# Chapter 1: The Writing Process

## Objectives

Upon completion of this chapter, readers will be able to:

1. Define the stages of the writing process, from finding a topic to revising a draft.
2. Generate a topic for a writing project and narrow it to a specific focus.
3. Create an outline and sequence its items using different methods, such as chronological or general-to-specific.

## Introduction to the Writing Process

The writing process takes you from the very beginning of a writing project—finding topics and analyzing audience and purpose—all the way to the end—writing and revising the rough draft. The following chapters focus on some of the key phases of that process:

* Strategies for team-writing
* Audience analysis
* Brainstorming and invention
* Narrowing
* Outlining
* Notetaking
* Libraries, documentation, cross-referencing
* Strategies for peer-reviewing
* Power-revision techniques

## Find Report Topics

As a writer in a technical writing course, you may need some strategies for finding topics for writing projects, which are provided in this section.

By definition, technical writing courses are opportunities to focus on practical uses of your writing skills. In a 16-week technical writing course, you would typically complete a work-related writing project every two to three weeks. For instance, you might draft user-friendly instructions for a new software tool used in your workplace or write a comparison report on the latest smart home security systems. Technical writing courses are also excellent opportunities to explore current trends in science and technology—such as breakthroughs in artificial intelligence, the latest developments in quantum computing, or innovative methods in sustainable urban farming like vertical hydroponics.

### Brainstorm Topics for Writing Projects

If you have a topic for your writing project, the next step is to think about subtopics related to it. Here is an excerpt of a brainstorming session in which these questions were used.

How does a wind-powered electrical system (WPES) work? What are the steps in its operation? Savings: discuss the amount of money that can be saved using WPES. Relationship between average windspeeds and electrical output: what happens when there's no wind, only very light breezes? Too much wind? Basic parts: rotor, generator, tail assembly, tower. Different manufacturers of WPES: how to get a good system and avoid being ripped off. Dimensions, materials, construction of common models of WPES; sensitivity to low wind speeds. Historical background on WPES: the time when more WPES were being used, just before rural electrification in the 1930s; who were the first developers? When has interest in WPES reappeared? Why? Two general classes of wind machines: lift and drag machines. Lightning protection of WPES. Aerodynamic principles as they apply to WPES. Understanding weather patterns and seasonal and geographical factors affecting wind. Principles of electricity: circuits, generators, types of current, meanings of terminology. Local, state, federal tax credits and research support in wind systems research, and WPES purchase by consumers.

### Narrow That Report Topic

In a technical writing course, the best place to start a project is with a real-world workplace challenge—something that genuinely needs writing to help solve it. Maybe your team needs clearer onboarding guides, or maybe your office struggles with inconsistent reporting formats. Starting with a specific problem means you already have a built-in audience and a focused purpose, which makes narrowing your topic much easier. On the other hand, if you start with just a general subject—like the future of AI, smart home tech, or climate trends like La Niña—it’s easy to go too broad and end up drafting something overwhelming and unfocused. Choose a clear angle, do thoughtful research, and you’ll end up with a document that’s actually useful—without turning it into a hundred-page textbook.

Narrowing means selecting a portion of a larger topic: for example, selecting a specific time period, event, place, people, type, component, use or application, cause or effect, and so on. Narrowing also means deciding on the amount of detail to use in discussing those topics.

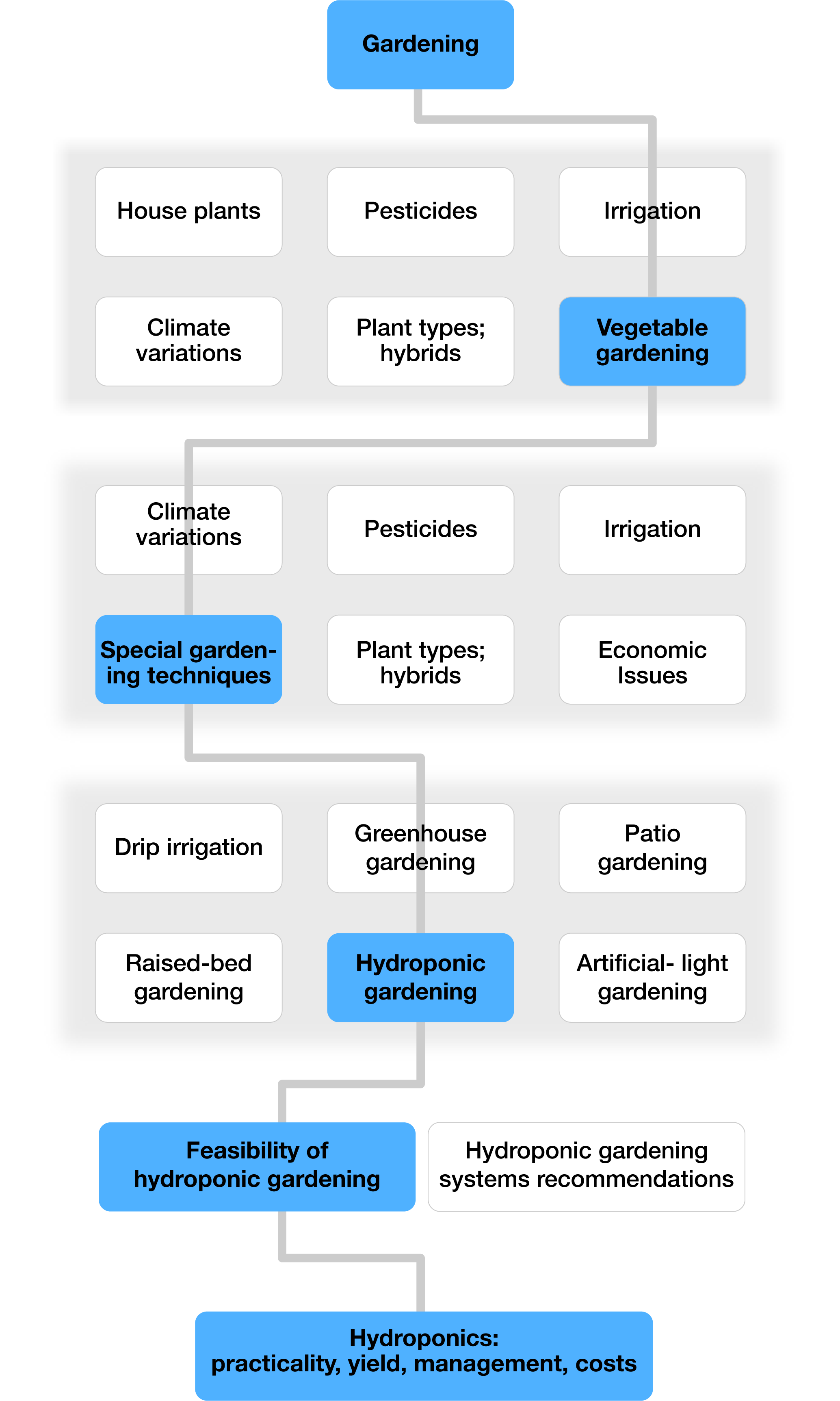
**Note**: In the following example of the narrowing process, you may wonder how all those subtopics seem to come to mind so effortlessly. If that's not the way it is for you, try some brainstorming and invention first.

### Following the Narrowing Process

Let's walk through a typical narrowing exercise to see how it works. This particular example works "backward" from a topic to a realistic audience and purpose. In a "real world" situation, you'd begin with a workplace situation.

1. Imagine that you want to write something about **gardening**. You have a backyard vegetable garden that you grow as a hobby, and of course for the vegetables it produces.
2. What can you do with a topic like gardening? You know you want to focus on **vegetable gardening**, but that's only a timid first step at narrowing. There are still dozens and dozens of topics related to vegetable gardening.
3. What are the **possibilities related to vegetable gardening**? Obviously, there are topics like planting techniques, pest control, fertilization and irrigation topics, perhaps even special-focus reports on individual vegetables—tomatoes, onions, butter beans, peppers. Among these, you lean more to gardening methods or techniques—such as drip irrigation, raised-bed gardening, organic pest control, and so on.
4. Now you are getting somewhere! But you can't write on all those techniques—**pick one**! Recently, you were reading about how NASA's plans for the human exploration of Mars includes growing food there on the planet—specifically by using hydroponic methods. This sparks your curiosity; it's the right topic for a technical document of some kind.
5. You're all done with narrowing, right? Sorry, you're barely half-way there. Hydroponics, the science and craft of growing plants without soil, is a big topic in its own right. What specifically interests you about hydroponics: Interested in setting up a hydroponics system in your garage? Curious whether the claims about hydroponically grown foods are true? Wondering what it takes to run a hydroponics system? Interested in finding a commercially available hydroponic system that meets your needs and price range? Yes—something about practical realities of hydroponics! Your real interest here is the **feasibility of hydroponic gardening, recommendations, or both**.
6. Now you have a choice: (a) focus on the feasibility of hydroponics or (b) focus on commercially available systems to determine which is best and which will fit in your garage. At this stage, you are not ready to pick a system; instead, you must convince yourself that the whole concept is practical. Therefore, let's focus on the **general feasibility**.
7. Another chapter in this book presents several kinds of feasibility: practical feasibility, whether it works; economic feasibility, whether it's too expensive and whether it pays for itself or offers economic advantages; implementation feasibility, whether it's too much trouble, whether you have to remodel your entire garage; and feasibility in terms of the yield and quality— whether hydroponically grown vegetables are any good.
8. So what's it going to be? You know that you want **answers to these questions**: does hydroponic gardening work? What's the yield? Is it any good? How much of a hassle is it? How expensive and how difficult is it to build your own system? And what do you need—in general terms—to build a system? Is this too much for a semester report in a technical-writing course?

You've come a long way from "gardening," but you may still need to keep going. Actually, you've done one other narrowing operation without noticing: the focus is small-time, hobbyist, or "home" hydroponic gardening—not commercial hydroponic gardening. In any case, you have four main questions: (a) how does it work, (b) how well does it work, (c) how much work is it, and (d) and what are the costs? These translate into the subtopics you see at the very bottom of this flow chart.



*Figure 1: Diagram of narrowing down your topic*

To this point, you've been operating in a vacuum, not considering audience and situation, focusing instead on your interests in this topic. Now it's time to get real—to define a real or realistic audience and situation. Who wants this document? Who would hire you (hydroponics expert) to write it? How would people obtain this document? Imagine that a hydroponics association, club, or special-interest group sends out a request for proposals (RFP). Its members want a technical writer to develop an overview guide on hydroponics: not a how-to, not a parts list—just an introduction answering people's questions and concerns. The organization will ship your overview to anybody who inquires about the topic—and the organization will pay you for all of this great work.

Are we there yet? Not quite. Narrowing means two things: zooming in on progressively smaller and smaller subtopics. And deciding on level and amount of detail. In this hydroponics overview, must you cover the four subtopics in excruciating detail? No, at most you'll want to cover practicality in moderate detail: readers need enough detail to see that the method actually works. Use the same amount of detail for yield, perhaps citing some comparative studies. But use only light detail for management and costs. You must keep this overview relatively brief and readable.

## Outlining-Generating Items and Sequencing Them

When you write a technical report, not only must you think of the right information to include (or exclude), you must also find a good way to arrange it. This is a two-part chapter: this part focuses on generating outline items and sequencing them; the second part focuses on turning a rough outline into a good, polished outline.

Outlines for technical reports are usually hard to handle solely in your mind; it's a little like trying to add a list of large numbers mentally. You must get report outlines in print in order to think about the arrangement of the topics within them. A good working outline serves you in at least four important ways:

* It shows you which areas of information to investigate and gather information on.
* It shows you which areas you can safely ignore (thus saving you plenty of time).
* It enables you to schedule your work into manageable units of time.
* It gives you a "global" view of your report project, an overall sense of the contents, parts and organization of the report.

### Generating Outline Elements

So, you’ve brainstormed a bunch of topics. Great! But now you’re staring at a Frankenstein list of ideas about cocombustion—burning municipal solid waste (MSW) with regular fuel to save money and make trash disappear—and it’s, well, kind of a mess.

1. Advantages of cocombustion
2. Steps in cocombusting MSW
3. Disadvantages of cocombustion
4. Historical background on cocombustion
5. Economics of cocombustion
6. Special components for cocombustion
7. Composition of MSW
8. Cocombustion power plant construction costs
9. Cocombustion power plant operating costs
10. Economic advantages of cocombustion
11. Environmental advantages of cocombustion
12. Characteristics of municipal solid waste (MSW)
13. Environmental disadvantages of cocombustion
14. Methods of MSW disposal

Don’t panic. That’s normal.

Let’s look at this glorious chaos of 14 topics. Right now, it’s like a junk drawer of half-related ideas: some talk about the pros, some the cons, some dive into money stuff, and others are just vibing in the background with technical jargon. What do we do next? Clean it up.

Step one: Start grouping. You’ve got multiple entries whining or cheering about cocombustion. Throw them into one big heading like Advantages and Disadvantages of Cocombustion:

1. Advantages and Disadvantages of Cocombustion
   1. Advantages of Cocombustion
   2. Disadvantages of Cocombustion

But wait! Plot twist: One of those advantages is economic, and there’s more where that came from. Break it off into a new section called Economics of Cocombustion:

1. Advantages and Disadvantages of Cocombustion
   1. Economic Advantages of Cocombustion
      1. Construction Costs
      2. Operating Costs
   2. Economic Disadvantages of Cocombustion

Nice. But now what about those environmental perks and problems? They deserve their own spotlight. Enter: Environmental Aspects of Cocombustion:

1. Advantages and Disadvantages of Cocombustion
   1. Economic Advantages of Cocombustion
      1. Construction Costs
      2. Operating Costs
   2. Economic Disadvantages of Cocombustion
2. Environmental Aspects of Cocombustion
   1. Environmental Advantages
   2. Environmental Disadvantages

Now we’re cooking.

Still staring at the rest of the list? You've got “Steps,” “Components,” and two different ways of saying “what's in the trash.” These are clearly part of the *How This Actually Works* section. Call it Process and Materials:

1. Advantages and Disadvantages of Cocombustion
   1. Economic Advantages of Cocombustion
      1. Construction Costs
      2. Operating Costs
   2. Economic Disadvantages of Cocombustion
2. Environmental Aspects of Cocombustion
   1. Environmental Advantages
   2. Environmental Disadvantages
3. Process and Materials
   1. Steps in Cocombusting MSW
   2. Special Components
   3. Composition of MSW
   4. Characteristics of MSW

Suddenly, the chaos looks a little more like a real plan.

Moral of the story? Outlining is messy. You’ll group, regroup, cut, paste, and curse your past self more than once, but that’s how it works. Starting with a brain dump and then shaping it into something that doesn’t look like an MSW fire is part of the writing process. Embrace the mess; it’s how clear, organized, useful documents are born.

### Sequencing Outline Elements

The next step in outlining is to sequence the items appropriately. There are so many different patterns of sequencing that only the most common ones can be reviewed here.

#### Chronological sequencing

One of the most common patterns in outlining is the chronological one. In an historical background section of an outline, the chronological approach is just about the only one you can use. Here is an outline excerpt concerning the historical background of nuclear research:

1. Historical background of nuclear research
   1. Becquerel’s theory of radiation in uranium (1896)
   2. The work of the Curies (far)
   3. The work of Rutherford (past)
      1. Demonstration of the internal structure of the atom (1911)
      2. Transmutation of atoms (1919)
   4. Development of technology to study atomic structure
      1. Cascade transformer (1928)
      2. Linear accelerator (1931)
      3. Cyclotron (1932)
      4. Betatron (1940)
   5. Hahn-Strassmann discovery of uranium fission (1938)
   6. Oppenheimer’s work on nuclear chain reactions [near (1940s) past]
   7. Explosion of the first atomic bomb (1945)

In some outlines, however, you almost don't notice the chronological pattern. For example, effects come after causes; solutions, after problems; or findings, after research method. The chronological pattern is most important in a research proposal outline.

1. Introduction
   1. Historical background on caffeine studies (past)
   2. Objectives of the study
   3. Limitations of the study
   4. Plan of development
2. Review of the literature on caffeine
3. Experimental method to be used
4. Results of the tests
5. Discussion of the results
6. Summary and conclusions
7. Implications for further research (future)

Chronologically, the researcher first defines the problem, then reviews the literature on the problem, plans a research method, conducts the research and gathers data, analyzes the data, and draws conclusions from it. Afterward, the researcher may consider areas for further research on the problem.

#### At-rest to in-motion sequence

Another common outlining pattern is to start with an object at rest, motionless as if in a photograph, and then to move to a discussion of it in operation, in action as if in a motion picture.

1. Basic Components of Wind-Powered Electrical Systems
   1. Rotor (motionless)
   2. Generator
   3. Tower
2. Basic Operation of Wind-Powered Electrical Systems
   1. Wind energy into mechanical energy
   2. Mechanical energy into electrical (in motion) energy
   3. Stabilization of electrical energy
   4. Conversion to household current

#### Specific to general sequence

Some outlines move from a specific, close-up focus to a more general, panoramic focus. They seem to start with a microscope, examining the minute details of a subject, and end with a telescope, considering the subject from a distance in relation to other things. (This pattern can also be reversed.)

1. Introduction
2. Characteristics of municipal solid waste (MSW)
3. Methods of disposal of MSW (*microscope*)
4. Processing municipal solid waste
5. Plant modifications for cocombustion
6. Advantages of cocombusting MSW
   1. Environmental advantages
   2. Economic advantages (*telescope*)
7. Case studies of three cocombustion plants

In this next outline, the focus broadens after part III, changing to aspects related to computerized voice recognition technology:

1. Introduction
2. Human voice production
   1. The generation of sound
   2. Factors affecting the human (microscope) voice
3. Components of the isolated word recognition system
   1. The preprocessor
   2. The feature extractor
   3. Components in the classification phase
   4. Decision algorithms
4. Problems with computerized speech recognition
   1. Accuracy
   2. Limited vocabulary size
   3. Privacy
5. Applications of voice recognition systems
   1. Data entry
   2. Mobility
   3. Security
   4. Telephone access
   5. Devices for the handicapped (telescope)
6. Current availability of speech recognition systems
7. The future of the computerized speech recognition industry

#### Rhetorical sequence

Elements in outlines can also be arranged rhetorically, in other words, according to what is most effective for the reader. Here are some examples of rhetorical patterns:

* Simple to complex
* Least important to most important (or vice versa)
* Least controversial to most controversial
* Most convincing to least convincing (or vice versa)
* Most interesting to least interesting

This list is by no means complete, but you can see that elements in it are arranged according to impact on the reader—that is, the impact the writer would like to have. Here are some excerpts of outlines where these patterns are used.

If you’ve ever dipped your toes into Python programming, you know some concepts are easy to grasp—like printing text to the screen—while others, like loops and data structures, take a little more brain power. If you were outlining a beginner’s guide to fundamental Python concepts, you’d probably organize it from the simplest to the most complex:

1. Essential Python Commands
   1. Print statement – Displaying messages and values
   2. Variable assignment – Using equals
   3. Lists – Storing multiple values
   4. If statements – Making decisions
   5. For loops – Repeating tasks

An obvious outlining principle is to avoid creating interruptions within an outline sequence. Here's an example:

**Outline Excerpt with Interruption**

1. Municipal solid waste generated in the US
   1. Increases since 1950
   2. Projected increases to the year 2000
2. Processing MSW for cocombustion
   1. Primary storage
   2. Grinding
   3. Air sorting
   4. Magnetic separating
   5. Screening
   6. Secondary storage
3. Characteristics of MSW
   1. Composition of MSW
      1. food waste
      2. paper and other rubbish
      3. noncombustibles
   2. Factors affecting energy content
      1. moisture content
      2. areas of MSW origination
4. Power plant modifications for cocombustion

**Revised Outline Excerpt**

1. Municipal solid waste generated in the US
   1. Increases since 1950
   2. Projected increases to the year 2000
2. Characteristics of MSW
   1. Composition of MSW
      1. Food waste
      2. Paper and other rubbish
      3. Noncombustibles
   2. Factors affecting energy content
      1. Moisture content
      2. Areas of MSW origination
   3. Processing MSW for cocombustion
      1. Primary storage
      2. Grinding
      3. Air sorting
      4. Magnetic separating
      5. Screening
      6. Secondary storage
3. Power plant modifications for cocombustion

In the problem version, the municipal solid waste discussion is interrupted by the MSW-processing discussion. A better arrangement would be to discuss MSW fully before going on to the discussion of how it is processed. Use these common arrangement principles to get your topic list into an initial rough order. The rearranged version of the topic list shown previously might look this way:

1. Historical background
   1. Rising energy, utility costs
   2. Search for alternatives (review)
2. Composition of MSW
3. Special components of the cocombustion plant
4. Steps in the cocombustion of MSW
5. Economics
   1. Cost to build or convert
   2. Cost to operate
   3. Cost of produced electricity
6. Advantages
   1. Less coal used
   2. Reduction of utility rates
   3. Less landfill used
   4. Reduction of landfill costs and needs
7. Disadvantages
   1. Expense of converting existing facilities
   2. Handling MSW
   3. Increased emissions

Please notice in all these outlines, there’s never a part A without a part B. There’s never a single bullet. For logical outlines, descriptions, arguments, remember, if you have a part 1, there’s a part 2.

## Electronic Notetaking Methods

A number of software applications are available that support notetaking and related tasks: Microsoft OneNote, EasyBib, and GoogleKeep are three you might know. Their basic functions are similar. A versatile notetaking tool is Miro. Miro is a collaborative online whiteboard platform that can be helpful in the writing process—whether you're working individually or with a team. While it is marketed mostly as a project management tool for organizations, it’s also very helpful for visual learners and student researchers. They provide their Educational plan free to staff members and students of educational institutions. If you are a student or staff member of an educational institution and would like the Educational plan, fill out [this form on Miro’s website](https://miro.com/education).

Here are the things Miro can help with.

1. **Brainstorming Ideas.** Mind maps and sticky notes let you visually explore and organize your thoughts. You can drag, drop, and rearrange ideas easily. These organizing functions help in identifying connections or gaps. Templates like Brainstorm, Mind Map, and Affinity Diagram guide idea development.
2. **Outlining and Structuring.** Miro allows you to map out the structure of your essay, article, or report using visual tools. Create hierarchical outlines, story arcs, or flowcharts to plan the introduction, body, and conclusion.Helps writers see the “big picture” of their argument or narrative.
3. **Research and Organization.** Use Miro boards to collect and categorize research: add links, images, quotes, PDFs, and notes.Create columns or sections for different themes, sources, or arguments.
4. **Collaboration and Feedback.** Multiple people can work on the board simultaneously, making it perfect for peer review or group writing.Add comments, tags, or votes to highlight important sections or suggest edits.
5. **Drafting and Revising.** While Miro isn’t a word processor, it helps with prewriting, revising structures, or visualizing changes.Use the board to move sections around, test different arrangements, or summarize complex content.
6. **Project Management.** Writers managing long projects can use Miro to track progress with kanban boards, timelines, or to-do lists.Miro provides training videos on their [training website](http://academy.miro.com/). Clyde D’Souza has created [a training and template](https://youtu.be/6brKZh3UgOo?si=0-vMDQS9tZ8IpkuB) to support writers moving through the writing process. Please know that no one involved in this textbook works for Miro. We just wanted to show you a free (for students and educators) notetaking tool that we have used successfully.

## Traditional Notetaking Methods

Many tools are available when you work through the writing process. However, there are writers who prefer the old-fashioned way of taking notes by hand. Many writers say it helps them to remember the information better and think about it more deeply. Science backs up this common observation, finding that “students . . . writing by hand had higher levels of electrical activity across a wide range of interconnected brain regions responsible for movement, vision, sensory processing and memory” (Hu, 2024). The process of condensing written or spoken information into notes for a project engages the brain more than simply typing what you hear or taking a picture of a relevant publication. For this reason, if you prefer handwritten notes, you need not change your strategy.

## Getting Ready to Write

When you've located the right sources of information for your report, it's time to start gathering the right information from them and developing it into a report. In other words, it's time to start reading, summarizing, paraphrasing, interviewing, measuring, calculating, and developing information any other way your report project requires. The technical report may be one of the largest writing projects that you've ever tackled: you may wonder how you are going to do all that reading and remember all that information. Concerning the reading, here are several suggestions:

1. Develop as specific an outline as you can: it shows you what information you must gather and, as importantly, what information you can ignore.
2. Use the indexes, tables of contents, and headings within chapters to read books selectively for just the information you need.
3. Divide your work into manageable, hour-long chunks (make progress rather than relying on big blocks of weekend or vacation time).

As for remembering the information you gather for your report, the most practical suggestion is to use some form of notetaking. Notetaking refers to any system for collecting and storing information until you can use it in the report. Notetaking involves the skills of summarizing, paraphrasing, or quoting. A good system of notetaking is one that enables you to gather a large amount of information over a long period of time and to be able to use that information without having forgotten it or lost it in the meantime.

In the traditional system of taking notes for a long report,

1. Develop a rough outline.
2. Do any preliminary reading necessary to construct a rough outline.
3. Locate your information sources, and make bibliography cards for each source.
4. Take the actual notes on index cards.
5. Label each notecard according to its place in the outline.
6. Provide bibliographic information on each notecard. Don’t wait until later to do this. You’ll be surprised how hard it is to find later.
7. Change or add extra detail to the outline as the notetaking process continues.
8. Check off the areas of the outline for which sufficient notes have been taken.

When you have taken sufficient notes to cover all parts of an outline, you transcribe the information from the notecards into a rough draft, filling in details, adding transitions, and providing your own acquired understanding of the subject as you write. Naturally, you may discover gaps in your notes and have to go back and take more notes.

### Developing the Rough Outline

As the section on outlining emphasizes, you must have a working outline before you begin gathering information. The rough outline shows you which specific topics to gather information on and which ones to ignore. Think of the outline as a series of questions.

If you don't have a good, specific outline, the sky is the limit on how many notes you can take. Think of the outline as a set of boxes that you fill up with the information you collect as you do your research for the report.

### Information on the Bibliography Cards

On the bibliography cards, you should record information that enables you or your readers to locate the books, articles, reports, and other sources. Remember that you'll use this information to create the bibliography or list of references for your report. The section on documentation shows you details on the information to record on many different types of sources, but remember these general guidelines:

* For books, record the "facts of publication": the city of publication, the publisher, and the date of publication.
* For magazines, record the title of the magazine, the date of issue of the specific magazine, and the beginning and ending page numbers of the article.
* For encyclopedia articles, record the edition number and date of the encyclopedia, and look up the authors' initials.
* For government documents, disregard the authors' names, use the department, administration, or agency name as the author, and copy the cataloguing number.
* For any private sources of information you use, for example, interviews or letters, record the date of the communication, the source's full name, title, and organization with which he or she is affiliated.

### Information on the Notecards

In the traditional notetaking system, a notecard typically looks like this:

BWR—fuel rod (III,A,1,b) fuel rod material—Zircaloy (same as PWR fuel rod) 148 in. long X 0.493 in. diam. slightly longer >' PWR fuel rod 16 D, 749

This notecard has the following features:

1. A word, phrase, or number that indicates where it fits into the outline (the "locator").
2. Bibliographic information: an abbreviation for the source of the note (book, article, etc.) and a page number.
3. The note itself, the information that will go into the report.
4. A number that indicates the notecard's place in the final arrangement of all the notecards.

#### Locator

The "locator" phrase or number tells you where the note fits into the outline, that is, when and where you'll use this information in the report. Locaters must be updated regularly. As you read, take notes, and learn more about your subject, you can flesh out, or "elaborate," your outline more and more, subdividing it into third, fourth, and even fifth levels.

#### Bibliographic Information

Each notecard must also contain bibliographic information, those details about the source of the note: the author, title, page number, and so on. Rather than write all such information on each notecard, use abbreviations: assign a letter to each source, make a key on a sheet of paper, and keep track of the sources on bibliography cards, as shown above.

### Methods of Recording Information on Notecards

The actual information that you record on the index card is rather small: a few statistics or a sentence or two, and not much else. You take such small bits of information to make it easier to "shuffle" your notecards into the sequence in which you'll use them in writing the rough draft. There are three ways of recording the information on notecards:

* Directly quoting it, copying the information directly from the source word-for-word
* Paraphrasing it, retaining the full detail of the information but in your own words
* Summarizing it, condensing the main points in the information in your own words

See what the [Purdue OWL (website)](https://owl.purdue.edu/owl/avoiding_plagiarism/best_practices.html) has to say about these methods.

#### **Direct Quotation**

In most technical reports, direct quotation is needed only for the following situations:

* Statements by important or well-known authorities or leaders
* Controversial statements you do not want attributed to you
* Statements expressed in unusual, vivid, or memorable language

Here is an example notecard with a direct quotation:

Myers, author of The Nuclear Power Debate and somewhat of a supporter of nuclear, emphs heavy inspect and penalties: During the period between July 1, 1975 and September 30, 1976 the NRC listed 1,611 items of noncompliance. Only six of these were considered serious violations, 923 were classified as infractions, and 682 were noted as deficiencies. The NRC issued fines to ten utilities totaling $172,250 between July 1, 1975 and December 15, 1976. NRC officials report that the limited use of fines and the efforts to get industry to regulate itself have worked. "By and large," one NRC official told IRRC, "I think our enforcement program is working." H, 46

When you copy a direct quotation onto a notecard, remember to do a few extra things that will save time and frustration later on:

* Write a lead-in to introduce the quotation, citing the author's name and any other important information about the author.
* Write a brief explanation, interpretation, or comment on the quotation you've just copied.

There are essentially two types of direct quotations: "block" quotations and "running" quotations. Here is an example of a block quotation (any quotation over 3 lines long, which is indented):

In Myers' view, the nuclear power industry has every reason to comply with the NRC's regulations to the very letter:

The NRC issues an order to shut down or imposes civil fines only after repeated violations have indicated what the NRC considers "a pattern of non- compliance." The NRC argues that, particularly with power plants, civil penalties are unnecessary for the most part. "The greatest penalty," one official said, "is to require the plant to shut down, forcing it to buy replacement power (often at a cost of $100,000 to $200,000 per day) elsewhere. A civil penalty's largest cost—the NRC is limited to a $5,000-per-violation ceiling per 30 days—is the stigma attached to it." (8:46)

The "stigma" refers to the fact that, once a nuclear power plant is fined, it will likely be the target of public concern and even more stringent and frequent NRC inspection.

"Running" quotations are direct quotations that are trimmed down and worked into the regular sentences of a report. Notice how much smoother and more efficient the running quotation is in the revised version below:

**Ineffective direct quotation:** There are two types of light water reactors: the pressurized water reactor and the boiling water reactor. LWRs of both types “convert heat to electricity with an efficiency of about 32 percent—significantly less than the best fossil-fueled plants, although about equal to the national average for all thermal electricity generation” [13:438]. As for harnessing the energy potential of uranium, LWRs are estimated to average only between 0.5 and 1.0 percent.

**Revision with running quotation:** There are two types of light water reactors: the pressurized water reactor and the boiling water reactor. According to Paul Ehrlich, who has been a consistent critic of nuclear power, both these types of LWRs "convert heat to electricity with an efficiency of about 32 percent—significantly less than the best fossil-fueled plants, although about equal to the national average for all thermal electricity generation" (13:438). As for harnessing the energy potential of uranium, LWRs are estimated to average only between 0.5 and 1.0 percent.

When you use direct quotations in your report, keep these guidelines in mind.

* Use ellipsis in direct quotations to indicate missing words. The three dots "..." show that words are omitted from the sentence. The brackets "[ ]" indicate changes made by the writer using the quotation so that it would read as good English and make sense.
* Never use "free-floating" quotations in reports. Always "attribute" direct quotations; that is, explain who made the quoted statement. Notice how this is done in Figure 6.
* Always provide adequate introduction for direct quotations and explain their meaning and importance to your readers. Notice how the block quotation above on NRC penalties (a) prepares the reader for the quotation, and, afterwards, (b) provides interpretive comment, on the meaning of the word "stigma" in particular.
* Use indented or "block" quotations whenever a direct quotation goes over three lines long. With any lengthy quotation, make sure that it is important enough to merit direct quotation.
* Whenever possible, "trim" the quotation so that it will fit into your own writing.
* Punctuate direct quotations correctly. [You can see the rules for punctuating direct quotations (website).](https://owl.purdue.edu/owl/research_and_citation/resources.html)
* Use ellipses to shorten direct quotations. When you do, however, make sure that the resulting quotation reads as good English.
* Use direct quotations only when necessary: if the passage doesn't fit one of the reasons for direct quotation cited at the beginning of this section, paraphrase or summarize it instead.

#### Paraphrasing

In technical report writing, usually the better approach to notetaking is to paraphrase. When you paraphrase, you convey the information fact-by-fact, idea-by-idea, and point-by-point in your own words. The writer of the original passage ought to be able to read your paraphrase and say that it is precisely what the writer meant. Here are some example paraphrased notecards:

BWR—fuel assembly (III,A,1,3) fuel assembly—63 f rods spaced, supported in a sq (8 x 8) arrangement by upper + lower plate 3 kinds: (a) tie rods; (b) water rod); (c) stand f rods 3rd, 6th f rods on a bundle's outer edge act as tie rods the 8 tie rods screw into castg of lower tie plate water rod: acts as spacer support rod, as source of moderator material close to the center of f bundle K, 2001

BWR—fuel assem (III,A,1,3) fuel channel—enclosure for f bundle; f bundle + f channel make up fuel assem is a tube with a square shape, made of Zircaloy dimensions: 5.518 in. X 5.518 in. X 166.9 in. function: channel core coolt thru f bundle and guide control rods K, 2001

Paraphrases are necessary and preferable for several reasons:

* You paraphrase because the content of the passage is so important to your report that you need every bit of it.
* When you paraphrase, you adjust the wording of the original to meet the needs of your audience, the purpose of your report, and your own writing style. In other words, you "translate" other writers' material into your own.
* A report of mostly direct quotations would be hard to read.
* Readers tend to skip over direct quotations, particularly long ones.
* One final reason for paraphrasing: you are actually writing bits of the rough draft of your report as you paraphrase.

Here is an example of an original passage and its paraphrases, with the unique wording of the original (which must be changed in the paraphrase) underlined.

**Original passage:** About a third of light-water reactors operating or under construction in the United States are boiling-water reactors. The distinguishing characteristic of a BWR is that the reactor vessel itself serves as the boiler of the nuclear steam supply system. This vessel is by far the major component in the reactor building, and the steam it produces passes directly to the turbogenerator. The reactor building also contains emergency core cooling equipment, a major part of which is the pressure suppression pool which is an integral part of the containment structure. . . . . earlier BWRs utilized a somewhat different containment and pressure suppression system. All the commercial BWRs sold in the United States have been designed and built by General Electric. Several types of reactors that use boiling water in pressure tubes have been considered, designed, or built. In a sense, they are similar to the CANDU, described in Chapter 7, which uses pressure tubes and separates the coolant and moderator. The CANDU itself can be designed to use boiling light water as its coolant. The British steam-generating heavy-water reactor has such a system. Finally, the principal reactor type now being constructed in the Soviet Union uses a boiling-water pressure tube design, but with carbon moderator. Anthony V. Nero, A Guidebook to Nuclear Reactors, Berkeley: University of California Press, 1979.

**Paraphrased version:** Boiling water reactors, according to Anthony V. Nero in his Guidebook to Nuclear Reactors, either completed or constructed, make up about one third of the light-water reactors in the U.S. The most important design feature of the BWR is that the reactor vessel itself acts as the nuclear steam supply system. The steam this important component generates goes directly to the turbogenerator. Important, too, in this de- sign is the emergency core cooling equipment, which is housed with the reactor vessel in the reactor building. One of the main components of this equipment is the pressure suppression pool. The containment and pressure suppression system currently used in BWRs has evolved since the early BWR designs. General Electric is the sole designer and builder of these BWRs in the U.S. The different kinds of reactors that use boiling water in pressure tubes are similar to the CANDU, which separates coolant and moderator and uses pressure tubes, also. CANDU can also use boiling light water as a coolant. The British have designed a reactor generated steam from heavy water that uses just such a system. Also, the Soviets have developed and are now building as their main type of reactor a boiling pressure tube design that uses carbon as the moderator. [12:232]

### Guide for Writing and Using Paraphrases

Here are some guidelines to remember when paraphrasing:

* In most cases, paraphrase rather than use direct quotation.
* Avoid the distinctive wording of the original passage. A paraphrase does not just change a few words from the original. It must have a unique sentence structure as well as different words.
* Do not interpret, criticize, or select from the original passage.
* Include bibliographic information on the author, source, and page numbers.
* In the rough draft, cite the author's name and other important details about her or him just as you would if were quoting directly. In the example, notice how the paraphrased author's name is given early.
* Refer to the paraphrased author in such a way to make it clear where the paraphrase begins and ends.
* Document a paraphrase just as you would a direct quotation. Mark the area of the paraphrase by citing the paraphrased author's name at the beginning of the paraphrase and by inserting a footnote or parenthetical reference at the end.

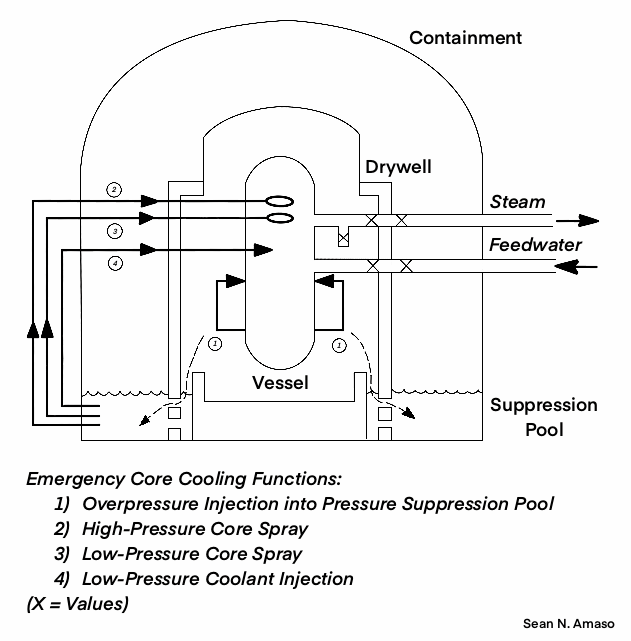
#### Summary

Summaries are usually much shorter than their originals. A summary concentrates on only those points or ideas in a passage that are important. Unlike in a paraphrase, the information in a summary can be rearranged. Here is a passage from which summaries below will be taken:

Numerous systems are available for controlling abnormalities [in boiling water reactors]. In the event that control rods cannot be inserted, liquid neutron absorber (containing a boron compound) may be injected into the reactor to shut down the chain reaction. Heat removal systems are available for cooling the core in the event the drywell is isolated from the main cooling systems. Closely related to the heat removal systems are injection systems for coping with decreases in coolant inventory.

Both abnormalities associated with the turbine system and actual loss of coolant accidents can lead to closing of the steam and feedwater lines, effectively isolating the reactor vessel within the drywell. Whenever the vessel is isolated, and indeed whenever feedwater is lost, a reactor core isolation cooling system is available to maintain coolant inventory by pumping water into the reactor via connections in the pressure vessel head. This system operates at normal pressures and initially draws water from tanks that store condensate from the turbine, from condensate from the residual heat removal system, or if necessary, from the suppression pool.

A network of systems performs specific ECC [emergency core cooling] functions to cope with LOCAs [loss-of-coolant accidents]. (See Figure 6.) These all depend on signals indicating low water level in the pressure vessel or high pressure in the drywell, or both.



BWR emergency core cooling systems

The systems include low-pressure injection, utilization of the RHR system, and high- and low-pressure core spray systems. The high-pressure core spray is intended to lower the pressure within the pressure vessel and provide makeup water in the event of a LOCA. In the event the core is uncovered, the spray can directly cool the fuel assemblies. Water is taken from the condensate tanks and from the suppression pool. On the other hand, should it become necessary to use low-pressure systems, the vessel must be depressurized. This depressurization can be accomplished by opening relief valves to blow down the vessel contents into the drywell (and hence the suppression pool). Once this action is completed, the low-pressure core spray may be used to cool the fuel assemblies (drawing water from the suppression pool) or RHR low-pressure injection (again from the suppression pool) may be initiated, or both. The RHR system may also be used simply to cool the suppression pool. (Two other functions of the RHR are to provide decay heat removal under ordinary shutdown conditions and, when necessary, to supplement the cooling system for the spent fuel pool and the upper containment pool.)

Anthony V. Nero, A Guidebook to Nuclear Reactors, Berkeley: Univ. of California Press, 1979, pp. 104-107.

##### Sentence-length summaries

Often summaries are only a sentence long. To create sentence-length summaries, use one or a combination of the following methods:

Locate a sentence or two in the original passage that summarizes the information that you want and simply rewrite it in your own words. Find the sentence in the third paragraph of the original that is the basis for this summary:

BWR—safety sys (IV,B,2) The systems that perform emergency core cooling functions in loss-of-coolant accidents include low-pressure injection, utilization of the RHR system, and high- and low-pressure core spray systems. I, 104

If no individual sentence will work, locate several sentences that contain the right information, and combine them.

BWR—safety sys (IV,B,2) In case of problems with control rods or loss of coolant, BWRs use an absorber to stop the reaction or emergency systems to replenish and maintain coolant around the reactor core, respectively. I, 104-107

Sometimes, the summary sentence is like a new sentence, scarcely resembling any in the original. Here is a different summary sentence on the passage above; notice how new it seems:

BWR—safety sys (IV,B,2) If the control rods malfunction, a substance can be introduced to shut down the reaction altogether, and if water is prevented from reaching the reactor core, BWRs are equipped with backup sources of coolant that can be sprayed or injected into the pressure vessel. I, 104-107

##### Extended summaries

A summary can be longer than a single sentence because of the important information contained in the original passage. (Remember, however, that a paraphrase is a point-by-point recap of the original, while the summary is a selection, reordering and condensation of the original.) Here's an extended summary of the passage above on BWR emergency safety systems:

Boiling water reactors use numerous systems to control abnormalities in reactor operations. If a problem with control rods occurs, a liquid neutron absorber can be injected to halt the chain reaction. If coolant is cut off from the reactor core, a reactor core isolation cooling system can maintain coolant inventory by pumping water from various storage areas. This system includes low-pressure injection, the residual heat removal system, and the high- and low-pressure core spray systems. The water supply for these various emergency systems ultimately comes from the suppression pool.

Whenever you summarize, you must handle the resulting summary the same way you would a direct quotation or paraphrase.

* Cite the name of the author and other important information about that author.
* Document that summary using whichever system is appropriate for your report.
* If it is an extended summary, make it clear where that summary begins and ends, for example, by referring to the author's name at the beginning and placing a footnote or parenthetical reference at the end.

#### Plagiarism

If you follow the guidelines presented in the preceding, plagiarism should not be a problem at all, but make sure you understand what it is. Plagiarism refers to two kinds of theft:

Reports with plagiarized information are often easy to spot for several reasons:

* Plagiarism is the practice—whether deliberate or not—in which writers borrow other people's facts, ideas, or concepts and present them as if they were their own.
* Plagiarism is also the practice—again whether deliberate or not—in which a writer uses other writers' exact words without quotation marks.
* In all cases, plagiarism is the lack of proper documentation: documentation refers to any system of footnoting or reference that indicates the author and source of the borrowed information.
* A reader may recognize the ideas or facts in the report as those of someone else. An expert in a field of knowledge can spot this theft of information right away.
* A reader may realize that the report writer could not possibly have developed certain information in the report. If a writer who is at the beginning of his/her/their studies sounds like an advanced physicist, something is fishy.
* Most readers can also spot a sudden change in the style or tone of the language of a report. Most people's writing style is as readily identifiable as their voices over the telephone.

Plagiarism is bad business: the plagiarizer can fail an academic course or lose his/her/their reputation among business and professional associates. It only takes simple documentation to transform a report with plagiarized material in it into one with legally borrowed material. The section on documentation explains these procedures in detail.

## Updating the Outline

As you take notes, you must regularly update the locators on all your notecards because as you read, take notes, and learn more about your technical subject, your outline may either change or become more specific. Imagine that you started with this excerpt of a rough outline and had taken these notecards:

**Rough Sketch Outline**

1. Safety Measures
   1. Pressurized Water Reactor Safety Measures
   2. Boiling Water Reactor Safety Systems
   3. Role of the Nuclear Regulatory Commission

**Corresponding Notecards**

BWR—safety sys. (IV,B) safety sys incl control rods, containmt bldg, resid heat removl sys there work like those in PWR unique to BWR: drywell, emergency core coolg sys 1 I, 100

BWR—safety sys (IV,B) drywell—encloses react vess + assoc equip (includes recirc sys, press relief valves on main steam lines) 2 I, 100

BWR—safety sys (IV,B) emergency core coolg sys—handles loss-of-coolt accidents; includes reactor core iso sys, hi- press core spray sys, lo-press core spray sys (figure for this, p.106) 3 I, 105-6

BWR—safety sys (IV,B) react core iso coolg sys: if loss-of-coolt accidt (causg closing of steam lines, feedwtr lines to react vessel), RCICS activated (maintains coolt inventory by pumpg water to reactor via connex in press vess head 4 I, 104

BWR—safety sys (IV,B) hi-press core spray: lowers press w/in press vessel, provides suppl water in loss-of-coolt accidt. with uncovered cores, spray directly cools fuel assemblies (wtr fr condensed wtr storge tanks + suppress pool 5 I, 104

**Revised Outline**

1. Safety Measures
   1. Pressurized Water Reactor Safety Measures
   2. Boiling Water Reactor Safety Systems
      1. The Drywell
      2. Emergency Core Cooling Systems
         1. Reactor core isolation cooling system
         2. High-pressure core spray

Notice that all five of these notecards are about "IV. B. Boiling Water Reactor Safety Systems." Notecard 1 divides this safety system into the drywell and the emergency core cooling systems. This division produces "1" and "2" under "B." Notecards 3 through 5, about the subsystems making up the emergency systems, produce "a," "b," and "c" under "2."

If you had taken these notes and updated your outline, you would revise the locators on the individual notecards like this:

Notecard Original Updated Alternate no. locators locators locators 1 IV. B same Safety/Boil.Wtr.React. 2 IV. B IV. B. 1 Safety/BWR/drywell 3 IV. B IV. B. 2 Safety/BWR/Em.Cor.Cool. 4 IV. B IV. B. 2. a Saf./BWR/Em.Cor.Cool/ React.Cor.Cool. 5 IV. B IV. B. 2. b Saf./BWR/Em.Cor.Cool./ Hi.Pres.Cor.Spray

Remember that if you don't like the number-combinations as locators, you can substitute short phrases, as is shown in the alternate locators above.

## Final Stages in the Notetaking Process

As you take notes, check off sections of your outline for which you gather sufficient information, as is done in this outline excerpt. In this example, the writer has taken sufficient notes for much of IV.B. but still needs information for the rest of the outline.

1. Boiling Water Reactors
   1. Description of the Basic Components
      1. Core
         1. core
         2. fuel
         3. fuel rod
         4. fuel assembly
      2. Control Rods
      3. Core Shrouds and Reactor Vessel
      4. Recirculation System
      5. Steam Separators
      6. Steam Dryers
   2. Production of Electricity
   3. Circulating Water
   4. Separating Steam
   5. Drying the Steam
   6. Producing Electricity
2. Safety Measures
   1. Pressurized Water Reactor Safety Measures
      1. Residual Heat Removal System
      2. Emergency Core Cooling Systems
         1. passive system
         2. low-pressure injection systems
         3. high-pressure injection systems
      3. Containment Building
   2. Boiling Water Reactor Safety Systems
      1. The Drywell
      2. Emergency Core Cooling Systems
         1. reactor core isolation cooling system
         2. high-pressure core spray
         3. low-pressure core spray
   3. Role of the Nuclear Regulatory Commission
3. Economic Aspects of Light Water Reactors
   1. Busbar Cost
      1. Construction Cost
      2. Operation and Maintenance Costs
      3. Fuel Costs
   2. Operating Capacity
      1. Availability Factor
      2. Capacity Factor

In the final step in notetaking, you arrange the notecards in the order that you'll use them as you write the rough draft. Read through your cards several times to make sure the sequence is right and that there are no gaps in the information you've gathered. When you're sure that the order is right, write sequence numbers on each of the cards to preserve the order (see the sequence numbers on the notecards in the next section). With the notecards in the right order and numbered, you are ready to write the first draft, which is discussed in the section on rough drafting.

## Other Systems of Notetaking

There are plenty of other ways to take notes. The main point of any form of notetaking, of course, is to make your report work easier and less time-consuming. You may prefer some other notetaking system because of your own work style or because of your report project. Or, you may end up using some other system in combination with the traditional one. Any system that enables you to get your work done efficiently is a good one.

### Mental Notetaking

For brief assignments or topics you know well, you might be able to keep everything in your head without writing anything down. But for longer or more technical reports, relying on memory alone is risky. Important details are easy to forget, and you may lose track of your sources. It’s best to record key information as you go, even if only in a quick voice memo or draft document.

### Digital Bookmarking and Annotation Tools

If you’re working with just a few sources, it’s still helpful to highlight and annotate them. Instead of physical sticky notes or slips of paper, consider using browser-based tools like Hypothes.is, Pocket, or built-in PDF annotators in tools like Adobe Acrobat, Notability, or OneNote. These allow you to organize digital highlights, add comments, and keep everything searchable.

### Screenshots and Digital Highlights

Rather than photocopying, take screenshots or save PDFs of essential materials. Then use apps like Zotero, Notion, or Evernote to highlight and tag the important sections. Be cautious: it’s easy to over-save and end up overwhelmed with too much material. This method works best when paired with good organization and an early effort to paraphrase and summarize rather than just copy and paste.

### Exploratory Drafts

If you’re already familiar with the topic, try drafting a rough outline or skeleton of your report. Tools like Miro, Google Docs, Scrivener, or even voice-to-text features on your phone can help you quickly map out what you already know. This early draft will reveal gaps in your knowledge—missing data, unclear terminology, or weak transitions—so you can take targeted notes to fill them into the draft. Writing the exploratory draft shows you what you know and don't know.

### Notetaking by the Source

If you're working with only a few sources, one effective notetaking strategy is to organize your notes by source, rather than by topic or theme. This method works especially well when you're reviewing a small number of dense articles, reports, or books. Here's how a modern version of this system might look:

* 1. Take notes from each individual source using a single document or digital page rather than separate digital notes for each small piece of information. Apps like Google Docs, Notion, OneNote, or Zotero Notes are especially helpful for this.
  2. Record all relevant information from a source on that one digital sheet, organized in paragraphs or bullet points. You’re capturing whole ideas, not just fragmented snippets.
  3. At the top of each digital note or document include complete citation information in MLA or APA format. Tools like Zotero, EndNote, or BibGuru can help you auto-generate this.
  4. As you write your notes, include exact page numbers (or screen locations, if digital) to make citation and quotation easy later on. This is especially useful for direct quotes or paraphrasing.
  5. Label each section of your notes with outline codes or tags that match your working outline (e.g., II.A.1). This keeps your notes structured and searchable later.
  6. As you complete sections of your outline with strong source material, check them off or color-code them to visually track your progress and identify what’s still missing.
  7. If needed, you can copy and paste sections of your digital notes into another document and rearrange them—similar to working with physical notecards. Digital tools like Scrivener or Trello also allow you to "move" content like cards or blocks.

Example Digital Notesheet:

Source:

Jemisin, N. K. How Long 'Til Black Future Month? Orbit, 2018.

(II.A.1) Description of Nahautu’s relationship with her father and the sky cities (pp. 127–128)

“He thinks I am his legacy, but he doesn't see that I have wings.” (128) – use for emotional tension

(III.B.2) Symbolism of nature and tradition in opposition (pp. 130–132)

Summary: Nahautu’s desire to stay in the valleys is framed as regressive but is ultimately tied to environmental survival.

This method is flexible, structured, and ideal for keeping your ideas connected to your sources.

## References

Hu, Charlotte. (2024). Why writing by hand is better for memory and learning. *Scientific American.* <https://www.scientificamerican.com/article/why-writing-by-hand-is-better-for-memory-and-learning/>

## Attribution

This chapter is revised from the first edition of *Open Technical Communication*, Chapter 5.1: “[Writing Process](https://alg.manifoldapp.org/read/open-technical-communication/section/134f046e-ff01-4eec-a525-2d1128957c1e)” by David McMurrey, which is openly available under a Creative Commons Attribution license.

The content in Chapter 5.1 of the first edition of *Open TC* was originally sourced and revised from David McMurrey’s *Online Technical Writing*, section titled “[Writing Process](https://mcmassociates.io/textbook/process_over.html),” which is openly available under a Creative Commons Attribution license.

## AI Assistance Notice

Some parts of this chapter were brainstormed, drafted, and/or revised in conversation with ChatGPT 4o and Google Gemini 2.5 Flash. All AI-generated content was reviewed and revised as needed by a human author.