A Guide to Technical Communications: Strategies & Applications

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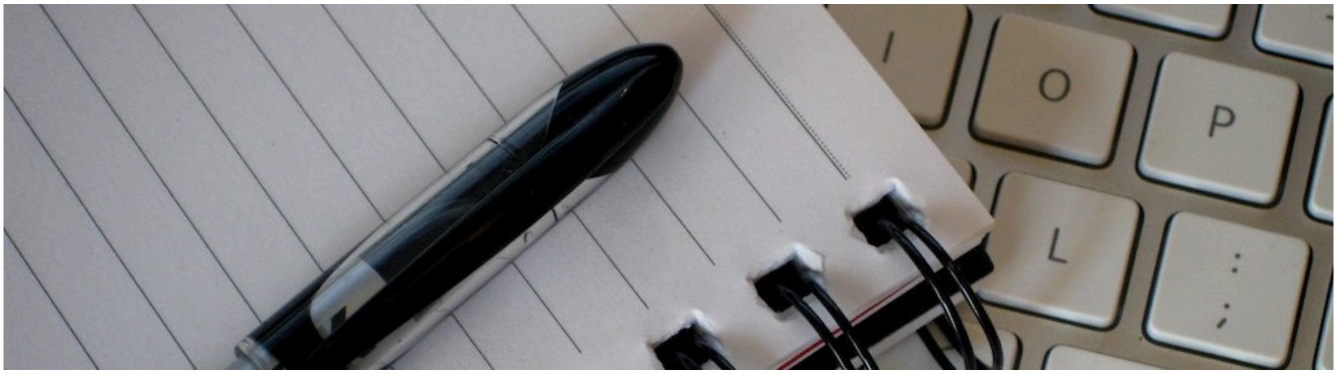
Introduction



Welcome!

Welcome to the textbook for Engineering Technical Communications courses at The Ohio State University. Our aim in writing this textbook was to create a resource specifically focused on and applicable to the kinds of communication skills most beneficial to the students who take our courses. Therefore, this textbook focuses on developing both technical and professional communication skills and will help readers practice strategies for critically analyzing audiences and contexts, real-world applications of rhetorical principles, and skills for producing documents (reports, proposals, instructions), presentations, videos, and wide variety of other professional communications.

References

Header Image: “Writing Tools” by Pete O’Shea / CC BY

What is Technical Communications?

At its most basic, communication is the transmission of information in the form of words, images, and sounds. We string words, images, and sounds together to make meaning and to share that meaning with others. How we form the "strings" depends on audience and context. For instance, how we talk, text, or email our friends and personal acquaintances is usually different than how we communicate with our bosses or coworkers.

You might be asking yourself how a technical communications class is different from other academic writing classes. In a traditional academic setting, the writing classroom tends to be about the demonstration of knowledge—expanding on ideas or documenting an understanding of traditional types of papers or essays (explanatory, argumentative, reflective) with the audience being the instructor. In a technical communication classroom, many of the principles are similar—organizing paragraphs effectively, following the writing process—but with an increased focus on the professional context for communicating information and, therefore, even more emphasis on concision, clarity, and accessibility.

Ultimately, the goal of technical communication is to transmit important information as effectively and efficiently as possible—information that allows you and the people around you to do your jobs well.

The other way that technical communications might differ from your concept of a traditional writing class is that it is not limited only to "writing." Part of transmitting information effectively is recognizing that we have many options for how we can communicate with our audiences. There are, of course, important written forms, such as reports, emails, proposals, and instructions, but you will also need to use visual and oral modes, such as presentations, videos, infographics, or diagrams. Further, web and social media offer professionals even more opportunities to communicate in a wide variety of formats. An effective communicator knows when and how to strategically deploy (or blend) these modes depending on audience and desired response.

The most important "strategy" emphasized in this textbook is that all communication must be designed with audience and purpose in mind. There are almost endless types of documents and forms of communication that will be at your disposal as a professional. In addition to knowing **what** you are communicating (the information, your expertise), you, the communicator, must thoughtfully consider **who** you are communicating to (your audience) and **why** you are communicating (the purpose).

Why is communication so important?

If you asked a professional to tell what they *really* spend their time doing, you might be surprised to learn that most of their workday is spent communicating. In a professional environment, communication becomes a thread that ties together your expertise, your duties, and your professional relationships. It allows you to first get a job and then perform your job well by fulfilling your duties, learning new skills, and maintaining good working relationships with your colleagues.

Sometimes incredibly knowledgeable people forget to consider the **who** and **why**, focusing only on the **what**, and this can lead to gaps in communication.

Imagine sitting in a lecture on particle physics when you don't know an electron from a proton. The professor speaks rapidly and offers no pauses for questions from the classroom and assumes that every student, in every seat, is receiving and processing the lecture in the exact same way. As a student, you would feel lost and your focus would be on trying to keep up rather than assimilating any new knowledge on the subject. This professor, in assuming everyone had the same knowledge base, has caused a gap in communication because of a lack of audience awareness. One of the basic tenets of being an effective communicator is to know how to avoid these communication gaps. By understanding an audience's makeup (education level, background knowledge, values, needs, etc.) and developing communication—in whatever form it may be—we can minimize the possibility of communication failure.

Engineers, especially, must be able to communicate within their teams and also be able to communicate complex information to a variety of audiences with different knowledge backgrounds. As Stephen Pinker (2014) explains,

> The curse of knowledge is the single best explanation of why good people write bad prose. It simply doesn't occur to the writer that her readers don't know what she knows—that they haven't mastered the argot of her guild, can't divine the missing steps that seem too obvious to mention, have no way to visualize a scene that to her is as clear as day. And so the writer doesn't bother to explain the jargon, or spell out the logic, or supply the necessary detail.

Essentially, anyone who has developed a specific area of expertise needs to be mindful that not everyone around them knows the same information or even sees the world in the same way. Part of being an effective communicator means recognizing that the process of communicating information is dynamic and creative and being sensitive to your audience's needs and understanding.

Ultimately, the goal of this textbook is to help you develop the tools and critical thinking skills you need to be an effective communicator in your professional life. While we do address specific, common types of workplace documents, it is important to know that the types of communicating you will do in your professional life will evolve and change over time. For instance, people who began their careers in the 1980's likely did not consider email writing an important skill, but today it is one of the most-used genres of workplace communication. Whatever happens in the future, a nuanced, audience-focused communication strategy will allow you to evolve and thrive. This textbook is a foundation to help you develop an awareness of the adaptability of communication.

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Rhetorical Foundations

Rhetorical Foundations

Structures, in order to remain standing, must be built on strong foundations. Like a building, communication must be built with a strong foundation in order to be effective. We build this foundation with an understanding of what Aristotle defined as the "available means of persuasion." This next chapter offers some basic tools for building effective communications.

References

Header Image: Untitled Photo by bogitw / CC0

What is Rhetoric?

Rhetoric is the ancient art and science of persuasion, the study of persuasion, and the individual process of persuasion. Unfortunately, in the 21st century, rhetoric tends to be positioned as something separate from everyday communication. However, all human activities are rhetorical, whether or not we are conscious of it.

Rhetoric is about strategic choices and approaches to communication whether textually, verbally, or even aurally and visually. When we communicate to different types of audiences about the same topic, we make strategic decisions on what details to include or omit, what types of evidence or support to use, and so on.

For example: let's imagine that you spent a little bit of time last weekend studying but mostly party-hopping and celebrating because your school's football team won the championship.

- When you speak to your **best friend** about your weekend, you are likely to provide details about how many parties you went to and what exactly you did at the parties, including gossip about mutual friends.
- When you speak to **your grandmother** about that same weekend, you might mention your study group meeting on Sunday afternoon, the take-out dinner you had on Friday night, and perhaps briefly mention that you celebrated the team's win with friends.
- When you speak to **your supervisor** at your on-campus job, you are likely to discuss the big football win (Go Team!), your looming exam schedule and how your study and exam schedule will impact your availability to work for the rest of the term.

All versions are accurate representations of your weekend, but you make strategic choices about which details to include or not include based on the particular **rhetorical situation** of your discussion. That is, how and what you communicate is shaped by:

- The writer, author, creator, also known as the **rhetor**
- The **audience**, including primary, secondary, and tertiary audiences
- The **topic** of the communication
- The **purpose**, which often can be broken into a primary, secondary, and tertiary purpose
- The **context** and **culture** within which the communication is taking place.

The context and culture impact the rest of the rhetorical situation (rhetor, audience, topic, purpose).

The three rhetorical appeals, as discussed by Aristotle are **ethos**, **pathos**, and **logos**. These three appeals are guided by **kairos**, which is about timing. The three appeals may be used alone, but arguments are most effective when they combine appeals to ethos, pathos, and logos, with strong grounding in kairos or timeliness.

Ethos: a Greek word for character, ethos is an appeal to character, especially authority and expertise. Ethos is often mistaken as an appeal to ethics. Though ethics are an aspect of a person's or organization's ethos, ethics are not the only component of character, authority, or expertise.

Celebrity and other endorsements are often based on ethos. Ethos is why an American Dental Association endorsement of a toothpaste is more powerful and generally holds more sway than an endorsement from a non-medical professional. At the same time, though, ethos as it relates to advertising is bit complex. Sometimes people or organizations will have strong ethos not because they are professionals in a given field (such as dentistry) but because they may they demonstrate the ideal results or benefits of a product.

Let's take Sofia Vegara, for example. Vegara is a popular actor due to her role on the sitcom Modern Family. Her ethos as one of the world's most beautiful people makes her an especially useful spokesperson for an array of personal care products, in part because she is known not only as an actor but as an attractive person. It is no surprise that she is a spokesperson for a variety of cosmetic and personal products, from Cover Girl makeup to Head and Shoulders shampoo. The latter product, though, is really where her ethos shines. Head and Shoulders is a dandruff shampoo, and generally, flaky scalp is not associated with beauty. By having Vergara star in Head and Shoulders' commercials, and further, having Vergara happily admit that her family has been using Head and Shoulders for over 20 years, the company relies on Vergara's ethos as a confident, beautiful woman to combat embarrassment that some people (perhaps particularly women) may feel when faced with their own dandruff and flaky scalp and the need for a medicated shampoo. Vergara's emphasis on how long her family has used Head and Shoulders even suggests that perhaps some of Vergara's success in the beauty arena is due to Head and Shoulders.

Pathos: originally, pathos described appeals to audiences' sensibilities. Modern uses of pathos generally means an appeal to emotions, both positive and negative. A rhetor may appeal to emotions that an audience already has about a subject, or a rhetor may elicit emotions.

> The Emotions are all those feelings that so change men as to affect their judgements, and that are also attended by pain or pleasure. Such are anger, pity, fear and the like, with their opposites. We must arrange what we have to say about each of them under three heads. Take, for instance, the emotion of anger: here we must discover (1) what the state of mind of angry people is, (2) who the people are with whom they usually get angry, and (3) on what grounds they get angry with them. (Aristotle, 1378)

As Aristotle argues, emotions are central to our decision making, even if we are not consciously aware of it. If a rhetor desires to persuade a particular audience, then the rhetor must understand the ruling emotions regarding the topic and the specific audience. What makes the audience angry (or pleased), who or what is involved in producing or evoking that emotional state, and why does that particular audience become angry (or pleased) within a specific context? Knowing the answers to these questions will help a rhetor better prepare an argument and provide a basis for developing evidence and identifying counterarguments.

Pathos appeals can sometimes be overwhelming and dominate an argument because emotions in general can be overwhelming. When emotions are strong enough, they can overtake logic and reason. Political campaigns are excellent examples of pathos appeals. Political ads often play on the fears and hopes of different demographics. For example, a political ad focused aimed at retired and elderly voters may claim that a candidate plans on eliminating social support programs such as Medicare or will drastically cut Social Security benefits. These types of ads do not need to contain facts or evidence of such actions to be useful and successful because they rely on the fears and worries that the intended audience already has about financial and medical security.

Remember, pathos is about the emotional state of the audience, not the rhetor.

Logos: an appeal to logical reason, logos is about the clarity, consistency, and soundness of an argument, from the premise and structure to the evidence and support. A rhetor appeals to logos by making reasonable claims and supporting those claims with evidence, such as statistics, other data, and facts. However, Logical and reasonable arguments and evidence are not universal across audiences, contexts, cultures, and times. What an audience considers reasonable claims and adequate evidence is influenced by an audience's values and beliefs. Further, data and facts may evolve over time as we obtain more evidence, information, and data.

For example, some people believe the Federal Drug Administration is part of a conspiracy to cover up evidence that common vaccines cause a variety of neurological, psychological, and physical disorders, despite extensive scientific evidence from around the world that demonstrates common vaccines are safe. The scientific evidence is not reasonable or logical (and therefore not persuasive) for the conspiracy audience because the evidence may come from manufacturers of vaccines, FDA-sponsored studies, or researchers or studies with have connections to the FDA or other government agencies. However, for other audiences—such as those who are simply unsure about the actual benefits or reasons for vaccines—the same studies and data may be quite persuasive.

Kairos is the Greek word for time. In Greek mythology, Kairos (the youngest son of Zeus) was the god of opportunities. In rhetoric, kairos refers to the opportune moment, or appropriateness, for persuading a particular audience about a particular subject. Kairos depends on a strong awareness of rhetorical situation. Kairos is the where, why, and when of persuasion.

For example, nearly all op-eds and political essays are kairotic. The rhetors work to relate their ideas and messages to whatever is happening in the news and popular culture.

Applications in Technical Communications

Rhetoric teaches us that our communications must be shaped with an understanding of our intended audience and desired purpose. This is also true of technical communications. The goal of technical communications is to get information from Point A (the author/speaker) to Point B (the audience) as efficiently and effectively as possible. A strong rhetorical foundation helps facilitate that transmission.

Think back to the story in the introduction about the student in the physics lecture. In that scenario, the student (the audience) experienced a breakdown in the communication (lecture) being delivered by the teacher (the author). For the student, a lack of background knowledge meant not being able to keep up with the lecture. This lack of background knowledge is just one of the many factors that can cause gaps or roadblocks in understanding. Often, these gaps or roadblocks lead to miscommunication.

Here's another example: Did you ever play Candy Land as a kid? Candy Land is a children's board game where the objective is for players to race through the game to find the missing King Kandy and be the first to arrive at Candy Castle without getting stuck in any of the pitfalls (stay away from Molasses Swamp!) that would slow a player down and allow others to pass.

"Candyland" by Dave Parker / CC-BY

Think of the successful transmission of information like playing a game of Candy Land–your job as an effective communicator is to avoid the factors that cause your audience to get "stuck" on their way to understanding.

In professional and technical communication, it is important to remember your rhetorical foundation in order to minimize the possibility of gaps/roadblocks in order to ensure your information gets where you want it to go — you guessed it! — as efficiently and effectively as possible. Whether you are writing an email to a client, typing a memo for your boss, or preparing a presentation, considering audience, purpose, and context as you draft will help you be an effective communicator and increase your professional ethos.

Job Search Communications

A number of complex communication situations arise during the process of searching for, applying to, interviewing for, and accepting a new internship or job. The stakes are high as you consider out how to position yourself as a professional in your field and it is deeply personal (you're trying to convince someone that you are a capable and qualified individual), so many people often feel unsure of themselves or nervous about this process.

As with any type of communication, these skills take practice and preparation, and the material in this chapter is designed to give you a chance to develop strategies that will help build your confidence through the hiring process:

- Reading and evaluating job postings
- Developing an excellent résumé and application letter
- Preparing for the interview and communicating after the interview

Focusing on communications and dynamics throughout the job search process also provides an opportunity to reflect on anti-discrimination laws in the United States and considering how those laws and the contemporary discourse about diversity in the workplace will play a role in your career.

Starting your career is a process of learning how to position yourself as a professional within your field, and much of that process relies on your ability to communicate effectively.

Preparing Job Application Materials

The following sections present a series of steps to guide you toward focused, personalized, and correct job application documents. Résumés and application (or cover) letters are common job documents, but our focus here is broader—we will ask you to consider the communication situation as a whole, from analyzing job postings to creating the documents as a dynamic process.

Your job materials are not forms to fill out, but strategic and persuasive communications that will need to be customized for each potential employer and at every phase in your career.

Starting the Job Search

The job search is more than finding a job posting for which you fulfill the requirements. This planning phase allows you to gather the information and language that you need to make yourself a strong applicant.

Know Yourself

As you begin the process of finding and applying for employment in your chosen field, it is important to take stock of your education, technical skills, and the experiences and characteristics that make you an ideal employee and co-worker. This self-assessment is the foundation for building strong job materials.

Beyond evaluating your skill set, this is also an opportunity to take stock of the types of environments you will thrive in:

Do you work better independently or in groups?

Have you always imagined working for a large company, with the structure and perks that offers? Or do you see yourself working on a smaller team, perhaps taking risks for a project you believe in personally?

Do you like developing new ideas and planning? Do you like seeing through a complex project to the finish?

Use this information as you search for potential jobs and internships and evaluate employers. Seeking out a work environment and job that suits your strengths and preferences will give you an advantage in the job search and in your career.

Know Your Field

Use the resources available to you (career services, job websites, networking events) to find positions. Go to career fairs and make connections. Even before you are truly "on the market" career fairs and networking events are great ways to build your confidence and become comfortable in professional environments.

You will find Job Search Tools/Resources from OSU's Engineering Career Services here. Students in other colleges and disciplines will be able to find similar career services information online as well.

Keep yourself informed and up-to-date on the projects and initiatives happening within your chosen field and especially of those employers that most interest you. This is not something you only do the night before a career fair or an interview – expose yourself to these ideas and discussions over a long period of time. These types of resources are a great place to get started:

- **Organizations and conferences.** Connecting with and simply being aware of the national organizations will expose you to current ideas and developments in the field. Most host conferences on a regular basis and even just reading the Call for Presentations or the titles and abstracts from a recent conference will introduce you to new terms and concepts, laying groundwork for future learning or research.
- **Company blogs or white papers.** Most companies "talk to" the public or the industry in some way to manage public perception, promote accomplishments, and (often) recruit employees. These might be highly technical or more casual or promotional in tone, depending on the company culture, industry, and their goals – any of these provide valuable insights.
- **Social media.** Following both companies and individual professionals will introduce you to their work, concerns, and developments in the industry. It also might make it easy for you to get exposed to these ideas as part of your regular online habits.
- **Local networking or meetup groups.** Professionals often hold events at a local level to meet each other and learn about what other companies in the area are doing. These might be purely social or they might include learning opportunities in the form of talks and presentations. On campus, you will also find a variety of discipline-specific groups and students organizations that can also expose you to new ideas and resources, not to mention great professional connections.

Build a vocabulary! Part of what you are doing as you prepare yourself for your career is learning a language – you are developing vocabulary and learning the language of your profession in addition to developing the required technical technical skills.

In the process of completing the self-assessment, you probably discovered that you have lots of skills and strengths seemingly unrelated to your field. It's important to remember that even unrelated experiences have taught you "transferable skills" – skills that may not be technically related, but are considered important to any field.

These "soft" skills are consistently ranked high on employer lists of desired attributes and include organizational skills, leadership abilities, teamwork experience, communication skills, problem solving, meeting deadlines, and so on. In the job search process, it is important to be able to describe your previous experiences in language that employers recognize as valuable.

Organization Management & Leadership	Research & Planning	Communication	Interpersonal	Other
Initiating new ideas	Forecasting	Speaking effectively	Being sensitive to feelings and moods of others	Managing time effectively
Coordinating tasks	Coming up with ideas	Writing concisely	Listening	Setting and meeting goals
Being detail-oriented	Identifying problems	Listening attentively	Developing rapport	Being a self-starter; self-motivated
Managing or directing teams or groups	Developing solutions	Facilitating group discussion	Providing support	Working independently
Coaching	Solving problems	Providing appropriate feedback	Motivating	Enlisting help when needed
Selling ideas or products	Imagining alternatives	Being tactful	Negotiating	Meeting deadlines
Decision-making	Gathering information	Negotiating	Sharing credit	Being diligent; tenacity to get the job done; follow-through
Managing conflicts or problems	Analyzing and evaluating information	Persuading	Teaching/training	Being responsible and reliable
Managing budgets	Setting goals	Interviewing	Delegating	
	Defining needs and requirements	Editing	Cooperating; working with a team	

Think & Write: After reviewing the transferable skills outlined above, spend some time thinking about any experiences (academic, extracurricular, job-related, etc.) you have had in which you demonstrated, practiced, or developed one or more of these skills. Select one, and, in a paragraph, describe what the specific experience was, explaining which skills you demonstrated and developed.

Designing an Effective Résumé

A résumé, from the French word for "summary," is a concise, standardized document that introduces you as a professional, most often for the purposes of seeking employment, but it also useful in other situations, such as applying for awards or seeking a promotion. It is likely a document you are already somewhat familiar with and you might even already have a résumé of your own, but learning how to strategically and confidently build a résumé for a particular audience and purpose is a vital professional communication skill. It is more than a list of jobs – it is a prioritized, condensed introduction to you, the job applicant, and it demands close attention.

> **Note:** The practices outlined here are focused on business culture and norms in the United States, so keep in mind that you will need to research and follow the appropriate standards if you're applying for positions internationally.

To understand everything else that follows in this section, it is important to first consider the rhetorical situation for this particular type of communication. *What is the intended effect? What are you trying to accomplish? Who is your audience? How will they be accessing and reading your document?*

AUDIENCE	PURPOSE
Employer or representative of an employer Seeking potential employees Evaluating a pool of applicants to see if they are qualified, looking for a reason to say yes or no Likely reviewing a set of résumés	Demonstrate that you possess the qualifications for the position (or award or promotion) Document your qualifications, experience, and work history Fulfill obligation to produce a standard employment document

Each decision you make about what to include in your résumé and how it should look should be made with these factors in mind, plus more, based on your knowledge of the specific employer or position.

Key Takeaways

Here are four basic rules regarding how to approach writing your résumé:

1. **Create multiple versions.** A résumé should be customized to the specific job you are applying for and adapted based on your knowledge of the employer. You should also consider how you will be submitting the document to determine the best formatting (See more about designed résumés vs. ATS résumés).
2. **Learn the conventions of your discipline.** Not every professional context is the same – it is invaluable for you to have someone in the field or even the specific company to which you are applying review your résumé. An engineer's résumé will likely look very different from a designer's résumé simply based on the audience's expectations.
3. **Update on a regular basis.** Even if you expect to stay in a job in the long term, take notes and gather information for your résumé every couple of months or after you finish a major project. It's difficult to remember the details of a complex project after the fact, so having that information documented is a huge asset.
4. **Eliminate errors from the document.** Because the résumé is condensed (a single page for undergraduate students) and since it is used to evaluate you as a potential employee, there is little tolerance for typos or errors. Check grammar, spelling, design consistency, punctuation, and language. Then check it again and ask a friend to review it. And then again.

What to Include in Your Résumé

The content in your résumé should be carefully selected to present the best, most applicable qualifications for a particular employer (the company and position for which you are applying) or purpose (attending a career fair).

Here are the basic types of information that you will select from as you build your résumé:

Strong action verbs are words that you should use to describe your activities throughout the résumé, typically beginning each bullet point in the experience descriptions. These words should be varied (avoid repetition), vivid (be specific, descriptive), and honest (don't overstate your activities or experience).

Here are some useful strong action verbs:
Analyzed, assessed, built, calculated, collaborated, coordinated, created, defined, delivered, designed, developed, documented, evaluated, examined, interpreted, managed, monitored, prepared, presented, programmed, provided, reported, researched, resolved, supervised, solved, supported

Strong action verbs to emphasize results:
Achieved, completed, improved, reduced, resolved, succeeded, surpassed

As you are planning what content to include in your résumé, know that information placed at the top of the document typically has the most impact. That's why education is almost always one of the first sections, since the first requirement in an internship posting is typically your year in school, major, and GPA. As you move down the page, though, lead with the most relevant, interesting sections, and organize the content to feature the experiences and skills that this employer will most value.

You will have many questions about what you should and should not do as you are compiling and revising your résumé. You can try to find answers to these questions online, but once you know the basics, ultimately, you will need to make your own choices about the best way to present your qualifications.

If you are wondering whether or not to include a piece of information, focus on the audience's needs. *Will they find this information valuable in making a decision about you as a candidate? Does it reveal something important about your skills, interests, and qualifications? Does it reveal something new about you that is not already revealed in the document?*

If you are wondering how to present a piece of information, know that the options are endless, but, again, you will want to focus on the audience. *Is the content presented in a way that is easy to see and understand? Is it logically connected to the information around it?*

Be confident as you make these decisions. There are fewer "rules" than you might think—the challenge is to create a document that is not just correct, but that strategically reveals you as a candidate for a job and an individual. You don't want your résumé to look like a form or to be exactly like everyone else's. Look for ways to include those things that express your personality and passion—the things that make you unique.

Visual Design Considerations

The content and language in your résumé, as discussed in the previous section, is the first priority, as you figure out how to explain your experiences and show the employer that you meet the requirements for the position. The visual design of your résumé—the way the information is presented on the page—also deserves some careful planning and consideration because it has an impact on the way your audience will be able to read and understand the information.

Recall that your reader (e.g., an HR representative, a campus recruiter) might be reviewing many résumés in a row and perhaps reviewing them quickly. An effective visual design can help ensure that your résumé is accessible and that it makes a good impression, which will make them more likely to consider you a strong candidate!

Key Takeaways

Here are some simple things to keep in mind as you are finalizing the design of your résumé (the example résumé above demonstrates many of these attributes for your reference):

- **Clear headings.** Content needs to be categorized visually, with main section headings (e.g., Work Experience) and subheadings Font size and type help visually organize the text on the page. All caps and bold are you best options for emphasizing headings and subheadings; italics and underlining are more difficult to read and should be used less often.
- **White space.** A résumé that is full of dense blocks of text becomes difficult to read. Our eyes need white space to help us understand how information is connected and how it relates to the content around it. Add space above headings and subheadings. Don't use unnecessary lines or embellishments—white space is often more effective.
- **Balance.** White space may be a helpful organizing principle, but you want to avoid too much white space or empty spaces on the page. Adjust the length of lines or the layout to ensure that each "quadrant" of the document has a roughly equal amount of content. The most common issue is a large "channel" of white space down the right side of the page.
- **Vertical alignment.** To keep a document visually organized, similar headings and elements (e.g., a bulleted list) should fall along the same vertical line—if you drew a straight line from the top of the page to the bottom, all the bullets would fall along the line, for instance. This keeps the document clear and organized (compare the example in the previous section with the "needs improvement" résumé below).
- **Coherence and consistency.** The same types of information (e.g., company name, dates) should be presented in the same way—same text formatting, positioning in the section. This helps "train" the reader's eye, making sure they know where and how to find the information.
- **Fonts and typography.** To ensure that your résumé displays correctly and is compatible with Applicant Tracking Software (ATS), it's best to use a common, standard, and professional font (Arial, Times New Roman, Tahoma). However, you can use more than one font—a serif font works well for headings alongside sans-serif fonts for body text.

Reflection & Discussion: Consider how the design of the résumé below affects you as a reader. How does your eye travel down the page? How would it make you feel about the job applicant's qualifications?

Example resume with poor formatting

Common Questions

Writing the Application Letter

Traditionally, the application letter or cover letter is a formal letter that accompanies your résumé when you apply for a position. Its purpose is to support your résumé, providing more specific details, and to explain in writing why you are a strong candidate for the specific position to which you are applying. It should not simply reiterate your résumé; it's an opportunity for you to make a case for your candidacy in complete sentences and phrases, which gives the reader a better sense of your "voice."

As always, it's helpful to start by first thinking about the audience and purpose for the application letter. *What information does your reader need to glean from your letter? At what point in the hiring process will they be reading it?*

AUDIENCE	**PURPOSE**
	State your intention to apply for the position
Specific (named) employer for a specific position	Explain why you are a good candidate by describing your experiences and demonstrating your skills (go beyond the résumé)
Gets a sense of your "voice" and your interest through your writing—you are talking directly to the reader	Display knowledge of and interest in this specific employer/job
	Produce a high quality piece of writing (proving that you have the ability)

As you draft the letter, consider what you would want to say if you were sitting across the desk from your reader. It should be written in a formal, professional tone, but you still want it to flow like natural speech—this will make it easier for your reader to absorb the information quickly.

What to Include in the Application Letter

It can be helpful to think about writing the application letter in sections or "blocks." This provides a basic structure for the letter; once you have an understanding of this foundation, you can customize, update, and personalize the letter for different applications and employers.

Introductory Paragraph

Open the letter with a concise, functional, and personable introduction to you as a job candidate. This is your chance to establish the essential basics of your qualifications and to set the themes and tone for the rest of the letter.

- Name the position you're interested in (by exact name and number, if available), and where you heard about it
- Clearly state that you are applying for the position—remember that you are requesting (not demanding) that they consider you as a candidate for the position
- Identify your major, year or graduation date, and school (this should be a brief preview of your educational status/area—you will go into more detail in the Education paragraph)

- Create a theme (essentially a thesis statement) for the letter, based on the job requirements and your knowledge of the employer (this may not be possible until you write the other paragraphs, so save it for last) → NOTE: Once you have established the thesis (the key reasons for your qualifications), keep in mind that the remaining paragraphs must specifically "prove" or "show" that you possess these qualifications

Optionally, you might also take the opportunity at the beginning of the letter to express your interest in working for this particular company and/or your passion for and interest in the field—I am particularly interested in this position because… This sets a nice tone and shows that you are engaged and enthusiastic. It is also an opportunity to demonstrate your knowledge about the employer and what they do (developed through your research).

Education & Academics Paragraph(s)

Since you will have already stated your basic educational status (major/year/school) in the introductory paragraph, the purpose of this paragraph is to paint a more detailed picture of you as a student, making progress in your academic program and gaining valuable experiences along the way. Your opportunity in this paragraph is to describe your academic progress in more specific detail, explaining the activities and knowledge you are developing that most matter for this position and employer. Carefully consider what the employer will value most about your educational experiences.

- Emphasize specific skills and knowledge that you are developing
- Describe significant coursework or projects—don't be afraid to focus in on a particularly compelling example or experience

If you have a lot of project experience or several key experiences that you want to highlight, this information may be written in multiple paragraphs.

This content should NOT be a laundry list of course titles. Instead, describe how your academics have shaped your understanding of the field you are entering and significant skills you are developing, but always tie it back to what the employer is looking for—stay focused on the information your audience needs and what they will care about.

Employment Paragraph (if applicable)

It is important for employers to feel that they are hiring responsible, reliable people who know how to hold down a job. If you do have work experience in this field such as a previous internship, this is a perfect time to discuss that. If you have previous work experience, even if it's not related to your field, this is your opportunity to describe the value of that experience—the value for you, but, more importantly, to your reader.

- Describe your previous work experience (show, don't tell that you're a good employee)
- Be specific about the company, the time frame, your responsibilities, actions and the outcomes/results
- Focus on relevant and transferable skills developed on the job

Activities Paragraph (if applicable)

Activities and involvement in things outside of your coursework and work experiences such as student organizations, clubs, and volunteer work are a great way to show that you are a well-rounded, motivated person with good time management skills. Personal, human connections are an important part of the job application process, and describing some of these activities and interests can help your reader start to feel a more personal connection.

- Demonstrate personality, values, and transferable skills through sports, volunteer, travel or other professional experiences
- Describe your specific actions and involvement honestly, while still trying to connect to transferable skills and the keywords in the job posting

If the employer has a strong program for charitable giving and involvement in an area that you share an interesting, that would be another opportunity to build a connection with them and show that you could embrace the company culture and values.

Concluding Paragraph

As you conclude the letter, tie everything together, acknowledge the next steps, and end on a positive note.

- Reference your resume (“You will find additional information on my résumé”)
- Request (don’t demand) an interview (“I would appreciate the opportunity to meet with to learn more about the position and discuss my application”)
- Provide contact information in the paragraph (phone number and email address)—don’t put this below your name
- Reiterate interest in the position, the employer—another opportunity to demonstrate your knowledge about the company

A Note About Topic Sentences

As you reinforce the main idea or purpose of the letter (that you have the necessary skills, qualifications, and temperament for the job), make sure you prioritize what your reader needs to know about you and that all of the experiences you describe are meaningful to them. One good way to do that is to focus on how you construct the topic sentences. The first sentence in each paragraph should clearly explain the purpose of the information contained in that paragraph.

Begin each paragraph with a statement that connects your experience to the employer’s requirements and desired qualifications.

Topic Sentence = My experience + Why it matters

Consider how the following examples were revised to focus more on the value of the experience to the employer rather than simply stating the information about the experience.

EXAMPLE 1:

- Original: During the past three summers, I worked at Ray's diner in my hometown.
- Revised: Working at Ray's diner in my hometown for the past three summers has taught me a lot about responsibility and reliability.

EXAMPLE 2:

- Original: During my freshman year, I was part of an Alternative Energy Vehicle project group.
- Revised: I gained first hand experience with collaborative problem solving and project management while working on an Alternative Energy Vehicle project during my freshman year.

The revised versions explicitly connect the experience (working at the diner, being on a project team) with the value and lessons learned, making it easier for your reader to understand, even while reading quickly, how this supports your qualifications.

Letter Formatting Considerations

Your application letter should use formal letter formatting. You will find detailed information about the required elements of a letter document here and more information about writing cover letters here (both are from Purdue's Online Writing Lab).

In today's job market, where many applications are online, the letter might be delivered in a variety of different formats. For example, it might be a PDF file uploaded to an online application system or if might be simply sent in the body of an email. In any case, consider the following as you decide how to format the letter:

- If you are delivering it as a stand alone file or an attachment, use a formal letter format and save it as a PDF (unless otherwise instructed).
- If you are sending the application letter content directly in the body of an email, you do NOT typically need to include the sender's (your) address, the date, or the recipient/inside address. You would begin the email with the greeting.

NOTE: Carefully follow all instructions for any job application process or ask to confirm how the materials should be delivered. It is possible, for instance, that a company would want you to send your application letter via email as an attachment—it just depends on how the company processes applications.

Career Portfolios

The word portfolio, by definition, is "a case or stiff folder for holding papers, prints, drawings, maps, etc." and "a collection of samples of a person's work, typically intended to convey the quality and breadth of his or her achievement in a particular field" (OED, n.d.). Though the word can be traced to 16th century Italy, its Latin roots (portare "to carry" + folium "leaf") date back even further.

A career portfolio–whether a physical or electronic version–is a place for gathering and maintaining documents important to your career. Think of it as a dynamic, expanded version of your résumé where you document and demonstrate your education, experience, and skillset. Where résumés and application letters are limited due to their genre-specific natures, the career portfolio can contain anything you want prospective employers to see. However, this does not mean that it should contain everything. It’s important to be selective and to think rhetorically about the items you choose to include.

As you gather documents, consider your chosen field. What do employers in the field find valuable? What skills and abilities do employers in the field expect employees to have? For instance, mechanical engineers might be expected to have design experience, project management experience, and effective communication skills. It might benefit a mechanical engineer, then, to include any schematics they have created, a strong project plan, and a writing sample or slide deck to document communication skills. Keep and maintain artifacts that showcase your strengths.

Portfolios can be either electronic or physical. A physical portfolio should be kept in an attractive binder, though an electronic version is easier to distribute and can be linked to on your résumé and LinkedIn profile.

Interview Strategies

Interviewing is the phase of the job search process where you go from being an applicant on paper to a real, 3-dimensional person. In one way or another, you are being evaluated on your verbal communication skills through this face-to-face (or phone) interaction. Employers want to see if you match up to the qualifications described in your résumé and they want to see if you have good interpersonal communication skills to get a sense of how you would function as part of their team.

Interviews are often intimidating for job seekers who feel the pressure of being evaluated and feel uncomfortable with the interview format. While the nervousness may never go away, effectively preparing for the interview can make you feel more confident, and, with practice, you will be better able to stay in the moment and treat the interview like a conversation.

This chapter will focus on general interview preparation, but know that different disciplines and industries have different interviewing techniques. For instance, the technical interview or “code day” has become standard for many computer science-related fields. You should always do research on standard practices in your industry, but also keep in mind that interviews can be surprising. In fact, some employers try to surprise interviewees to get a sense of how they think and react in unfamiliar situations. Part of your challenge is to stay open-minded and relaxed so you can project confidence, even in unexpected or unfamiliar situations.

Preparing for the Interview

Good preparation before an interview is based on understanding who your audience is—understanding the employer and the industry. This is not the type of information that you can memorize the night before. Take time as much time as you can to read and absorb information from a variety of sources to get a thorough sense of the company—not just the basic information you find on the “About” page of their website, but the tone and personality they broadcast in social media, their achievements, their community involvement, etc.

The following text was originally written by Caleb Craft for the Engineering Career Services Job Blog at The Ohio State University and has been adapted for this textbook with permission.

Every semester I facilitate workshops on interviewing strategies for engineering students. In the presentation the following question is asked: **"What do you think employers say the number one interviewing problem for our students is?"**

Do you know the answer? You probably do. In fact, I have yet to lead a workshop where the right answer was not guessed right away. The number one constructive statement from Engineering Career Services (ECS) employers is that students are not prepared by doing simple research about the company.

Did you know that you are supposed to do research before going into an interview or a career fair? You probably did! Most students seem to know the importance of research and claim to practice this prior to an interview, but still most employers say students don't know enough about the company and industry.

Consider:

1. students may not know how to research effectively and, more importantly,
2. students may not know how to clearly communicate this research to the employer.

This may seem like old news, but because many employers and students are not seeing eye to eye on just how prepared students are, you owe it to yourself to consider the following advice. Think of it as double-checking your research methods before your next employer interaction!

The solution is pretty straightforward. Start by using multiple resources to look at the company and position from different angles.

Next, spending time on the company website is an absolute must. Useful information can be found on the homepage, the "About Us" page, the "Careers" page, as well as any pages about mission, vision, and values. Know facts such as: what goods/services the company provides, who the company's customers are, and where your position of interest fits within the company structure. But also pay attention to how the company portrays itself. Recent news and social media platforms may also be a good tool for this information. Lastly, Glassdoor is a great resource to check out recent employee reviews of specific companies and even see actual interview questions that were asked of candidates.

But the key to doing all of this research is to remember that you are not just gathering information for the sake of gathering information. I have never heard of an interview where an employer asked a candidate to write down everything they know about their company. During every step of your research you should be asking yourself the following question: How do my interests, values, and qualifications fit within this company/position? Remember, answering this question is the primary purpose of an interview and asking yourself this question helps narrow your interests as well. If you aren't considering this question than you are not researching effectively.

> "The two words 'information' and 'communication' are often used interchangeably, but they signify quite different things. Information is giving out; communication is getting through."
>
> Sydney J. Harris

Now, let's look at how you might convey that information during an interview.

Remember that the main goal of your company research should be to answer this question: "How do my goals/interests/values/qualifications fit into this company/position?" If you have actually thought through this question during research you will be prepared to communicate this information strategically in two ways: research-proving answers and research-proving questions.

For example, let's say you are applying for an internship at Engineering Inc. and you notice on their website that one of their core values is "Sustainable Action." In your interview you are asked why you wanted to be a chemical engineer. A research-proving answer could be, "I chose chemical engineering because I have always excelled at math and science, but I also wanted to do some good with my career. That's actually one of the reasons I am interested in Engineering Inc. I noticed while reviewing your website that your company's committed to sustainable engineering."

Or perhaps you are asked where you see yourself in five years. How can you answer honestly, but also align your answer with what you have learned about the company? When speaking about your strengths or qualifications, provide answers that are reflective of you and the desired qualifications listed on the job description. Again, the goal of your interview is to convince the employer that you are the best fit for the company and position. You have to be looking through this lens during your research and every question that you answer!

Lastly, no interview is complete until you have your chance to ask questions of the employer as well. As you know, this is not a time to ask about salary or vacation time, but it is a good time to ask about factors that are important to you in a job search. That being said, your questions are another opportunity to demonstrate your knowledge through research-proving questions. Did the company just release a new product model or open a new facility? Asking questions about these things shows that you really do have a genuine interest in the company, and that you've done your homework.

So there it is! The big "secret" to interview success really boils down to knowing who you are, thinking about how you fit when you research companies and positions, and then seizing opportunities to communicate this fit during interview answers and questions. Pretty simple, right?

"Communication – the human connection – is the key to personal and career success."

Paul J. Meyer

During the Interview

Once you have prepared mentally and gathered information for the interview, it's time to prepare for the interaction during the interview.

Dress the Part

Let's keep this simple—*dress your best*. In most business cultures, dressing professionally is a sign of respect, conveying that you care about the position, that you want to make a good impression.

Here are the basics:

1. Wear your best professional clothing—this typically means a suit (for men, a tie) and dress shoes (no

open toes, no white socks).

2. Try on the complete outfit (including shoes) to make sure you're comfortable. Does it fit? Stay in place? Can you sit down, shake hands, and move comfortably? You don't want your clothing to distract you or the interviewer.

3. Clean and press your clothes and shoes. Prepare your outfit the night before and hang it up (no wrinkles!).

Even if you know the work environment is casual, you should dress "up" for the interview—more professionally than you would if you worked there. The exception would be if you are explicitly told not to—for instance, if the recruiter specifies that you should dress "business casual."

Don't Come Empty Handed

Arriving at the interview with important documents and notes shows that you are prepared and thinking ahead. Organize all your materials in a nice folder or folio—presentation matters!

Print out several clean copies of your résumé and any other documents you might want to reference, like the job or internship description or your references. You should also bring a few samples of your work, if possible—documents you've prepared or artifacts from projects.

Make the most out of all of that research and preparation by bringing notes. A nice notebook or paper and a pen are perfectly acceptable for you to have in the interview and they can help you feel more focused by getting some of the information out of your head and organized on paper.

Follow these guidelines:

1. **Be organized.** Re-write or type and print your notes so you can easily find the information you need. You don't want to be shuffling through scraps of paper.

2. **Keep it simple.** Write down keywords, brief phrases and ideas that will jog your memory, not a complete script.

3. **Prepare questions for the interviewer** (see examples below). You typically have the opportunity to ask these questions at the end of the interview, when it can be difficult to remember what you were going to ask.

Pro Tip

Take notes during the interview! The interviewer will likely reveal information to you during the conversation—write down anything that you want to remember for later or anything that you want to come back to later in the conversation.

Questions to Ask the Interviewer

In addition to revealing your knowledge of the company, these questions are also an opportunity for you to figure out if the employer and the company culture is a good fit for you. Think carefully about what matters to you, what would allow you to do your best work, and try to ask questions that will give you insight into those factors.

- What are the primary tasks or responsibilities for a person in this position? What does a day in this job look like? Is travel required? Overtime?
- What is the orientation or training process?
- What are the goals/priorities for a person in this position? How will success be measured?
- What is the company's assessment and review process?
- Does the company support professional development activities?
- How does this position fit within the team/department? What is the reporting structure?
- Does this position function alone or within a team setting?
- How would you describe the company culture or team dynamic?
- What is this company's approach to management?
- What are the company's overall goals and priorities and how do those affect someone in this department/position?

NOTE: This is not typically the best time to ask about salary and benefits. This is your opportunity to learn about the workplace and the position—the environment, how it's structured, employee support programs.

From Donnie Perkins, Chief Diversity Officer, College of Engineering. Learn more here.

Following are some **questions students may ask prospective employers about their diversity, inclusion and equity**. Company recruiters who can provide factual and reasonable responses to these questions are on a positive track advancing diversity and inclusion in ways that truly benefit employees, the company, customers, and community while promoting innovations, strategic thinking and active engagement.

- How does company define diversity, inclusion, and equity? Provide an example of how diversity, inclusion, and equity benefits [Company].
- What are the racial, ethnic, and gender demographics of [Company's] company-wide, leadership, and manager levels?
- As a national and/or multinational company, describe your cultural competency training program for employees who will take assignments in [specific countries or continents where the company does business].
- Describe the role and responsibilities of women and persons of color on [Company's] leadership team.

- Give me an example of how [Company] values people of color, female, LGBTQ, veteran and employees with disabilities.

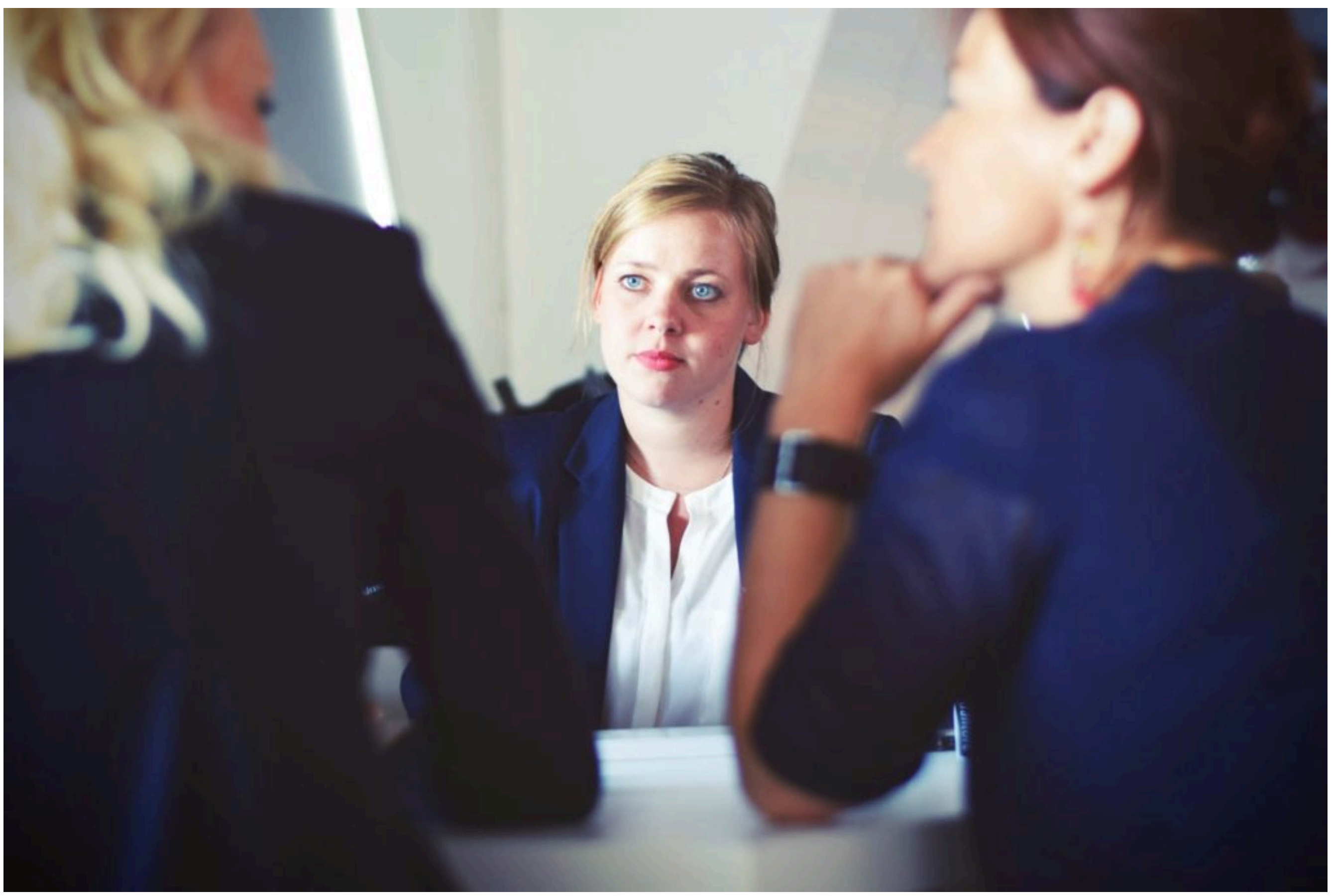
Body Language & Interaction

As a general rule, it's important to be observant and take your cues from the interviewer. Reflect their tone and pay attention to the dynamic they set—are they very formal and profession or more conversational? It's okay to make small talk, but you want to follow the lead of the interviewer.

Shake hands. Most of the time, these professional interactions will begin with a handshake. Be prepared with a firm (but not too firm!) and confident handshake. It never hurts to practice!

Be conscious of your posture. You will want to sit up straight (no leaning or lounging) and avoid crossing your arms in front of your chest (it can seem defensive or withdrawn).

Make eye contact. Look at the interviewer while they ask you questions and give them non-verbal cues—smiling, nodding—when appropriate. Make it clear that you understand what they're saying, that you're listening.



Speak clearly and thoughtfully. Adjust your volume for the environment and make sure the interviewer can hear and understand you easily. Don't rush yourself and take time to deliver thoughtful responses. Ask for clarification if you don't understand a question.

Project calm. Fidgeting and extra movement can make you seem nervous even if you aren't. Be aware of your tendencies and try to minimize them. If you know you fidget, try to keep your hands folded and avoid clicking or tapping the pen. Don't wear jewelry that you will play with or that will make noise while you move. Wear your hair in a way that will not tempt you to touch or play with it constantly. If seated at a table, sit towards the front of the chair and plant your feet on the floor—it can help keep you steady.

Be yourself. With all of the previous tips in mind, you also need to feel comfortable and like yourself. If you are enthusiastic, if you talk with your hands, if you are shy, that's fine—you just need to be the most engaged, professional version of yourself you can be in order to show the interviewer what you are capable of in the workplace.

After the Interview

At the end of the interview, you will want to ask the interviewer what you can expect in terms of next steps or when they might make a decision about the position. This will help set your expectations and allow you to prepare for future interactions—they might have multiple rounds of interviews or they might have another week left of meeting with candidates, for instance.

Within 24 hours of the interview, you should send a thank you note to the interviewer(s). Email is a standard and expected vehicle for this message and you will likely have already been in contact with them via email or will have their business card from the interview.

The formula for this message is simple, but choose your words carefully and try to extend their good impression of your written communication here as well:

+ Relevant subject line

+ Gratitude for their time and the opportunity

+ Your continued interest in the position

+ Something specific from your conversation (this is where taking notes comes in handy!)

+ Reminder of your qualifications

+ Positive and forward-looking conclusion

You will want to reflect the overall tone of your interaction—try to make it consistent with the person they met the day before.

Subject: Design Engineer Internship – Thank you

Ms. Tanner,

Thank you for the opportunity to meet with you yesterday. I feel like I learned a lot about the Design Engineer Internship role at ABC Innovations and I remain very interested in the position.

After hearing about the project I would be assigned to, I did some further research on your prototyping process and I can see interesting connections with the work I did in my previous internship. It would be exciting to build on that knowledge with your team.

Please feel free to contact me via phone at xxx-xxx-xxxx or email if there is any additional information I can provide. I look forward to hearing from you.

Thank you,

J. Buckeye

HOW TO MAKE OR BREAK THE INTERVIEW

01: PRE-INTERVIEW

So you've landed your first interview, congratulations! To be sure you are ready, here are some key steps for preparation.

LET'S PICK OUT YOUR **THREADS**

KEEP IT SIMPLE

Try to stay away from aggressive plaids and patterns in your attire

ACCENT PIECES

Keep any fragrance, makeup, or jewelry to a minimum

CHECK YOUR KICKS

Make sure that your shoes look clean and professional

BE WELL-GROOMED

A job-seeker's personal looks can affect an employer's decision

SHOPPING SPREE

Invest in a new suit or slacks and a button-down shirt

IRON IT OUT

Make sure all of your clothes are wrinkle-free the night before

DO YOUR RESEARCH AHEAD OF TIME.

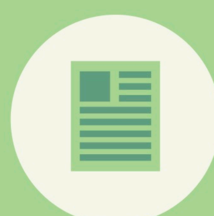
47%

of applicants have little knowledge about the company prior to the

Explore the company's website and learn its mission statement

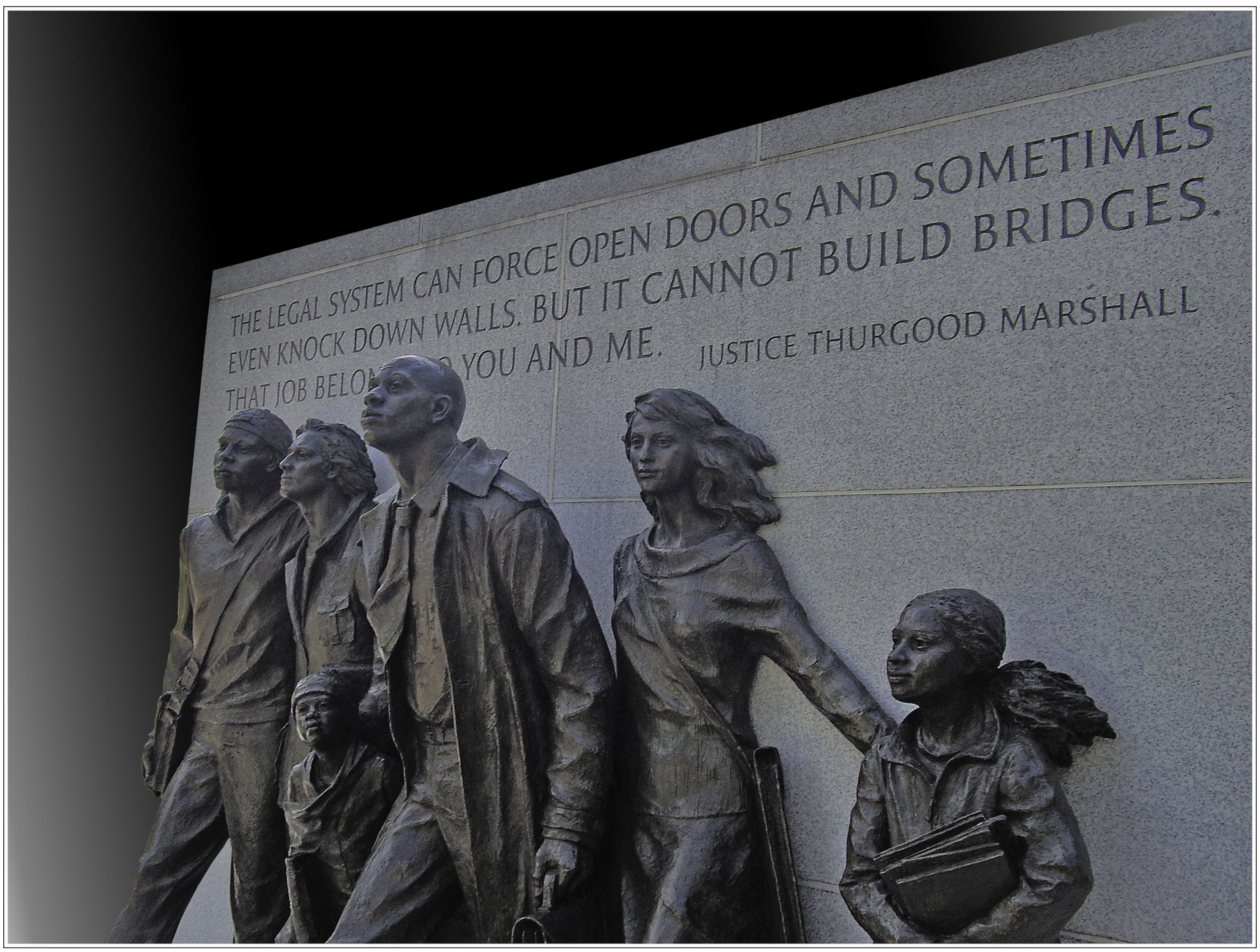
50%

of employers said spelling mistakes on a CV is one of the worst



Ensure that your resume is up-to-date with your latest job

Employment Access, Equity & Opportunity



The Virginia Civil Rights Memorial commemorates leaders who worked for desegregating schools in the state
“Virginia Civil Rights Memorial — State Capitol Grounds Richmond (VA) 2012” by Ron Cogswell / CC BY

In this section, we turn our attention to social issues that affect the workplace—specifically, questions of social diversity and the importance of equitable employment opportunities in the United States.

The U.S. is a diverse and multifaceted country. And yet, social and historical forces combine to create an imbalance in the workforce—in the access groups of people have to educational and economic power and in the ways contributions to the workforce are viewed and valued.

As a society, we have realized that diverse teams, companies, and groups of people are better equipped to innovate and address the needs of the customers they serve. Companies of all sizes are working to address these issues in their hiring practices and in the ways they foster positive, inclusive work environments for their employees.

How will you work to make the U.S. workforce more equitable and inclusive?

Most importantly, we hope that you recognize this as unfinished business. We encourage you to think of this as a discussion and as a dynamic, ever-changing part of your professional life. The way things are now are not the way they will be in 20 or 30 years and you will be part of that change. How the workforce of 2050 looks like is, in part, up to you. The goal in this chapter is to give you the opportunity to think about your contribution to that future, where you fit into picture, the impact you will have in your own sphere of influence.

https://osu.pb.unizin.org/engrtechcomm/wp-content/uploads/sites/7/2017/08/diveqincvideo4.mp4

History & Context

Perhaps you have noticed that most employers include a statement about being and “equal opportunity employer” in their job
statement in the footer of their Careers website (jobsatosu.com):

> The Ohio State University is an equal opportunity employer. All qualified applicants will receive consideration for employment without re
> or protected veteran status.

Statements such as this are so commonplace that you might not spend much time thinking about them, but they reveal somethi

The Civil Rights Act of 1964 (CRA), originally introduced by President Kennedy and signed into law by President Johnson or
discrimination illegal at the Federal level, outlawing practices like segregated schools, public restrooms and water fountains. T
establishing the Equal Employment Opportunity Commission, whose mission is investigating and enforcing anti-discriminatio
Bill:

Why was this legislative action necessary? In the decades before the CRA, decisions about recruiting and hiring were at times
wanted" section of newspapers in the early 20th century were often separated jobs for men, women, and, in some cases, by rac
"girls" to fill certain roles. Low-paying and unskilled jobs were more likely to be reserved for women and minorities, greatly l

You can see some examples of segregated job advertisements here (from the Learn NC website).

One impact of the CRA was the establishment of "protected classes," which are ways of classifying groups of people at
discrimination. Initially, the protected classes identified were race, color, religion, sex, and national origin. Over time, anti-dis
needs of the American workplace.

This timeline shows the dates and legislation that officially recognized the protected classes:

- **1964:** Race, color, religion, sex, or national origin
- **1967:** Age – 40 or older (Age Discrimination in Employment Act)
- **1974:** Veteran status (Vietnam Era Veterans' Readjustment Assistance Act of 1974 and Uniformed Services Emplo
- **1990:** Disability (Americans with Disabilities Act)
- **2008:** Genetic information (Genetic Information Nondiscrimination Act)

The laws also includes provisions for people who have filed charges to protect them from experiencing retaliation or sti

As explained by the EEOC, "Every U.S. citizen is a member of some protected class, and is entitled to the benefits of EE
[emphasis added] of women and minority group members" (National Archives, n.d.).

The ever-evolving nature of the laws and discourse in our society is evident in the status of the LGBT community as a prote
gender identity (2015) as part of the "sex" protected class. A number of state and local governments have passed specific an
currently no explicit Federal protections in place.

Diversity & Inclusion in the U.S. Workplace

It is important to remember that making discrimination illegal does not mean that it no longer happens. The purpose of the E
defend people's right to work and thrive in their professional lives.

Even if the law levels the playing field, historical and social realities can have real consequences on an individual's access and
and income levels. As Beasley (2012) articulates in *Opting Out*,

> "[The Civil Rights] act, coupled with the initiative of a number of colleges and universities across the country, produced a significant ris
> received at least a bachelor's degree compared with only 7 percent in 1969 (US Census Bureau 1973, 2001). While college education is in
> face considerable hurdles. Indeed, over this same period of time, the difference in average earnings of black and white college graduates d
> discrimination was legally banned, the question remains: what continues to hold African Americans back, if not the law?"

So, if the CRA "resolved" issues surrounding employment discrimination, why aren't hiring practices fair and completely unb

Let's consider an oft-cited example involving professional orchestras. Up until the 1970s, musicians in symphony orchestras
entirely merit-based, the decision makers agreed to a new process of blind auditions, where the musicians would perform behi
The result was that women were between 25 and 46 percent more likely to be hired than men than they were during the old au
(Miller, 2016). This example asks us to consider how simply removing sex or gender from the process of evaluating an applic

Disparities in employment combined with shifts like the blind auditions have raised important questions about the ways in w
decisions. If a screen changes hiring outcomes for orchestras, how are these forces playing out in other parts of the job market

The causes and effects of discrimination are varied and multidimensional, so researchers working in a variety of fields have con
and power structures. Following are just a few examples of studies that demonstrate the impact of social biases in the workplac

Racial Bias

In a significant study conducted in Chicago and Boston in 2001–2002, researchers submitted résumés to a variety of advertis
were selected based on census data for common names in the white and black communities. They found résumés with names
those with names like Lakisha Washington or Jamal Jones. Further examination of the difference between how better quality
benefitted significantly more from a higher quality résumé than those presumed to come from black applicants (Bertrand & M

Gender Bias

In a different study researching names and gender, Moss-Racusin, et al. (2012), asked science faculty to evaluate identical res
ranked as more qualified than the candidate named "Jennifer" in spite of their identical credentials. The candidate perceived as

A number of studies have shown that perceptions of women's abilities can affect how they are treated in the workplace. In
preference over women for a job that required skills in mathematics, even when data shows equal competence between genders
to note that bias was present regardless of participant gender.

Similarity Bias

In a study published in the *American Sociological Review*, Rivera (2012) identifies the importance interviewers place on
experiences, and self-presentation styles" above productivity or job-related skills. This study illustrates the effect of similari
employees are evaluated.

It is human nature to gravitate towards like people (thus the similarity bias mentioned above). In diverse group (or team) se negative emotions" and, as a result, "these emotions . . . can blind people to diversity's upsides: new ideas can emerge, indiv process" (Chhun, 2010).

We must, however, remember the perils of our tendency toward insularity: "Though people often feel more comfortable with the intellectual workout that stems from disagreements" (Chhun, 2010).

Benefits of Diversity

And, in addition to basic principles of fairness and equality, it turns out that a diverse workforce is more profitable. Research and innovate at higher rates:

- Forbes conducted interviews and distributed surveys to 321 executives of global companies and found that the vast major planned to "leverage diversity for innovation and other business goals" (Forbes Insights, 2011).
- A McKenzie study demonstrated a correlation between diverse executive boards and higher returns on equity (Barta, Klei

Ultimately, research tends towards the benefits of a diverse and multi-talented workforce. More and more companies are recog

These are evolving issues that raise complex, difficult questions about what it means to have equal employment opportunities. about diversity and inclusion, no matter who you are.

Discussion & Reflection

What does "diversity" mean to you? How do you think about, define or use the term?

Consider how often you find yourself interacting with people who "look like" you in terms of race, ethnicity, and gende

What made it possible for you to be where you are, in terms of your education and prospects for future employment? family members, for example) forms of support. What pushed you down this path?

Consider the impact of having socio-economic opportunities for groups of people systematically limited. What are the s of its members have a similarly limited access to gainful employment (or education or fair housing)?

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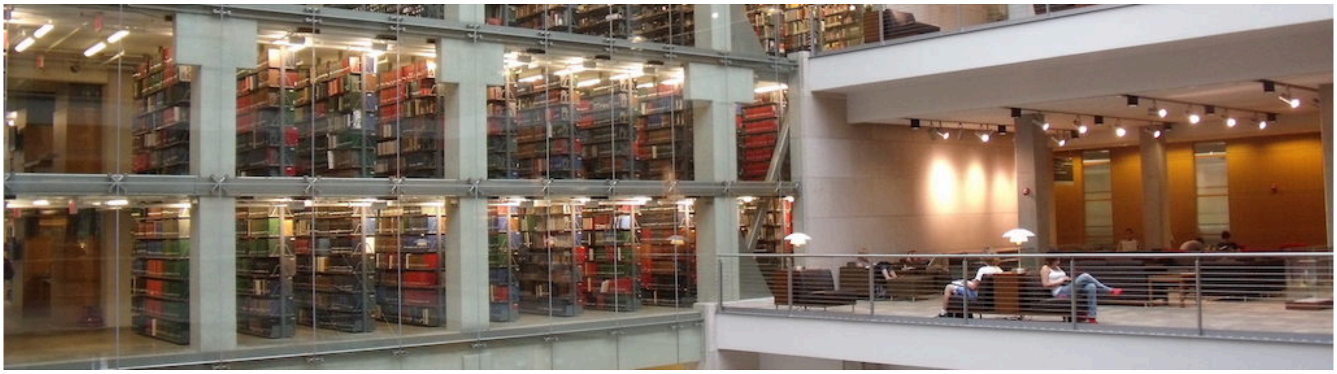
Engaging With Research



Carrying out and communicating research is an integral part of professional communication. This chapter explores many of the considerations of sound, ethical research, including:

- Common Types of Research Reports & Documents
- Conducting Research
- Evaluating Sources
- Documenting Sources
- Writing About Research

References

Header Image: "William Oxley Thompson Memorial Library East Atrium" by Ibagli / Public Domain

Common Types of Research Reports & Documents

Research is central to most work in STEM fields and you may often be required to conduct various types of research as part of your professional life. Lab reports, recommendation reports, proposals, and white papers are just some of the professional documents that rely on research. These are the kinds of documents that can help organizations make decisions, solicit new clients and contracts, and communicate with the public.

For more information on these common types of professional correspondence, see the Workplace Communications chapter.

Strategies for Conducting Research

In the 21st century, we have more information and knowledge instantaneously at our fingertips than could have been imagined 100, 50, or even 30 years ago. Figuring out how to wade through all of that information can be daunting. Research is one way we can we can make sense of and discuss all the information available to us. Research is the basis for strong and persuasive communication because it helps us understand what others have said, done, and written about a particular topic or issue.

What is research?

Research begins with questions. Before you begin to find sources, you must determine what your already know and what you hope to learn. Do you want first-person reflections and commentary? Statistics and facts? News reports? Scientific analyses? History?

For example, if you are interested in a recent piece of legislation then you would want to locate the full-text of the bill as well as commentary about the legislation from reliable news organizations such as *The Wall Street Journal* or *The New York Times*. If you are interested in statistics about the U.S. population, you might go to the U.S. Census Bureau or the Pew Research Center. Perhaps you are interested in the experiences of veterans returning from active duty. In this case you may turn to blogs or op-eds written by vets, official U.S. military records from agencies such as the Department of Defense, Department of Veterans' Affairs, or organizations such as the RAND Corporation.

Primary v. Secondary Research

There are two basic kinds of research—primary and secondary. Often, primary and secondary research are used together.

Primary research is often first-person accounts and can be useful when you are researching a local issue that may not have been addressed previously and/or have little published research available. You may also use primary research to supplement, confirm, or challenge national or regional trends with local information. Primary research can include:

- Interviews
- Surveys

- Questionnaires
- Observations and analysis
- Ethnography (the study and description of people, cultures, and customs)

Secondary research is what many students are most familiar with as it is generally requires searching libraries and other research institutions' holdings. Secondary research requires that you read others' published studies and research in order to learn more about your topic, determine what others have written and said, and then develop a conclusion about your ideas on the topic, in light of what others have done and said. Some examples of source types that might be used in secondary research include:

- Academic, scientific, and technical journal articles
- Governmental reports
- Raw data and statistics
- Trade and professional organization data

Primary and secondary research often work together to develop persuasive arguments. Let's say, for example, you are interested in using STEM knowledge to improve the quality of life for the homeless population in Columbus, Ohio. The most successful project would use both secondary and primary research. First, the secondary research will help establish best or common practices, trends, statistics, and current research about homelessness both broadly in the U.S. and state, and more narrowly in the county and city.

Your brainstorming would likely lead to questions regarding the following:

- The major issues facing homelessness and combating homelessness in the U.S.
- The homeless population and demographics for Columbus, Ohio
- Services currently available for the homeless in Columbus
- Services available in other cities and the state

The above information would likely be available through secondary research sources. Useful information would likely be available through city and state government agencies such as U.S. Department of Health and Human Services or the U.S. Department of Housing and Urban Development; local and national homeless advocacy groups such as the Coalition on Homelessness and Housing in Ohio, Columbus Coalition for the Homeless, National Alliance to End Homelessness, and the National Coalition for the Homeless. You would also need to search relevant research databases (discussed in the Where Do I Look? section) in subject areas such as engineering, sociology and social work, and government documents.

Second, primary research, such as interviews or surveys can provide more in-depth and local bent to the numbers and details provided in secondary sources. Some examples of groups to interview or survey include local homeless advocates; shelter and outreach employees and volunteers; people currently or previously experiencing homelessness, such as the vendors or writers for the street newspaper Street Speech; researchers or university-affiliated groups, such as OSU's STAR House, that conducts, compiles, and applies research on homelessness.

Often, the strongest research blends primary and secondary research.

Where do I begin?

Research is about questions. In the beginning the questions are focused on helping you determine a topic and types of information and sources; later in the research process, the questions are focused on expanding and supporting your ideas and claims as well as helping you stay focused on the specific rhetorical situation of your project.

Questions to get started

- What is my timeline for the project? You will likely want to set personal deadlines in addition to your instructor's deadlines.
- What do I want to know or learn about? This helps you determine scope or the limits of your research. If you're writing a dissertation or thesis, then your scope will generally be larger because those types of projects are often 100+ pages. For a term paper, the scope will be more narrow. For example, if you're interested in NASA funding and research, you may limit yourself to the past 10-15 years because NASA because NASA has been around for nearly 60 years. Further, you may limit your focus to research that has transitioned into technologies or resources used outside of NASA and the space program.
- What do I already know about this topic?
- What biases might I have about this topic? How might I combat these biases?

Questions to determine methodology

- Where might I find useful, reliable information about this topic? For academic research, you will generally focus on library, technical, scientific, and governmental resources. It is fine if you are not quite sure exactly where you should look; your instructor should be able to help you determine some places that would be appropriate.
- Will I need to perform primary research, secondary research, or both?

Next you will have to develop a **research question**. By this point you should have a general idea of your topic and some general ideas of where you might find this information.

Research Questions

Research questions generally form the basis for your project's thesis. Research questions are not about facts, but are about opinions, ideas, or concerns.

Which of these is a research question?

1. What is NASA's budget for 2016?
2. What is the impact of NASA's budget on scientific breakthroughs and contributions to non-space-related fields?

The former can be answered quickly and easily (NASA's 2016 budget was about $19.3 billion), but the latter requires detailed analysis of multiple sources and considerations of various opinions and facts.

Once you have developed your research question(s), you are ready to begin searching for answers.

Where do I look?

In the 21st century, we generally turn to the internet when we have a question. For technical, scientific, and academic research, we can still turn to the internet, but where we visit changes. We will discuss a few different places where you can perform research including Google, Google Scholar, and your university library website.

Google and Google Scholar

The default research site for most students tends to be Google. Google can be a great starting place for a variety of research. You can use Google to find news articles and other popular sources such as magazine articles and blog posts. You can use Google to discover keywords, alternative terms, and relevant professional, for-profit, and non-profits business and organizations. The most important thing to remember about using Google is that search results are organized by popularity, not by accuracy. Further, because Google customizes search results based on a user's search history, searches performed by different people or on different browsers may provide slightly different results.

For many technical, scientific, and scholarly topics, Google will not provide access to the appropriate and necessary types of sources and information. Google Scholar, however, searches only academic and scientific journals, books, patents, and governmental and legal documents. This means the results will be more technical and scholarly and therefore more appropriate for much of the research you will be expected to perform as a student. Though Google Scholar will show academic and technical results, that does not mean that you will have access to the full-text documents. Many of the sources that appear on Google Scholar are from databases, publishers, or libraries, which means that they are often behind paywalls or password-protected. In many cases, this means you will have to turn to a university or other library for access.

University Libraries

Library resources such as databases, peer-reviewed journals, and books are generally the best bet for accurate and more technical information. A Google search might yield millions and millions of results and a Google Scholar search may yield tens or hundreds of thousands of results, but a library search will generally turn up only a couple thousands, hundreds, or even dozens of results. You may think, "Isn't fewer results a bad thing? Doesn't that mean limiting the possibilities for the project?" The quick answers are yes, fewer results means fewer options for your project, but no, this does not mean using the library limits the possibilities for a project.

Overall, library resources are more tightly controlled and vetted. Anyone can create a blog or website and post information, regardless of the accuracy or usefulness of the information. Library resources, in contrast, have generally gone through rigorous processes and revisions before publication. For example, academic and scientific journals have a review system in place—whether a peer-review process or an editorial board—both feature panels of people with expertise in the areas under consideration. Publishers for books also feature editorial boards who determine the usefulness and accuracy of information. Of course, this does not mean that every peer-reviewed journal article or book is 100% accurate and useful all of the time. Biases still exist, and many commonly accepted facts change over time with more research and analysis. Overall the process for these types of publications require that multiple people read and comment on the work, providing some checks and balances that are not present for general internet sources.

So what are common types of library sources?

- Databases: databases are specialized search service that provide access to sources such as academic and scientific journals, newspapers, and magazines. An example of a database would be Academic Search Complete.
- Journals: journals are specialized publications focused on an often narrow topic or field. For example, Computers & Composition is a peer-reviewed journal focused on the intersection of computers, technology, and composition (i.e. writing) classrooms. Another example is the Journal of Bioengineering & Biomedical Science.
- Books: also called monographs, books generally cover topics in more depth than can be done in a journal article. Sometimes books will contain contributions from multiple authors, with each chapter authored separately.
- Various media: depending on the library, you may have access to a range of media, including documentries, videos, audio recordings, and more. Some libraries offer streaming media that you can watch directly on the library website without having to download any files.

How do I perform a search?

Research is not a linear process. Research requires a back and forth between sources, your ideas and analysis, and the rhetorical situation for your research.

The research process is a bit like an eye exam. The doctor makes a best guess for the most appropriate lens strength, and then adjusts the lenses from there. Sometimes the first option is the best and most appropriate; sometimes it takes a few tries with several different options before finding the best one for you and your situation.

Once you decide on a general topic, you will need to determine keywords that you can use to search different resources.

Exercises

Let's say you read an article about how four Mexican immigrants and their cheap robot beat MIT in a robotics competition, and now you are interested in the topic of immigration and STEM education or employment. After reading the article, you decide on some terms:

- Illegal aliens
- Hispanics
- STEM
- Education

- Employment

It is important to have a wide range of keywords because not all terms will result in the same information. Developing a list of keywords can be aided by a quick Google search. A Google search may reveal more official language or terms; broader or narrower terms and concepts; or related terms and concepts. You can also search for the term + synonym to find other words you might use. Keep in mind, a synonym search will not work for all terms. For technical and scientific topics, though, Google may not be a lot of help for finding other terms.

You can use a couple different tricks to narrow your search. Using quotation marks around two or more words means the search results will contain those words only in that specific order. For example, based on the exercise above, a search for “illegal aliens” would only provide results where these words appear in this exact order, with no words between them. A search for illegal aliens without the quotation marks will search for “illegal aliens” but also any sources that have the word illegal and alien anywhere in the text.

Writing about Research

Determining a topic and finding relevant resources are only the beginning steps in the research process. Once you locate sources, you actually have to read them and determine how useful and relevant they are for your particular research context.

Understanding and Documenting the Information

Remember, our own ethos relies, in part, on the quality of the secondary research sources we use. That is, the sources we use can either add or detract from our overall credibility. Therefore, reviewing, processing, and documenting information is an integral part of the research process. Below, we discuss a variety of strategies for effectively understanding and documenting sources.

Skimming

Skimming is the process of reading key parts of a text in order to get an overview of an author's argument and main ideas. There are many different methods for skimming, so you will have to determine which works best for you and your particular source.

Well-written texts such as essays, articles, and book chapters are generally formatted in similar ways:

Introduction: provides the main idea/thesis as well as overview of the text's structure
Body: provides claims, arguments, evidence, support and so on to support thesis
Conclusion: provides connections to larger contexts, suggests implications, ask questions, and revisit the main ideas

Ideally, the main ideas will be presented in the introduction, elaborated on in detail in the body, and reviewed in the conclusion. Further, many sources will contain headings or subheadings to organize points and examples, and well-written paragraphs generally have clear topic sentences, or sentences that provide the main idea(s) discussed in the paragraph. All of these aspects will help you skim while developing a sense of the argument and main ideas.

When you skim a source, consider the following process:

1. Read the introduction (this could be a few paragraphs long).

2. Scan the document for headings. In a shorter article, there may not be any headings or there may be only a couple.

3. Whenever you see a new heading, be sure to read at least the first few sentences under the heading and the final few sentences of the section.

4. Read the conclusion.

Example: Skimming a Book

When we encounter a text for a first time, it's a good idea to skim through to see if we need to take a further look at it in our research. One method for doing this is referred to as the First Sentence Technique, which entails reading the introduction, the first sentence of each paragraph, and the conclusion. This approach can be useful for taking notes and creating summaries of sources.

A slightly more in-depth approach can deepen your understanding of the text and help you identify particular sections or even other resources that might be helpful:

- Scan the preface, acknowledgements, and table of contents. (This identifies the methods and framework for the book.)
- Scan the notes at the end of chapters to better understand the author's research.
- Scan the index to see if the book covers the information you need.
- Read the introductory paragraphs for each chapter. (This can help you better understand the structure and arguments of the book.)

Taking Notes

Taking notes is a central component of the research process. While you skim the articles, record important information, beginning with publication information. Publication information provides a sense of the rhetorical situation for the source, such as intended audience and context. As you encounter texts in your research, consider its role in your project and take note of the publication information as noted. Recording the publication information as you go will help avoid problems or mistakes when citing and building the reference list.

You may think: what should I record from the sources other than the publication information? The goal of research notes is to help you remember information and quickly access important details. You should write down the following details:

- Thesis statement
- Keywords
- Major points or claims
- Evidence, support and/or examples
- Headings (depending on the source)

You may want to write down the thesis, points, and claims exactly as they appear in the source. **However, whenever you copy the language exactly, be sure to use quotation marks to indicate that the information is coming directly from a source/author.**

Restating the Information in Your Own Words

After taking the time to skim and take notes, you should also put the author's thesis and ideas into your own words. This ensures that you truly understand the source and the author's points. There are two major ways to approach this process: summary and paraphrase.

Summary

Summaries are condensed versions of the original source, in your own words. Summaries focus on the main ideas, but do not copy any of the original language. A 500 page book or a 2 hour movie could be summarized in a sentence. **Summaries do not contain the same level of detail as the original source.**

Example: Summary

The following text demonstrates a summary of an original passage:

Original Text

"Lead can enter drinking water when service pipes that contain lead corrode, especially where the water has high acidity or low mineral content that corrodes pipes and fixtures. The most common problem is with brass or chrome-plated brass faucets and fixtures with lead solder, from which significant amounts of lead can enter into the water, especially hot water."

Summary

Water becomes contaminated by lead when lead pipes, solder, or certain types of fixtures degrade, and hot water can increase the amount lead released.

Environmental Protection Agency. (2016). Basic information about lead in drinking water. Retrieved from https://www.epa.gov/ground-water-and-drinking-water/basic-information-about-lead-drinking-water

Paraphrase

Similarly, paraphrases are restatements of source material, in your own words, but the difference is that paraphrases tend to be closer in length to the original source. **Paraphrases have the same level of detail as the original.** Remember, though, if you copy from the original even two or three words in a row you must provide quotation marks around those words.

Example: Paraphrase

Original

"Lead can enter drinking water when service pipes that contain lead corrode, especially where the water has high acidity or low mineral content that corrodes pipes and fixtures. The most common problem is with brass or chrome-plated brass faucets and fixtures with lead solder, from which significant amounts of lead can enter into the water, especially hot water."

Paraphrase

Water becomes contaminated by lead when lead pipes or lead solder degrades. Certain types of fixtures, such as those plated with chrome and brass, as well as hot water, acidic water, and water with lower amounts of minerals can make lead contamination significantly worse.

Regardless of whether you choose to directly quote, summarize, or paraphrase a source, you **must** document the source material. **Failure to do so is plagiarism** and can lead to allegations of academic or workplace dishonesty.

Annotated Bibliographies*

Annotated bibliographies are a common step in the research process. Annotated bibliographies are exploratory in nature—they help writers organize their thoughts and sources about a topic and help writers determine a direction for their research. Depending on the academic discipline, purpose, and instructor preference, the style, content, and even the name of annotations can vary. This document is a basic overview, so please confirm details of your annotated bibliography with your instructor.

Purposes of an annotated bibliography

For you: During the research and writing process, the annotated bibliography helps you, the researcher, keep track of the changing relevance of sources as you develop your ideas. It also helps you save time by focusing on each author's essential ideas (which helps you make connections between sources), and it can help you begin the process of composing your project.

For others: During the research process, annotated bibliographies also help show your instructor that you are consulting idea-generating and relevant sources and, more importantly, that you understand the significance of and relationship between your sources. When you seek assistance from your librarian, annotated bibliographies also help the librarian guide you toward the best available sources. Finally, annotated bibliographies help your writing consultant/tutor work with you more efficiently on integrating an author's ideas into your writing.

What is an annotation?

Generally, an annotation provides a summary of the major ideas in a source, such as the source's thesis (argument) and major supporting details; an evaluation of the ideas and points in the source; and a sense of how the source connects with your project and other sources in the annotated bibliography.

Questions to consider as you compose your annotation:

- What is the thesis (main argument of the source), and what is the general purpose of the source?
- Who is the author and what are his/her credentials? Who is the intended audience?\
- What theoretical or ideological assumptions does the author advocate, and where or how does that appear in

the source?

- What topics does the source cover? What types of evidence does it use?
- What parts of the argument or analysis are particularly persuasive, what parts are not, and why?
- What types of rhetorical appeals (ethos, pathos, logos) does the author use in the development, deployment, and support of their ideas?
- How is this source useful, or not useful, to your project? How does it help you advance the argument for your project?
- How well does the source relate to or not relate to the other sources in your annotated bibliography?

What are the parts of an annotated bibliography?

1. The first part of every entry in an annotated bibliography is a citation of the source. Follow the citation style preferred by your instructor.

2. The second part of every entry is an annotation or description of the source. Annotations can vary in length, depending on the purposes of the annotated bibliography. Generally, the annotation will contain some information about the author's credentials/authority, followed by a brief summary of the source, taking into consideration the audience, author's viewpoint, and the thesis statement. Assessments of the source can appear anywhere, but it is commonly featured at the end of the annotation. Consider whether you found the argument or analysis persuasive, whether this source is useful to you, and why. You may also include any relevant links to other sources.

Sample, APA style:

Tien, F. and Fu, T. (2008). The correlates of the digital divide and their impact on college

student learning. Computers and Education 50(1): 421-436. doi:10.1016/j.compedu.2006.07.005

Although Taiwanese scholars[1] Tien and Fu focus on Taiwanese college students, a significant portion of the article is pertinent to a U.S. context. First, the authors acknowledge that most discussion of the "digital divide" incorrectly simplifies the issue of technological access.[2a] As a result, they discuss what they call the three dimensions of the digital divide: access; use and knowledge; and skills (422).[2b] This recognizes what several other sources in my bibliography have touched upon: access does not mean use nor does it mean knowledge or skills to effectively use digital technologies.[3a] Second, they explain that many countries, the US and Taiwan included, depend upon education at all levels to combat the digital divide(s). The issue is that there are deficiencies within educational systems which sometimes work to reinforce the divides already in place.[3b] Tien and Fu claim, however, that educational contexts hold the most possibility for combating the digital divide(s).[3c] Tien and Fu claim that demographic and socio-economic background had no significant influence on accurately predicting computer use,[3d] which contrasts with claims of other sources such as Kirtley.[4] However, gender and major did appear to have an influence on computer use; Tien and Fu note, for example, that female students tended to devote more focused computer time on academic-related work.[3e] Overall, the first half of the article that breaks down the different dimensions of the digital divide is the most useful for my project.[5]

1. This establishes the authority of the authors and evaluates the source's usefulness in an American context.

2a/2b. Establishes the argument of the article.

3a. Specific supporting details; establishes connection with other sources in bibliography.

3b/3c/3d/3e. Specific supporting details.

4. Establishes connection to other sources in bibliography.

5. Establishes usefulness for specific project.

*This content adapted from a handout created by the Center for the Study and Teaching of Writing at OSU. Emphasis (color) added and sample modified to APA format.

Research Conversations

Research is about understanding the prevailing opinions, arguments, facts, and details about a given topic. This requires reading what others have already said and published about a topic. We can understand this as the conversation about the topic. For most topics and issues, there can be multiple conversations, each grounded in a specific context, culture, and field of study. Rhetorician Kenneth Burke (1941) calls this the "parlor conversation."

> You come late. When you arrive, others have long preceded you, and they are engaged in a heated discussion, a discussion too heated for them to pause and tell you exactly what it is about. … You listen for a while, until you decide that you have caught the tenor of the argument; then you put in your oar. Someone answers, you answer him; another comes to your defense; another aligns himself against you. … The hour grows late, you must depart. And you do depart, with the discussion still vigorously in progress. (Burke, 1941, p. 110)

In other words, before you can effectively and persuasively enter into any conversation, you must understand and consider what others have already said. Otherwise you may simply replicate others' ideas, ask questions or raise issues that have already been resolved, or otherwise lack the knowledge and information needed to make productive and persuasive contributions to the topic.

Academic writing requires presenting your sources and your ideas effectively to readers. According to Graff and Birkenstein (2006), authors of the book *They Say, I Say*, the first element in the process involves "entering a conversation about ideas" between you—the writer—and your sources to reflect your critical thinking (p. ix). Graff and Birkenstein provide templates (a quick Google search for "They Say I Say templates" brings up many examples) for organizing your ideas in relation to other research, your thesis, supporting evidence, opposing evidence, and the conclusion of your and others' arguments.

You are likely already aware of the '"they say/I say" format. A common version of this is:

> "On the one hand, ______________. On the other hand, ______________."

When talking about research, you might begin with "on the one hand, Researcher X (2015) claims….." and then insert, “on the other hand, I argue…..” Or, you may use this construction to put two sources in conversation before inserting your ideas. For example:

> On the one hand, Researcher X (2015) claims…..On the other hand, Researcher Y (2016) argues…Building on Researcher X and Researcher Y, I contend…

What is most important to remember about integrating research and your own ideas is that you must provide clear attribution of ideas in the text. Attribution is not only about citations, but also about providing textual clues about source material and its origins. Sometimes this is described as introducing and explaining and sometimes it is described as sandwiching a quotation or idea. For example:

> According to Researcher X (2015), “information directly quoted from source” (p. 20). That is, [explanation, justification, or other explication on the quoted material].

Data Commentary

Data Commentary

Part of the research process includes making sense of the information you find, for yourself and especially for others. Data commentary is the process of explaining and contextualizing information. This section will discuss what data is (including some different types) and why commentary is important for understanding data.
What is Data?

Writ large, data can be defined as any information generated or collected through inquiry or observation. For example, in your class, you might observe individuals with curly, straight, or wavy hair. Observations of these categories of hair comprise one kind of data. Alternatively, you might measure how varying levels of carbon and nitrogen affect the growth of plant root structures. The measurements of plant roots represent another kind of data.

What are the Types of Data?

Both of the above scenarios involve the generation of data: information about observable or measurable phenomena in the world. In the scenario above where effects of carbon and nitrogen are associated with plants' root structures, data would consist of measurements associated with the roots. For example, the length of roots produced by each plant, or the number of 'shoots' branching from each root are two different sets of quantitative data. Quantitative data is usually defined as numerical information, generated or collected through measurements conducted by humans or mediated through devices (computers, microscopes, scales, etc.)

Alternatively, the information collected in the first example—that people in a given group have different hair texture that can be described and grouped by category—is what we usually call qualitative data. Qualitative data is observable or measurable information that is not (typically) numerical in nature.
Writing and Talking about Data: What can we do with it and what should we do with it?

While the distinction between these two types of data can be valuable, it's important to recognize that there are not hard and fast boundaries between the two. Qualitative judgments are often made about quantitative data, and quantitative judgments can be used to manipulate qualitative data:

"All quantitative data is based upon qualitative judgments; and all qualitative data can be described and manipulated numerically." (http://www.socialresearchmethods.net/kb/datatype.php)

What does this mean? It means that when we collect quantitative data, our measurements are based on our qualitative judgments about what is important/valuable information to measure. So, in the root example above, the plant's root length or complexity are potential measures that tell us something about how the plant has been affected by the variables, carbon and nitrogen levels. Through exposure to other scientific studies of similar phenomena, through which they have gained expert judgment and shared disciplinary knowledge, ecologists have come to expect that there will be a relationship between root length and complexity and these variables. This example demonstrates that what is important or valuable to measure is determined by a researcher's questions, but also by cultural values and beliefs within that researcher's discipline, as well as the larger culture.

How quantitative data is generated involves qualitative judgments that are influenced by larger disciplinary and cultural values and standards. In addition, analysis of quantitative data also involves interpretation and explanation influenced by what the interpreter already knows about the topic, what she wants to suggest with the information, and for whom she is presenting the information.

For example, the researcher studying the effects of carbon and nitrogen on plant roots might compose a paper for a scientific journal; the audience for this piece would be other researchers interested in plant ecology. In this paper, the researcher could focus on the data and results, emphasizing how varying levels of carbon and nitrogen differently influence plant root length and structure. Because of her audience (other ecologists) and purpose (communicating her results), the researcher doesn't need to explain the significance of her findings in the same way she would if, for example, she was explaining her results to the public. The same study, written to appear in Popular Science, would need to explain why it matters that carbon and nitrogen differently influence plant root length and structure. The researcher might, for example, hypothesize that overuse of synthetic, nitrogen-based fertilizers on agricultural plants, such as carrots, could reduce the size or density of the crop yield. A conventional farming audience, or an audience interested in sustainable farming might differently interpret this representation of the research differently than the scientific audience reading the scientific article covering the same research and data. The difference lies in the purpose for which the writer is interpreting the data and how she must represent what is at issue, given the conventions and expectations of the genre of scientific article, versus popular news coverage of scientific research.
How Persuasion and Data Interpretation InteractAlthough it would be convenient for data to 'speak for itself,' this is rarely, if ever, possible. One individual looking at the data makes different sense of it than another, although through persuasion and discussion, we can come to agree what the data means. In the field of engineering, as well as many other scientific and technical fields, acceptance of your ideas and interpretations are based not only on your technical facility—coming up with the best answer or solution—but on your ability to persuade someone else that your interpretation or idea is the best answer solution. As such, technical writing and communication becomes a vital way of not only understanding what it is you know (e.g. writing an explanation of your results so you understand what it means), but also transmitting that knowledge to others. Until knowledge is shared, until

you have effectively communicated what you know to another party who shares the same interpretation of the facts or data, what you know can't really count as 'knowledge' (Winsor, 1996, p. 5).

Using and Documenting Sources

Ohio State University Libraries has created their own PressBook, *Choosing & Using Sources*, with excellent information on the research process. Check out Chapter 6 for information on evaluating sources and Chapter 7 and Chapter 8 on using and citing sources.

Note: As with this PressBook, you will need to click on each individual section of a chapter to read the entirety of a chapter.