Chapter 3. Writing in a Technical Communications Style

In this Chapter

- Understanding writing style and recognizing the importance of writing in a style that meets readers' expectations
- Discussion of effective technical communications style that is defined as *concise*, *precise*, *direct*, and *well organized*
- Recognizing and using meaningful, precise language

3.1 Voice and tone

- Understanding and using appropriate language, voice, and perspective in engineering communications
- Addressing common issues with writing in

the discipline—active vs. passive voice, nominalization, personal vs. impersonal tone

3.2 Mechanics and grammar

- Learning to recognize and address habits and errors in your writing
- Reviewing common grammatical issues that affect students in FE and FEH

3.3 Citations and citation styles

- Recognizing the role of citing sources in written documents
- Reviewing the basics components of citations in IEEE and APA style

A technical communications writing style is (almost always) **concise, precise, direct,** and **well organized**. The following sections outline useful tips and best practices, but know that these are only a starting point. Writing style is something you must be aware of and continually work to refine as you develop your communication skills.

A technical communications writing style prioritizes the *efficient transfer of information*—this may be a change from

the types of writing you have done in the past. “High school writing” is more typically descriptive expository essays with a length requirement. Technical communication asks you to document information and communicate it in a concise, precise, and professional way. The focus tends to be more on how well the writing achieves that goal rather than on proving that you read or understand something.

Writing assignments often provide specific structures or lists of required elements; however, simply fulfilling these guidelines is rarely enough to create a cohesive, clear document. To be a successful writer not just in first year engineering, but in your major courses and career, you must be attentive to the ways your writing style needs to vary from one situation to the next.

Understanding “Writing Style”

To understand what “writing style” is, think about all the different ways people talk. With their tone of voice, volume, and speed of delivery, they are able to project different moods, personalities, and purposes. Think about how a person sounds while they’re telling a funny story. Then think about how a person sounds while telling you about their problems.

You might also intuitively know that certain ways of speaking are appropriate for some situations, but not for others. If you wanted to deliver a passionate speech to persuade your audience to vote for you, you certainly wouldn’t want to sound like you were delivering a eulogy at a funeral (or vice versa).

Those same concepts apply to your writing. *How* you deliver information—the voice, tone, mood of your writing—is the “style.” It affects how well your audience will understand and respond to the information you are trying to communicate.

Since writing style affects how your reader responds, be aware of and *use* it to help you achieve your purpose.

In most situations, you must also communicate in the style your reader expects. This is often driven by genre (type of document) and context. If you are asked to produce a lab report, your reader will have certain expectations about what goes in it, and if you don't meet those expectations, it will reflect poorly on you as a communicator and make it less likely that your message is delivered.

Since writing style affects how your reader responds, be aware of and use it to help you achieve your purpose.

Audience and purpose, then, will always affect your writing style, as discussed in Understanding Your Audience. In this chapter, you will find guidance for developing a general technical communications writing style for documents common to First Year Engineering.

Concise

Sentences should be clear and simple, communicating one concept per sentence. In situations where you want your message to be unambiguous, simple, short, direct sentences are best.

Avoid "filler" or "fluff" that clutters up your writing and does not provide useful information. Here are some common types of "filler" to be aware of:

Vague or hedging language	*Avoid:* basically, to a certain extent, kind of, sort of, stuff, things, something, about (+ number)	
Redundancies	each ~~and every~~ present ~~time~~ ~~end~~ result ~~absolutely~~ essential ~~completely~~ eliminate enter ~~into~~ ~~fellow~~ teammate ~~final~~ conclusion cancel ~~out~~ ~~the month of~~ [August]	
Wordy phrases	make an adjustment	= adjust
	make a decision	= decide
	provide assistance	= assist
	a large number of	= many (or quantify)
	at the present time	= now
	due to the fact that	= because
	in order to	= to
	in the near future	= soon
	prior to the start of	= before
	until such time as	= until
	in the event that	= if
	serves the function of	= functions *or* is
	being	= (omit—just invite an action)
	do not hesitate	

Examples of editing for concision

Before: Keep this information on file for future reference.

After: File this information.

Before: Ideally, it would be best to place the billing ticket just below the monitor and above the keyboard.

After: Place the billing ticket between the monitor and the keyboard.

Before: We need to act on the suggestions that the supervisors offer us.

After: We need to act on the supervisor's suggestions.

Before: Due to the fact that we reduced the weight of the AEV, we used less energy.

After: We used less energy because we made the AEV lighter.

Before: It was the offset battery that made the AEV fall off the track.

After: The offset battery made the AEV fall off the track.

Before: There is a danger of poor communication causing a bad outcome in the team project.

After: Poor communication can negatively impact the team project.

Keep in mind, however, that shorter is not *always* better. For example, there may be times when you might sacrifice concision for the sake of sounding more personable, friendly or conversational. If you have to deliver bad news, a two-sentence email might come across as rude or uncaring, while writing a longer email that builds rapport and includes more qualitative,

personable touches might soften the blow. This approach could have a positive impact on a team dynamic or a client relationship so that, even with a slightly higher word count, the final outcome is better.

Practice & Application: Exercise D – Software Design Pitch Video Prep

Precise

Precise wording avoids ambiguity and ensures the correct information is conveyed to your reader. This is obviously essential to engineering settings, where highly technical information is being communicated.

Precise writing will generally meet the following criteria:

1. **Statements are verifiable.** Ambiguity might provide a sense of security, but leads to documents that, at best, need to be further investigated. Imprecise language in the workplace can lead to dangerous misapplication of results.
2. **Statements are specific and meaningful.** Phrases or descriptors that are used in everyday life are often not appropriate in a technical document. Words like “cold” or “best” are meaningless unless a standard of comparison is established. What is considered “cold” for a metal? For organic material?
3. **Descriptors are quantified whenever possible.** If exact data is not known, it should be replaced with objective observations, e.g., “The water began to boil.” When making quality determinations like “better” or “best,” determine what criteria you are using and instead of making a subjective statement, share that criteria with your reader.

4. **Word choice accurately represents the level of certainty.** Words like “prove,” “guarantee,” or “certainty,” communicate a finality that rarely exists in science and engineering. You will often draw conclusions based on evidence, but it is unlikely that you will ever prove or guarantee the results of your experiment or design. Use words that are accurate and still allow for uncertainty, such as: “indicate,” “suggest,” “highly likely,” “reduce,” “decrease” or “increase”

Imprecise:	More precise:
Several holes were drilled in the plank.	*Three (3)* holes were drilled in the plank *four* (4) *inches apart.* *Quantifies the number of holes and the spacing.*
A few of the LED's on Design 1 were kind of faint.	*Two* LED's on Design 1 were *noticeably less intense than their counterparts on Design 2.* *Quantifies the number of LEDs and provides a specific point of comparison.*
The beaker of water was placed in the ice bath until it was cool.	The beaker of water remained in the ice bath until its temperature *reached 23°C.* *States a specific temperature to define "cool."*
Using a lower water cement ratio in the concrete mix will eliminate cracking.	Using a lower water cement ratio in the concrete mix will *help reduce* cracking. *Avoids an absolute statement that could set unrealistic expectations.*
The tests performed proved that the custom data structure does not have errors.	The tests performed using the custom data structure *did not encounter errors.* *Avoids overstating ("proving") the conclusion that can be drawn from the test.*
The team determined that Design A was the best.	Design A *completed the test successfully and used the lowest amount of energy.* *Explains the basis for the determination of what specifically made the design "the best."*

Application: Addressing error in lab documentation

In lab documentation, **systematic and random error** should be addressed. The report should address both the potential errors that could have occurred and the effect those errors would have on the results.

Systematic error is an error that cannot be lessened through continued trials. These errors often occur when tools are not sufficiently accurate or a model is used that does not fully explain the system being studied. Address inaccurate simplifying assumptions made in the experimental design or analysis. For example, many experiments assume that there are no frictional losses in a system. This may significantly impact the results of an experiment testing the performance of a motor. Results should acknowledge that additional losses due to friction were not considered.

Random errors are unpredictable factors that affect the data gathered from the experiment. The effects of random errors can be minimized through repeated trials. For example, if a beaker should be filled to exactly 20ml, it is approximately equally likely that the researcher would fill the beaker slightly above or below that level. After multiple trials, the

average level should be close to 20ml. If it is not, there are likely systematic errors also affecting the experiment.

Practice & Application: Exercise E – Making Data Meaningful

Direct

Technical communication should get to the point quickly—readers need to know right away what to expect and if the document will meet their needs.

A key aspect of directness in writing style is vocabulary. The most direct approach will use vocabulary that is right for the situation and doesn't use "fancy" or "flowery" words in an attempt to sound "smart" or impressive.

It is tempting to write unnecessarily complex sentences in an attempt to elevate the perception of your expertise, but this can obscure the message being communicated... *Wait, let's try that again...*

Writing unnecessarily complex sentences is tempting when you are trying to seem smart, but this can make your message less clear. *Better!*

In most professional communications, the goal is to sound knowledgeable, yet unpretentious and natural *for the situation and audience*. Use jargon only if it improves the quality of the communication. See Understanding Your Audience for a discussion of appropriate levels of technicality based on audience type.

Some examples of "flowery" language (and more direct replacements):

- ascertain (determine, learn)
- terminate (end)
- utilize (use)
- employ (use)
- endeavor (try)
- herein (here)
- procure (get)
- rendered inoperative (failed)

Here are some additional practical ways to ensure directness in technical and professional writing:

- Clearly state the purpose and scope of a document or communication at the start—get to the point quickly.
    - When possible, put the most important information near the beginning—stating a request in the first lines an email or making a recommendation in the opening of a report are both examples of being direct in the ideas/information.
    - Some types of documents, like memos, will require a specific purpose statement, but any communication should clearly tell the reader what they can expect to find, similar to the "In this Chapter" call-outs used in this guide.
- Use concise, meaningful subject lines for professional emails. Include specific keywords and indicate the purpose of the communication (words like "request," "scheduling," or "update" help the reader identify the purpose).

This is important for communicators in many contexts, and the

policy of Plain Language is a useful example of a real-world application of "directness" in communication.

Plain Language as an example of "Direct" communication

In 2010, the U.S. Congress passed the Plain Writing Act, which established that government documents issued to the public must be written clearly. Guidelines for plain language have been developed around the world to enhance the public's access to information. The U.S. guidelines state that users should be able to *find what they need, understand what they find, and use what they find to meet their needs.*

Plain language is a method of communicating information that focuses on the reader's experience. How can the information be presented in a way that is useful to the reader? Different types of communication will require different levels of background information, but the important information should always be easy to access.

Well Organized

The order in which information is presented affects how easily it will be understood. As a communicator, you will need to make sure that any document, email, or presentation you create has an intentional, logical, and consistent organization.

To be successful as a communicator, you must first understand the organization of the communication and then project that to your audience. Having a "big picture view" of the document's purpose and structure early in the writing process is key—it is difficult to impose good organization on a piece of writing unless you have carefully considered organization from the start.

Here are some practical ways to make a document clearly well organized:

- **Outline the document** during the "Represent & Plan" stage of the writing process. This is especially useful when writing as part of a team because it ensures that each team member has a shared understanding of how each section "fits" into the larger document.
- **Use an advance organizer** to "forecast" the content of a document and set your audience's expectations for the structure of the communication. For example:
    - "This report outlines the need for this program and then offers specific evidence to support the proposed plan."
    - "In the following sections, we provide an overview of the experimental methodology, present the findings, analyze the data, and offer our conclusions and recommendations."
- **Divide longer documents with headings and subheadings**

so your reader can navigate easily; give presentation slides meaningful titles, section headings, and slide titles. These types of cues will make your organizational patterns visible to your audience.

- **Use transition words and phrases** to help your reader understand connections as they move between sections, paragraphs, and sentences. Here are some useful "transition" words and phrases:
    - Addition or connection: *also, first/second/third, in addition to, moreover*
    - Result: *as a result, and so, therefore, because, as a consequence*
    - Comparison: *similarly, likewise, in the same way*
    - Contrast or alternative: *however, yet, still, otherwise, on the other hand, on the contrary, nevertheless, notwithstanding*
    - Example or explanation: *for instance, for example, specifically, in fact, in other words*
    - Summary or conclusion: *finally, in conclusion, in closing*
- **Use simple, direct topic sentences** to open paragraphs (BLUF) and then support them with more detailed information. See Paragraphs [link] for more information.

There are several models that technical communications often follow to present information.

Model	When to Use
Chronological	Highlights the progression of events that occurred or tasks that should be completed. Often used in: • Progress reports • Project plans
Spatial	Describes a physical structure using an organizing principle like east-to-west or top-to-bottom. Often used in: • User manuals • Product design descriptions
Priority	Presents information in order of importance or emphasis. Often used in: • Safety documentation • Proposal • Feasibility study
General to Specific	Familiarizes the reader with context or theory before introducing a complex idea. Often used in: • White paper • Proposal • Presentation
Problem → Method → Solution	Discusses the methods used to address an issue and their effectiveness. Often used in: • Lab reports and lab memos • Technical report • Experimental documentation

While your reader should be able to find specific information easily, they should also see a clear direction for your document as a whole. Consider your reader's experience empathetically. If you were reading this document, where would you expect

to find certain information? Will your reader gain a clear understanding of your process from reading the document from start to finish?

A Note About Lab Report Organization

A Lab Report contains sections for Results and Discussion. Students often present the data from a specific portion of the lab, then immediately discuss the meaning of that data within the Results section before moving on to the results of the next portion.

From a chronological perspective that seems logical, but that is not the structure of a lab report. Switching back and forth from results to interpretation is awkward and may leave your reader looking for data interpretation in the Discussion section that is not there.

See Lab Report Content Guide for more information.

Practice & Application: Exercise F – Precision and Paragraph Organization

Key Takeaways

- When you are revising or editing for writing style, ask...
    - Meaningful?
    - Verifiable?
    - Useful information for my reader?

Additional Resources

The Basics of Scientific Writing (University of Nebraska)

3.1 Voice and Tone

Voice and tone are the elements of writing style allow you to manage how your reader "hears" and understands what you are saying. Depending on the communication situation, you might want to create a sense of objectivity, authoritative distance, or make the information active and immediately accessible. You might want to present yourself as a formal, consummate professional or build a friendly rapport with your client.

Similar to evaluating the appropriate level of technicality for your audience, considering how your word and grammar choices affect your reader will give you better control over how well the information is understood.

Active vs. Passive Voice

It is important to know the difference between active and passive voice and when to use them. Both active and passive voice can be valid and correct, but, used inappropriately, they can lead to confusing and needlessly complex sentences.

In the **active voice**, the subject of the sentence is the actor—the main verb describes what the "doer" is doing. This is an efficient way to construct simple, direct sentences that communicate an action.

- She threw the ball.
- We wrote the lab report.

In the **passive voice**, the subject of the sentence is the thing

acted upon. It directs the reader's attention to the thing that experienced the action (the verb) of the sentence.

- The ball was thrown.
- The lab report was written.

NOTE: The passive voice typically uses some form of the verb "to be" (is, was, were, had been, etc.).

There are perfectly sound reasons to use both "voices" in writing. There are cases when the actor (the "who") is unknown, unimportant, or implied:

- The city was founded in 1806. (By whom? *A lot of people. That's not the point here—I'm focusing on the date.*)
- My laptop was stolen! (By whom? *I don't know, obviously!*)

There are also times when you might consciously choose to minimize the role of the actor:

- The deadline was missed. (*I'd rather not say who's to blame...*)
- Part of the track was broken. (...due to circumstances out of our control, but that isn't important to my reader.)

However, ineffective use of the passive voice can cause issues with concision and clarity in large part because it relies on "to be" instead of more precise action words—why say "The report was written by me" when you can say "I wrote the report"?

In scientific or technical writing, there is a common (but not universal) perception that personal pronouns can undermine the objectivity of the writer or distract from important information. This is one of the main reasons passive voice appears so frequently in scientific or technical writing—the focus is shifted away from the person doing the action.

Personal vs. Impersonal Voice

In technical communication, where the focus is on conveying data and important information, it is common for writers to avoid using personal pronouns (I, you, he, she, we, etc.). This is one reason writers opt for the passive voice—saying "The wire was cut" rather than "I cut the wire."

There is not a universal rule against personal pronouns in scientific writing. Different contexts and situations will require different approaches, so you must be aware and adaptable.

For FE and FEH, different assignments will require different tones:

- **3rd person** preferred in Lab Reports, Lab Memos, Technical Reports, Progress Reports
- **1st and 2nd person** preferred in Email, and potentially in writing for websites

To avoid first person, but still use active voice, use "the team," "team members," or "the group" rather than first person pronouns:

- Two team members analyzed the code. (Rather than "We analyzed...")
- The team calculated the speed of the vehicle. (Rather than "We calculated...")

Nominalization

The passive voice inherently requires more words than the active voice, but a concise, simple passive voice construction is still

possible. Technical or scientific writing is prone to wordy, sluggish phrasing—what Lanham (2007) calls "Official Style" [cite]—caused in large part by inappropriate **nominalizations**, which are a result of *misusing the passive voice*.

Nominalization is turning a verb into a noun—essentially describing an action as a thing. For example:

Past tense verb: analyzed → We **analyzed** the results.
Noun: analysis → An **analysis** of the results was made.

Verb: to describe → The witness **described** the suspect to the police.
Noun: description → A **description** of the suspect was given to the police.

While nominalization might be *grammatically* correct, it can distract from the "real" action of the sentence by replacing the main verb with a form of "to be." As with passive voice, writing with too many nominalizations creates sentences that are difficult to read and overly complex. This type of writing is more demanding for your reader and you will be more likely to lose their attention or understanding.

Active Voice	Passive Voice	AVOID: Passive Voice with Nominalization
The team verified the contents of the lab kit. (or "I verified..." in 1st person)	The contents of the lab kit were verified.	A verification of the lab kit contents was carried out.
The team member removed the insulation with a wire stripper. (or "I removed..." in 1st person)	The insulation was removed with a wire stripper.	Removal of the insulation was completed using a wire stripper.

Tone

Avoid emotional or qualitative language in technical documentation. Keep your reader's focus on the measurable, verifiable information and the objective aspects of your decision-making, not personal or emotional responses.

For example, these types of phrases would not aid a reader's ability to understand or verify the information and would be **too "emotional"** in tone:

- It worked beautifully.
- The result was terrible.
- We were thrilled.

Go here for more information about using precise language effectively.

Minimize overly casual language. Many of the things you say in casual conversation with your classmates do not belong in a Lab Report. You might *know* this, but it's surprisingly easy during the writing process for those phrases to creep in... show up... no, *appear*. See?!

Here are some examples of language that would be **too informal** in a Lab Report:

- figured out, got it
- came up with
- bouncing off [ideas], thinking outside the box
- checked out, test out
- ran into
- messed up, screwed up, threw off
- hard (in the sense of "difficult")

You might use this type of casual, conversational language

strategically in specific situations (it could show personality in an email or even some types of presentations, for instance), but it does not usually have a place in formal technical writing or documentation.

Key Takeaways

- Writing can be technically correct yet still ineffective for communicating your message if the writing style is not appropriate.
- Use the passive voice when appropriate or strategic, but don't allow it to affect the clarity and concision of your writing.
- Avoid unnecessary nominalizations—give preference to "real" verbs that describe the main action in a sentence rather than is/are/was/were.

Additional Resources

Passive Voice

Resources on subjects/verbs
Cohesion, Coherence, and Emphasis

3.2 Mechanics and Grammar

Writing correctly is vital to being an effective communicator. Errors like misspellings, subject-verb agreement, and incorrect punctuation are distracting to your reader, making it less likely that your communication will achieve its purpose. Your reader won't likely notice correct grammar (correctness is expected), but they *will* notice errors. Incorrect grammar reflects poorly on you as a communicator.

Your reader won't likely notice correct grammar... but they *will* notice errors. Incorrect grammar reflects poorly on you as a communicator.

As discussed in Engineering Your Writing Process, the review and revision process is essential to producing clear, correct writing. You need to give yourself time to "re-see" your own writing and be able to spot the errors.

To get better at this, try to predict your mistakes. When you receive feedback on your writing, you need to be able to not just correct the errors that were marked, but recognize patterns and weaknesses so you can learn and improve in the future. Become aware of the types of mistakes you tend to make and focus your effort on correcting those issues:

- **Observe and reflect.** Carefully review feedback you receive on your writing in FE/FEH and other classes or experiences. Do you see any patterns? Any repeated comments or corrections? What issues are most challenging for you to see in your own writing?

- **Learn and develop.** Work to understand the problem areas—read, look at examples, rewrite things you have written in the past. Visit the Writing Center and ask for coaching on the topic.

There are an incredible number of excellent resources online and on campus available to help you address grammatical and mechanical writing issues. As you start to learn how to write in college and in the engineering discipline, make it a priority to fill in any gaps in your skills.

The topics outlined here frequently affect students beginning to write in a technical communications style.

Tense

The "tense" we write in indicates to our reader when something happened—past, present, or future. These subtle differences carry important distinctions.

Past: I provided the report. (*I sent it to you last week.*)

Present: I am providing the report. (*It's attached to this email.*)

Future: I will provide the report. (*I am still working on it and will send it soon.*)

This might seem easy and it typically is intuitive for people fluent in a language, but in technical communications and the complex documents you will write (often as a team), it is important to be aware of tense and use it consistently and correctly in the right places.

Past tense is most common for the engineering technical communications you do in FE and FEH because you are reporting activities that already happened—describing a

procedure, lab, research process, or results of an experiment or test. Be consistent with tense as you describe what you and your team did and what your findings were.

Present tense is logical and acceptable for writing emails or communicating with a public audience on your website. In lab reports, present tense might be used to define problems in the Introduction or in making recommendations in the Conclusion ("The team recommends…").

Future tense is necessary when describing next steps and upcoming planned activities in progress reports, and might also be useful in emails when describing what you will do next.

Parallel Structure

Parallel structure or **parallelism** is about maintaining grammatical consistency in lists. In a list, you are essentially creating a set of things for comparison and those things should be of a similar type to make the comparison useful.

It is easiest to see in simple sentences:

Not parallel: I like to bike, play baseball, and skiing.

Parallel: I like to bike, play baseball, and ski.

Parallel: I like biking, playing baseball, and skiing.

When writing a formatted list, the same rule applies. A list requires a clear lead-in and then all listed items must be the same grammatical form.

This list maintains clear parallel structure:

For the camping trip, I am packing the following:

– *Tent*

– *Sleeping bag*

– *Bug spray*

– *Bottled water*
– *Camping stove*

But this list includes varying grammatical forms:

On the camping trip, I want to do the following activities:
– *Hiking*
– *S'mores* [Noun instead of a verb—should be "Making s'mores" to be parallel with the first item]
– *Go stargazing* [Different verb form that the first list item—should be "Stargazing"]

It is easier to make mistakes with parallel structure as sentences get more complex because you lose the connection to the "lead-in." Edit sentence and bullet point style lists carefully for parallel structure.

Example: Editing for parallel structure

Original:

This memo contains an overview of the lengths of pipes by themselves and with their fittings, a sketch of the finished roller coaster that met all lab requirements, analyzes how well built the roller coaster was, and explains the challenges that were experienced while executing this lab.

Visualized as a bulleted list to make the grammatical comparison easier to see:

This memo contains

– **an overview** of the lengths of pipes by themselves and with their fittings,
– **a sketch** of the finished roller coaster that met all lab requirements,
– **analyzes** how well built the roller coaster was, and
– **explains** the challenges that were experienced while executing this lab.

NOTE: The first two are nouns and make sense following the phrase "This memo contains…," but the next two are verbs, so they don't maintain parallel structure or logical grammar. You would never say "This memo contains analyzes…" and formatting as a list helps make that error clear.

Revised so all the listed items are nouns:
This memo contains **an overview** of the pipe lengths alone and with their fittings, **a sketch** of the finished roller coaster that met all lab requirements, **an analysis** of the quality of the roller coaster's construction, and **an explanation** of the challenges experienced while executing this lab.

Paragraphs

A **paragraph** is not just an arbitrary collection of sentences, but a meaningful set of information. Learning how to paragraph effectively will help you move from an outline to fully written document and develop better organized, coherent documents.

Paragraphs should be focused on one main idea. Ideally, all the sentences in a paragraph should work together to explain and build on the idea in the topic sentence (typically the first sentence).

Another way to think about the role of a topic sentence in a paragraph is that they put the **"bottom line up front" (or BLUF)**. Rather than giving your reader all the details before you tell them what the point is, the topic sentence states the main idea, then fills in the supporting information. Topic sentences need to be meaningful and specific—they should contain specific keywords and present an idea that *can* be developed further in the paragraph instead of vague, placeholder language. For instance,

- **Avoid:** The team reviewed the results.
- **Better:** The team reviewed the testing results to understand the design efficiencies.

- **Avoid:** It is necessary to change the process.
- **Better:** It will be financially beneficial to change the product testing process.

In general, paragraphs should be short and focused. There is no absolute "rule" about paragraph length, but 7-10 lines on the page is typically a reasonable range for most document formats. If you see a paragraph that stretches on much longer than that, it likely contains more than one main idea and could be broken up into two or more better focused paragraphs.

Paragraph Cohesion

Cohesion refers to the degree to which a reader can follow the

logical progression of ideas developed in a given piece of writing. We can talk about cohesion at the level of a paragraph, a document section, or an entire document.

But how is cohesion achieved? Cohesion occurs when the reader can easily resolve, from sentence to sentence or section to section, the relationship between

- the given information (what they already know)
- and the new information.

This becomes more difficult when the information is more technical in nature, so make use of the following strategies to increase cohesion:

Transitions: Transitions are words, phrases, and sometimes entire sentences that act as logical bridges between ideas developed in one sentence, paragraph, section, or document, and another. It's important to note that transitional devices are not interchangeable, but rather, they signal to your reader how you want them to interpret the relationship between what has come before, and what will come after. Therefore, when making a comparison between two things, it's appropriate to say "on the other hand…" but if you were summarizing or concluding a section, you would select a different transitional device, such as "consequently," or "as I have shown…". See more about useful transition words here. [Link to "Well Organized"]

Threading words: Threading words can clarify connections among topics and actions in sentences and paragraphs expressing complex ideas. Threading words include the following types:

- **Repetition of key terms** can be particularly useful when referring to a sequence of events that involve multiple, complex steps with technical names. Repeating the terms

helps the reader keep track of the development of the paragraph's subject and actions.

- **Synonyms** for the key term and **pronouns** (it/they) can also enhance cohesion, and are helpful when you want to avoid beginning each sentence with the same construction or style.
- **Demonstratives** (this, that, these, those) can also help clarify which topic/subject from the previous sentence or paragraph that you are referring to in the following new sentence/paragraph.

Notes	Sample Paragraph
Topic sentence states a main idea or "claim." The idea is meaningful and specific. Supporting sentences clearly relate back to the claim presented in the topic sentence, adding detail and explaining. Sentences connect and build on each other, moving from a general statement about the value of communication skills, through the benefits to their future academics, and then career tracks. This serves as a transition to guide the reader's focus from academics to their future career.	Technical communication skills are valuable for first year engineering students. Writing in an engineering or scientific context might be new for these students, but emphasizing communication skills at the start of a student's academic career will help them perform well in their degree program. Engineering students must develop effective written and verbal communication skills alongside their technical skills. Beyond academics, these skills will support students' future career development and advancement in or out of the engineering field, allowing them to not only have innovative ideas, but to share and promote them successfully.

Examples: Well-structured, coherent paragraphs

The context of a document is often needed to fully *assess the effectiveness of a paragraph, but these paragraphs generally show good attention to BLUF and adequate development.*

The experiment showed that increasing the size and quantity of propeller blades increased the power output of the turbine. The three-blade manufactured propeller produced 0.25 W, while the two-blade propeller produced 0.12 W. Design 2 produced 10% more power than the smaller Design 1 (see Table 3), suggesting that blades with a larger surface area may produce more power. 30 degrees was the more powerful pitch tested, producing 5% more power than the 45 degree pitch (Table 5).

—

The team will use concept scoring to evaluate whether the team should move forward with their design changes. Concept scoring allows qualitative factors to be compared systematically. The matrix will be used to score each design on criteria from the mission concept review. These criteria scores will be compared to determine whether the team's design changes are aligned with the client's priorities. To

increase accuracy of results, designs will be scored in a set of trials. This process will clarify the differences between designs.

The specific heat of the unknown metal was determined to be 0.242 cal/g°C. Using the values obtained for the energy released by the metal and the change in temperature of the metal, equation 3 was used to calculate an experimental specific heat.

$$C = \frac{Q}{m\Delta T}$$

Specific heat (cal/g°C) = energy lost (cal)/ mass(g) * change in temperature (°C) (3)

The experimental values are shown in Table 4 (see Appendix C for sample calculations).

Table 4. Experimentally determined specific heat values

Trial	Specific Heat (cal/g°C)
1	0.241
2	0.244
3	0.242

The average of the experimental values was 0.242 cal/g°C with a standard deviation of 0.00153.

The data suggests that vehicles on Woody Hayes Drive consistently travel 4-5 mph faster than the posted speed limit. The speeds of all cars observed can be found in Table A3. The data set indicated with strong central tendency and low dispersion that the typical vehicle speed on this section of Woody Hayes Drive was between 29 and 30 mph. This value was reasonable, given the posted speed limit of 25 mph.

Practice & Application: Exercise G – Logic, Cohesion, and the Bottom Line

Key Takeaways

- Readers care about grammar and correct writing, even though grammar is not the only requirement for effective writing. Incorrect or messy grammar and mechanics will undermine your authority.
- Pay attention to patterns of grammar or mechanical issues in your writing and work to

improve them—seek feedback and resources that will help you.

- Use tense consistently and correctly—past tense is most common in lab-related writing for FE and FEH.
- Be consistent when writing lists—all items in a list should have the same grammatical form (parallel structure).
- Give paragraphs a clear main idea or "claim" that is clearly stated in a topic sentence and developed in the supporting sentences.

Additional Resources

Center for the Study and Teaching of Writing – Writing Mechanics handouts
Parallelism (parallel structure)

3.3 Citations and Citation Styles

As in all academic writing, you will be asked to document your sources in engineering technical communications. When you reference information or ideas from a book, article, website, handout, presentation, etc. in your own writing, you must tell your reader where it came from—failure to do so is plagiarism and academic misconduct. Citing sources also connects your reader to a broader range of sources and information, and it ultimately builds your credibility as a communicator.

Citation styles are a set of conventions or rules for giving credit to source material. Different disciplines use different styles. For instance, you are likely familiar with the Modern Language Association (MLA) style from English or writing classes, since this style is most commonly used in the arts and humanities.

At this university, Institute of Electrical and Electronics Engineers (IEEE) and American Psychological Association (APA) styles are most commonly used. Familiarize yourself with the basic guidelines of those styles—an overview is provided below. You can find a longer list of citations styles and information from the Ohio State Libraries here.

Check the assignment sheet or ask your professor/TA about their requirements for citations because they may vary, but always assume that you need to cite your sources.

Recognize that various citation styles exist—you can research and use them when needed. Even if you make a mistake in the

punctuation or formatting, you *absolutely must make an effort to credit source material*. Check the assignment sheet or ask your professor/TA about their requirements for citations because they may vary, but always assume that you need to cite your sources.

Citing Sources — the Basics

Citation styles typically define the rules for two main components:

1. **In-text citations.** Indicate basic, limited information about the source in the flow of the text, wherever the information or idea is directly referenced in your writing. Also referred to as "textual citations."
2. **List of sources.** A separate listing of all sources used with detailed and complete publication or location information. Depending on style, this list has different names and will follow various organizational patterns. Anything referenced in an in-text citation must have a corresponding entry on the source list.

IEEE

The **Institute of Electrical and Electronics Engineers (IEEE)** developed a citation style that is used widely within computer science and engineering and is similar to many of the styles used by other specific engineering disciplines.

In-text citations

Numbers in square brackets are used to identify the source in the sentence—use space before the bracket and place before any punctuation.

It is not *necessary* to reference the author's name, although the author may be referenced in the sentence—this is your choice as a writer.

Multiple sources are presented with each number in brackets and separated by commas.

Sources are numbered in order that they are presented in the text (i.e. the first source is [1], the second is [2]); once a source is numbered, use the same number if it is referenced elsewhere in the document.

Examples:

The provided material had a thickness of .347 mm [5].
For complete findings, see [4].
...consistent with findings of recent studies [2], [3].
Jones [6] identified the contradiction.

List of sources

A list titled "References" is placed after the main text of the document.

Sources are presented in numerical order; bracketed numbers are flush left with a hanging indent.

Article titles are in quotation marks; book/journal titles are in italics.

Author names are given as first initial(s) and last name (e.g., J. Smith, M. J. Jones).

Basic format—include relevant or available information:

J. Doe and B. Deer, "Article or chapter title in quotes," *Book / Journal Title in italics*, vol. #, no. #, Month Year of publication. [Format]. Available: retrieval URL or database name. [Accessed Mon. Day, Year].

Examples:

Course materials

[1] Ohio State Fundamentals of Engineering Program, "Stress and strain." [Course documentation]. Available: carmen.osu.edu for ENGR 1182. [Accessed Mar. 8, 2018].

Journal article retrieved from the internet

[2] A. Huang, "Understanding interpersonal dynamics in peer review assignments," *Current Issues in Technical Communication*, vol. 63, no. 5, July 2010. [Online]. Available: http://cietc.edu/volume63/number5/. [Accessed Dec. 7, 2017].

Book (print) with multiple authors

[3] P. Rogers and C. Lauper, *Musical Vision*. New York City, NY: Purple Press, 2016.

APA

American Psychological Association (APA) style was developed for use in the social and behavioral sciences, but is often used in other scientific fields, including engineering and engineering education.

In-text citations

Sources are indicated in line with author's name (last name only) and date of publication.

- If the author's name is in the sentence, the date is alone in parentheses after the referenced information: "Smith (2017) found that the material measured…"
- If the author is not named in the sentence, name and publication date are placed together in parentheses, separated by a comma "… findings supported by the data (Smith, 2017)."
- If there is no person or persons named as author, the name of an organization may be used instead.

Publication date is presented only as year. If there is no known publication date (common in online sources), the date is replaced with "n.d." NOT the retrieval date (that is provided only in the References list).

Examples:

Jones (2014) identified the contradiction.

The provided material had a thickness of .347 mm (Ohio State Fundamentals of Engineering Program, n.d.).

A report from the U.S. Environmental Protection Agency (2013) shows an increase in mercury levels. The results were consistent with findings of similar recent studies (Doe & Beer, 2009).

List of sources	A list titled "References" is placed after the main text of the document. Sources are presented in alphabetical order based on the start of the entry (typically the author or source name—whichever was used to identify the source in the in-text citation); use hanging indent. Article titles are in plain text (without quotation marks); book/journal titles are in italics. Author names are given as last name followed by first initial(s) (e.g., Smith, J., or Jones, M.J.). Basic format: Doe, J., & Deer, B. (2007). Title of article. *Title of Journal in italics*, volume #(#). Retrieved from http://www.someaddress.com/full/url/ Examples: *Course materials* Ohio State Fundamentals of Engineering Program. (n.d.) Stress and strain [Course documentation]. Retrieved March 8, 2018 from carmen.osu.edu *Journal articles retrieved from the internet* Huang, A. (2010, July). Understanding interpersonal dynamics in peer review assignments. *Current Issues in Technical Communication*, 63(5), Retrieved from http://[fullURL] Jones, M.J. (2014). Contradictions in technical documentation. *Journal of Made Up Things*, 4(2). Retrieved from http://[fullURL] *Book (print) with multiple authors* Rogers, P., & Lauper, C. (2016). *Musical Vision*. New York City, NY: Purple Press.

Key Takeaways

- Cite all sources that are not your original work.
- Use the recommended style for citations, if

provided. If not, choose a style you are comfortable with.

Additional Resources

APA formatting guide from OWL