you can document it as a limitation in your research report, but so you develop habits of mind that will impel you to seek unbiased sampling methods in future research in your schooling and career.

Implicit bias is also an ever-present issue to take steps to avoid. Even science-based researchers and practitioners inadvertently bring in personal and cultural biases to their work. Two ways to reduce implicit bias in your survey are a) write good survey questions and answer choices, and b) proactively work to ensure racial, ethnic, gender, and socioeconomic diversity in your sample.

Let's look at a couple examples for proactively inviting diversity. Imagine you want to survey people who are at risk of carpal tunnel syndrome due to their work. You might have easy access through family members to a population of office workers. But garment workers, electricians, and musicians are also at risk for this syndrome, and might have different sets of circumstances related to treatment, task switching, and other factors.

Or perhaps you want to survey engineering undergrads. You could post notices around your engineering building and library. But you could also reach out to student groups at your university such as the National Society for Black Engineers (NSBE), Society for Women Engineers (SWE), and others.

See [Appendix A](#) for a comprehensive guide to planning and writing surveys.

This section contains material taken from:

- Parts of the section “Writing questions for virtual surveys” and the first four paragraphs of the Surveys section are taken from [Introduction to Primary Research: Observations, Surveys, and Interviews](#) by Dana Lynn Driscoll , and is used under a [CC-BY-NC-SA 3.0 License](#).
- All but the first paragraph of the section “Face-to-face and virtual interviews” is taken from [Principles of Sociological Inquiry: Qualitative and Quantitative Methods](#) by Saylor Academy and is used under a [CC-BY-NC-SA 3.0 License](#).

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- [1] D. L. Driscoll, “Introduction to Primary Research: Observations, Surveys, and Interviews,” Writing Spaces, 2011. Accessed: 20 Aug. 2020. [Online]. Available at: <https://wac.colostate.edu/books/writingspaces2/driscoll--introduction-to-primary-research.pdf>
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4. Mitigating bias in your observation notes



Photo by [Felipe Furtado](#) on [Unsplash](#)

As you engage in observation, you'll want to ensure that you focus on the details and the facts. According to Driscoll (2011):

[T]he ethical concern of being unbiased is important in recording your observations. You need to be aware of the difference between an observation (recording exactly what you see) and an interpretation (making assumptions and judgments about what you see). When you observe, you should focus first on only the events that are directly observable. [1]

Driscoll (2011) gives the following entries in an observation log as an example:

1. The student sitting in the dining hall enjoys his greasy, oil-soaked pizza. He is clearly oblivious of the calorie content and damage it may do to his body.
2. The student sits in the dining hall. As he eats his piece of pizza, which drips oil, he says to a friend, "This pizza is good." [1]

What are your thoughts about each of these entries? Is one entry more biased than the other?

Let's look at the entries one-by-one. Driscoll (2011) points out that in the first entry, "the observer makes assumptions about the internal state of the student when she writes 'enjoys' and 'clearly oblivious to the calorie content'" [1, p. 161]. However, the observer doesn't detail what she actually knows about the pizza's nutritional value or how she knows that the student is enjoying the slice.

In the second entry, the observer includes only the observable details and facts.

As you record your observational notes, you'll want to be careful to include only details and facts. Otherwise, you might incorporate bias into your notes, making it difficult to understand the situation in its organic truth.

One way to guard against bias is to create a five-column observational chart which gives you room to include your own thoughts and perceptions, so that you can later evaluate your thoughts and perceptions and determine whether they're valid and important for your design. Such an observational sheet might look like this:

Table 3.1 Observation notes on student eating pizza

Details of observation	Knowledge making	Knowledge re-making	Internal biases	Things to consider
Student sat at table with a slice of pizza that was cheesy and gooey	The pizza might have looked appealing to the user	Maybe students don't pay attention to calorie content	I pay attention to calorie content, so I notice when others don't.	<p>There could be another reason this student isn't paying attention. Maybe they always do, but have chosen to give themselves a day off from nutritional food.</p> <p>Have I checked the menu? Maybe it is limited this time of day, or the pizza is more affordable than other items on the menu.</p> <p>I wonder how familiar the student is with this pizza -- maybe they usually eat elsewhere.</p>
Pizza dripped with grease	That student is eating a lot of grease	Or to nutritional value	And I make sure to only eat foods with less than 4 ingredients	
Student smiled and took a bite	They seem to like it, though.	This student seems oblivious to how bad that pizza is for them	I judge others who eat things that are bad for them	
Grease dribbled down student's chin	A LOT of grease	REALLY oblivious	I REALLY judge others who eat things that are bad for them	
Student said, "This pizza is good."	But it makes them happy.	This student likes greasy foods	I can't understand why	

Let's consider each of these columns in detail.

Details of observation. In this column, the observer only wrote down details and facts. This enables them to draw upon these details and facts when writing up their report. By eliminating personal opinions, it reduces bias in the report, and can allow others to potentially identify additional insights or questions.

Knowledge making. In this column, the observer thought more deeply about the details and facts of their observation. They formed new knowledge based on what they observed. This, then, enabled them to take their details a step further by forming conclusions from those details.

Knowledge re-making. In this column, the observer reflected even deeper into their conclusions. They began to form hypotheses.

Internal biases. In this column, the observer checked their hypotheses for bias. They began to understand that some of their hypotheses may be unfounded, or may be infused with bias, thus weakening their standing.

Things to consider. In this column, the observer considers their biases and begins to understand there may be other reasons this student is eating a gooey slice of pizza. Herein, then, is an unknown: The researcher realizes that there's more they need to learn about this situation. They reevaluate what they know, and formulate next steps for research. Perhaps the researcher will want to conduct an interview with this student and others in order to find out more. The researcher might have new questions to ask as a result of examining their biases, such as what, when, and where the student typically eats and the importance of cost in making selections.

Now let's apply this situation to design by using another example. Let's return to an example of a user who has carpal tunnel syndrome.

Table 3.2 Observation notes on user trying to write

Details of observation	Knowledge making	Knowledge re-making	Internal biases	Things to consider
User's hand shakes when they hold a pencil.	User seems to have difficulty holding a pencil.	Maybe the pencil is too small for user's large hand.	My hand is small, so maybe I'm misjudging how big user's hand is.	I'm really not sure whether user always has trouble holding pencils, or maybe if it's just this pencil. I also understand that I can be judgmental because I have such good penmanship.
User corrects their grip by pushing the pencil further into their fist.	User seems to be working hard to hold the pencil in their grip.	Maybe user needs to relearn how to hold a pencil.	I have really good penmanship, so I don't understand when others can't hold pencils right.	To bolster my knowledge, I'll conduct an interview with user and have user demonstrate with other pencils of varying sizes. Maybe "not giving up" actually aggravates the problem. The fact that I've never had chronic pain is making it a little hard for me to empathize.
User's writing is wobbly.	User seems unable to write legibly.	Maybe user's handwriting is always illegible, even without carpal tunnel.	See above	
User sighs and tosses pencil onto the table without finishing their letter.	User seems frustrated and gives up.	User is impatient and gave up too easily.	I don't really understand what it's like to have carpal tunnel, so I'm judging user.	

In this example, the researcher realizes that there's more they need to know about carpal tunnel syndrome – not only the mechanics of the syndrome, but its psychological and lifestyle implications. As such, they choose to conduct a contextual inquiry where they have the user demonstrate their grip with writing implements of various sizes and ask the user questions about the effects carpal tunnel has had on their everyday life.

This section contains material taken from:

- [Introduction to Primary Research: Observations, Surveys, and Interviews](#) by Dana Lynn Driscoll, and is used under a [CC-BY-NC-SA 3.0 License](#).

References

[1] D. L. Driscoll, "Introduction to Primary Research: Observations, Surveys, and Interviews," Writing Spaces, 2011. Accessed: 20 Aug. 2020. [Online]. Available at: <https://wac.colostate.edu/books/writingspaces2/driscoll--introduction-to-primary-research.pdf>

5. Documenting Primary Design Research

After you've completed your research, you should document it thoroughly and as quickly as possible, as your memory may be altered if you wait too long. You should also document the implications for the next stage in your design process in a primary research summary. In this way, you create a framework for justifying the elements of your prototype. As you've learned, it isn't enough to create a prototype; you must also explain why or take note about the justifications for each element of the design. By doing so, you not only provide reasoning about why your ideas are sound; you also enable others to replicate and build upon your ideas.

The research you conduct builds upon your knowledge of the design challenge, problems users face, and unmet needs they have. This may include surveys, observations, and interviews, among other forms of primary research. Some of this research might happen in person (e.g. with clients, users, family members, friends, or roommates you are currently living with) and some will happen remotely.

As you research, you'll want to gain answers to the following questions to be included in the documentation:

- What are you planning to do for primary research in the initial information-gathering phase? Start with an overview (e.g. Our primary discovery research will include a questionnaire, in-person observation, and remote short interviews.). Then go into specifics (e.g. The questionnaire will be distributed as a Google Form to 18- to 22-year-old college students on the Facebook groups [name the groups], and will include the following questions). Justify these plans.
- Who are your users or research subjects for each piece of this research? Justify your choice of users/research participants.
- How will you gain consent from your users to use their data? Will you be recording any interviews? Will you be collecting identifying information with surveys? Justify your choices here too.
- Is there any specific guidance you would like from your professors and other design teams in the class as you prepare for this research? What questions, concerns, or uncertainties do you have about this research?

Once you have this information, you'll want to categorize your information. For example, if some of your information focuses on the user's difficulty with writing, that can go under a category titled DIFFICULTY WITH WRITING. Under this category, you might include observations that you made about why and when the user faces difficulty with writing; interview answers which detail why a patient with carpal tunnel might have difficulty with writing, etc.

Once you have your information grouped by category, be sure to summarize the results in each category. This will provide your team with a brief overview of your results, which they can draw from as they develop the prototype and write the report. Your summaries should be methodical and thorough.

After you've summarized the results of each category, you'll need to incorporate those results into a testing report. Using the framework of a formal testing report can be extremely helpful. The components of a formal report are the introduction, methodology, results, and discussion.

Introduction. Purpose for doing the research. What are you trying to learn, and what is the context for wanting to learn it?

Methodology. How are you doing the research? The methodology includes your research tools (e.g., naturalistic observation; in-person interview; survey distributed via Google Docs) user or user group(s) (e.g., a middle-aged man with carpal tunnel syndrome; a sample of 100 college students recruited from specific Facebook groups), materials, and the time and date/date range you did the research.

Results. What did you learn? The results section includes only the raw data you collected. You are not doing analysis or pulling out implications yet. This is where you'll include the summaries you created for each category.

Discussion. The discussion is your analysis and conclusions, and also includes any limitations present during the testing.

If you are using more than one research method in the same session, make sure you detail each, and make clear which results belong to which method. For example, you might visit someone who has carpal tunnel and observe them using their home office space; while there, you might ask them questions and take measurements related to their desk set-up. Make sure, in your notes and your summary, that you identify what was learned through observation, what was learned through interview/conversation, and what was learned through measurement.

If you are doing multiple distinct research sessions (for example you survey people with carpal tunnel syndrome, and you also do an expert interview with an occupational therapist), it might be clearer to write a separate methodology and results section for each. You might have separate discussion sections for each methodology, or you might write one synthesizing discussion that pulls out important points, patterns, and implications from the research as a body.

Visual communication is an essential component of your primary research results. In your results section, include plenty of photos and/or sketches to help your reader understand, and you remember, what you observed. Generate surveys and tables to illuminate your survey results. In your discussion section, include a primary research table that pulls out key takeaways, their implications, and potential next steps in the context of your design process. Make sure to properly label your figures and tables, and to reference them in the text so the reader knows when and why to look at them.

Appendix A - Survey Planning Guide

To write and distribute your survey, first carefully read the information about surveys and sample populations in [the DTC resource].

Set the groundwork

Who are your target respondents? Which of your various user groups and stakeholders is your survey aimed at? Be clear about who you have in mind so you succeed in collecting the information you need.

What questions are you trying to answer? Keeping specific goals in mind will help you write questions – and answer choices – that yield the information you need without getting intrusive or lengthy.

How will you access your sample population? Strive to reach beyond a convenience sample.

- Watch this [short and useful video](#).
- Proactively seek to reduce implicit bias by seeking out user groups that are commonly underrepresented in research (while it varies by topic, this generally includes racial and ethnic minorities, women, and, for the type of research you are doing, non-students).
- Think about in advance and write with thought the text you will use to ask people to take part.

What are you using to build your research instrument? Google Forms (free) works great for the type of research you are doing. Other options are SurveyMonkey (free for brief surveys) and Qualtrics (you may have free access through your learning institution).

Know how to write survey questions

Here are a few common types. For examples and more types, look at this [brief and readable resource](#) from SurveyMonkeys.

- **Single-answer multiple choice.** Use for clear, relatively simple questions. This type of question is useful for filtering and sorting the data you collect. [example]
- **Multiple-answer multiple choice.** Respondents can choose more than one answer in a list.
- In both types of multiple choice, decide whether an “other” choice with a short-answer line is needed.
- **Ranking.** Respondents rank answer choices according to a specific factor, such as most to least frequent or most to least preferred. Make sure the word or phrase you choose to describe the factor is precise, clear, and can’t easily be misinterpreted.
- **Rating.** Respondents rate answer choices on a scale, for example, 1 to 10. Make sure you define your scale, e.g., “Rate the following hat styles on a scale of 1 to 10, where 1 means you would never wear it and 10 means you would definitely wear it.”
- **Comparison.** This is a form of multiple choice, but it’s helpful to point out for the type of research you will be doing. You can suss out user preferences and perceptions more easily with comparison questions sometimes than with a list of abstract ideas. Example: “Two travel cups are identical except one is totally recyclable and costs \$5 more. Which one would you buy?”

Write your questions and answer choices

A survey should be as brief as possible, but it is also your last best chance to collect the information you need (relatively few respondents will respond to a second, follow-up survey). Below are some tips; you can also read [this brief and readable article](#) from Qualtrics about common pitfalls to avoid.

Collect relevant demographic/background information. Think carefully in advance about what demographics are relevant to your research questions. Demographics can be very helpful for analyzing data later, but there is no need to collect personal data if it is unnecessary for analysis.

Strive for equity and dignity in your data collection categories and in your language. If you need to know age, offer checkboxes with ranges instead of requiring an exact age. If you need to know gender, offer choices other than male and female (for example “non-binary” and “other”). If you need to know income level, ask respondents about “income level,” not “class.” For race and ethnicity data, carefully consider what needs to be captured and why, and do research on how [link needed], as these demographics can be multilayered.

Be precise and thoughtful in what you are asking respondents to assess. Make sure you are only asking them about one feature or factor in each question.

Think carefully about when and why to ask open-ended questions. This will make your analysis job vastly easier and more reliable. Open ended questions are messy and time-consuming for analysis, and you will find yourself forced to interpret people's meaning. That said, open-ended questions can yield a lot of information.

Follow up as many questions as you can with “Why.” You will get much more insight into respondents’ perspectives and reasoning. Some “Why” questions can be answered through multiple choice answers or a checklist – use analyzable sources like that if possible. But be cognizant that you may accidentally silence people’s experiences through your choice of answers; include “Other” with a short-answer line.

Avoid asking the same things in an interview that you would in a survey. Interviews are a deeper dive and more of a commitment for the respondent; you get less breadth of information, but more depth. Use these differences to your advantage.

Be precise in your language. When you ask how “easy” something is, are you talking about how much strength is needed? Knowledge? Familiarity? How intuitive is it?

Ask one question per survey item. For example, “Do you feel pogo sticks are too dangerous or silly to use as a method of transport?” is two different questions, if you’re trying to determine which of those two reasons people don’t like pogo sticks, and is actually a leading question, if you are trying to determine why people don’t use them

Ask precise questions, always keeping in mind what you are trying to learn. For example, “Would you be willing to train for a half marathon” might not be enough information for your project. You might benefit from following up with questions about the most important factors leading to a Yes or No answer.

Test the survey

Have someone take your survey and flag any parts that give them pause. Revise the survey and test it again.

Prepare to distribute

Write an introduction to your survey to tell people in a sentence or two its purpose, its content, and how long it will take.

Thank people at the end of the survey.