Reading

Thinking

Writing

MACC Handbook
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LOGOS Mission Statement:
We expect students who graduate from MACC to be proficient in
college-level communication. This expectation includes critical thinking,
critical reading, and writing. It is our professional responsibility to help
develop this proficiency. With this in mind, we recommend that every
course involves critical thinking and incorporates assignments that require
reading and writing.

The Logos Project provides education, resources, and support in
order to ensure that students realize this expectation and faculty fulfill this
responsibility.
I. Rhetoric and Writing with Purpose

The foundation of rhetoric lies in the social act of communication. Essentially, rhetoric is using available resources to enact a purpose (or “telos”) through spoken or written communication. Rhetoric is as old as language itself and people have attempted to codify it since the advent of writing.

During the time of Socrates (circa 5th century BCE) there were two schools of thought which argued for distinct purposes of rhetoric. The Sophists believed that the purpose of rhetoric was to persuade the audience and its effectiveness was to be measured by how well it persuaded. Socrates believed that the purpose of rhetoric was to reveal the truth about the issue under discussion. Socrates believed that rhetoric was not a stylistic exercise in order to persuade a gullible audience, but a means for discovering and expressing what “the good” is.

Both the Sophist and Socratic views of rhetoric highlight its breadth—it is as much process, a way of coming to a conclusion, as it is a way to express that conclusion. And although we will be utilizing more contemporary practices of rhetoric, the foundations of classical rhetoric will never be too far from our discussion.

A. The Rhetorical Situation

There are many factors that dictate how you approach a moment of communication. For example, if you are visiting a doctor’s office because of some malady, your primary purpose is to express, as specifically as you can, what your symptoms are—you want the doctor to know exactly what you are feeling. The doctor, on the other hand, is not only responding to the expression of your symptoms, but is comparing those symptoms to a possible diagnosis, leading to further questions. This rhetorical situation really doesn't involve “persuasion,” but is focused on an exchange of information. When you find yourself in casual conversation with friends, a specific purpose might be absent. The easygoing banter reinforces the already-established social cohesion among friends.

Consider the language you would use in a text (RU ready?) compared to the language you would use if testifying in a court case, or were confessing to a clergy member. Every rhetorical situation we find ourselves in, every speech act we make, is governed by assumptions (and sometimes rules) that dictate our expression and our response to the expression of others. Social or professional awkwardness results from not adhering to the assumptions and rules of a rhetorical situation. Indeed, the court would go silent if you answered in response to a question of the judge, “That’s right Daddio!”
I. Rhetoric and Writing with Purpose

This handbook explores the rules and assumptions for analyzing and expressing yourself in academic rhetorical situations, which are an essential, if narrow, group of speech acts that we use in higher education. In order to explore these assumptions and rules, we need to formalize the speech act, first using information theory, and then using contemporary rhetoric.

If we were to ask ourselves, “What are the necessary ingredients for a successful speech act?” We would probably generate the components in information theory. We need a Sender, a Message, a Receiver, and a Channel. The Sender has a Message to send to the Receiver. The message is transmitted through a Channel. What do you think the channel is for a speech act? If you think it is language you would be right.

The rhetorician James Kinneavy noted that all rhetorical situations can be discussed in these terms if we define them by their purpose. Kinneavy’s organization of the speech act into purposes has defined instruction in composition for the last forty or so years. The easiest way to envision Kinneavy’s scheme is by using a visual aid.

![Diagram of writer, subject, and reader in a triangle]

By organizing the rhetorical situation in terms of its purpose, we have an all-inclusive vocabulary for organizing communication. Unless you are an experimental writer and artist (see the OULIPO writers), every act of communication you engage in begins with a purpose (the ancient Greeks had a marvelous word for the end, purpose, or goal of human activity: *telos*).

We will use Kinneavy’s scheme to describe the kinds of writing you will be asked to complete in an academic setting.

1. Self-Expressive Writing

If the purpose of the writing focuses on the Writer, that kind of writing is called Self-Expressive writing. The purpose of self-expressive writing is to reveal the writer to the audience, not to be judged, or in an attempt of persuasion, but to express the writer’s self. Examples of this kind of writing are the diary, personal letters, chatty emails, or informal texts. Memoirs, in which a writer...
writes about his or her life, are a kind of formal act of self-expression.

You may encounter this type of writing early in a composition class or in a creative writing class. Otherwise, it is very rare to encounter this kind of speech act in The Academy (we will use the term “The Academy” to designate any institution of higher education, in this case, MACC). Indeed, how something is unique to you is rarely pertinent in The Academy. The Academy is a place where what you think, what can be measured as objective, what can be proven, is most important. Indeed, you ought to avoid starting any statement with, “I feel…” in The Academy. It is your rigorous and considered thoughts that count the most, not your feelings.

When you write in the self-expressive mode, an honest, accurate approach works best. Remember the telos—you want to share with the audience something about yourself worth telling.

2. Informative Writing

If the purpose of the writing focuses on the Subject, that kind of writing is called Informative Writing. The purpose of informative writing is to describe, evaluate, measure, analyze, a subject. Examples of informative writing include lab reports, description, newspaper accounts, phone directories, graphs, indices, textbooks, etc.

Personal feelings about the subject are not germane in informative writing, nor is the purpose to persuade (though informative writing certainly can be marshaled in service of a persuasive intent). The focus is on subject matter.

Informative writing is more difficult to accomplish than you may think. We live in a culture, through the digital media, of instant personal reactions to anything. Our culture focuses more on how something affects us than it does on what the thing is. Informative writing is only concerned with what the thing itself.

In order to effectively write informatively, a few terms need to be defined. First you need to know the difference between subjective and objective. Subjective means pertaining to you—how something affects you. For example, vanilla ice cream. If you say, “I don’t like vanilla ice cream.” That is a subjective response. Objective means the qualities of a thing that exist independent of any one observer. “Vanilla ice cream is given its flavor by vanilla beans.” That is an objective statement.

Let’s say that you refuse to believe vanilla beans exist—you are wrong on facts and your denial of vanilla beans does not make them go away, nor does it make vanilla ice cream any less delicious. Okay, you caught me! The deliciousness of vanilla ice cream is a subjective response. In The Academy, you need to be
diligent about not treating subjective responses as objective responses. “Vanilla ice cream is the worst,” is a subjective statement disguised as objective, unlike, “Vanilla ice cream is the best.” Okay, you caught me again, that is a subjective statement.

When you write informatively, you avoid subjective responses in the language that you use. One way you do so is by avoiding using words pejoratively. What does “pejorative” mean?” Let’s define a few other words first so we can firmly grasp what “pejorative” means. First denotative. The denotative meaning of a word is its dictionary definition—its technical and precise definition. But words can evoke all manner of feelings and thoughts. The connotative meaning of a word is the feelings that word evokes. For example “slim” and “slender” have relatively positive connotations whereas “skinny” can have a negative connotation—yet their denotative meaning is just about the same. You use a word in its pejorative sense when you use a word for its negative connotation. In politics, for example, the denotative meaning of “conservative” is someone wanting to conserve, or preserve the status quo. A “progressive” or “liberal” is someone who wants to improve the status quo. Depending who the audience is, both of those terms are often used as an insult; in other words, they are used pejoratively, even though their dictionary definition is value neutral. If someone screws up their face and gives a disgusted look while saying, “Oh, he’s such a liberal,” that’s using the term “liberal” pejoratively.

The key to most informative writing is a rigorous attention to the way things are—the particulars of the subject—not its effect on the perceiver. Informative writing is factual (a fact is an objective condition) and descriptive; it avoids judgment and opinion.

When your informative writing involves description, the old writer’s adage, “Show don’t tell,” applies. “The sunset was beautiful,” is telling. Why? Because the writer is telling the reader how to interpret the sunset. Do you recognize that statement as subjective? Now if the writer writes, “the evening was colored with roseate-streaked clouds moving across a pale blue sky,” the writer is showing the reader what made the sky look “beautiful.” Let the reader make the esthetic judgment—the writer should present those details to the reader. What is the most effective way of providing details to the reader? By presenting sensory information—what you can feel, hear, see, smell, and taste.

The reader is always advised to have a bit of skepticism when interpreting any informative writing—you want to make sure the writer is not presenting information with an agenda hidden from you. Beware of persuasion in informative clothing!
3. Persuasive Writing or The Argument

When the purpose of a piece of writing is to move the reader to a new position, it is called persuasive writing. This kind of essay, the essay of persuasion, or the argument, is where the subject matter gets complicated quickly. I will focus more on the Socratic purpose of persuasion than the Sophist purpose.

The Greek philosopher Aristotle, in his book *The Rhetoric*, highlights three ways to persuade an audience. For Aristotle the grounding for these modes of persuasion is in what Aristotle believed moved our souls. The three modes Aristotle highlights are Pathos, Ethos, and Logos. We will discuss each in turn.

If you want to persuade an audience, appeal to their emotions. Pathos is an appeal to the emotions of an audience. Advertisers and politicians do this all the time—they scare the audience, make them feel insecure, or superior, in order to “sell” their viewpoint or product. “Give me your money or I’ll punch you in the eye,” is pathos argumentation. When Marc Antony wants to raise the rabble against Brutus in Shakespeare’s *Julius Caesar*, he plays to the emotion of the audience. Many teachers of writing would argue that the pathos appeal is fine and that many great writers have used it. I take the Socratic approach in dismissing it. I believe that the pathos appeal should be limited and subordinate to ethos and logos, because pathos is not connected to “truth” or the “good.” In other words, its effectiveness at manipulating audiences has nothing to do with being right, truthful, or good. In politics, whenever you hear a politician argue that their position should be endorsed because it is for the “good of the children,” the alarm bells of the pathos appeal should ring in your ears. Of course, no one wants to hurt innocent children. Generating fear in your audience is also an emotional appeal. When a politician states, “the world is on fire! The world is on fire!” you should recognize the appeal to the emotion of fear and put out the fire with logic.

“Ethics” is the study of correct behavior or action. An Ethos appeal is one where the author’s integrity is on display. If someone has earned your trust, you are more likely to assent to what they propose. How do you set yourself up as an ethical writer? First, don’t lie! Give opposing views a fair hearing. If you are using other people’s ideas or words CITE THEM otherwise you are a plagiarist and plagiarists cannot make ethical appeals. If you sound honest in your work, if you treat those who disagree with you with fairness, if you properly cite the work of the sources you rely on to make your case, you will be establishing yourself as an ethical writer.
I. Rhetoric and Writing with Purpose

a. Logos and Reasoning

The appeal that carries the most weight in The Academy is the logos appeal. The **logos** argument must be soundly reasoned, punctuated with facts, arranged according to an internal logic that leads your reader to accept your proposition out of its rational inevitability. This arrangement of propositions or facts is the essence of reasoning. One way I like to think of reasoning is that it takes old “knowns”—facts that are fairly well-established, or premises that are credible—and derives new “knowns” from the old. That movement—from established knowledge to new knowledge—is the movement of reasoning.

The Academy recognizes two types of reasoning that help us derive a proposition from evidence—**Inductive** and **Deductive** reasoning.

Generally speaking, **Inductive Reasoning** takes us from specific cases and derives a general law from looking at the specific cases. Let’s say you met an alien from the planet Zork and the alien was purple. You then proceeded to a Cardinals game and in the box seats off the third base line were a large group of purple creatures. In the fifth inning the announcer states, “The St. Louis Cardinals would like to extend a welcome to our visitors from planet Zork” whereupon they stand up in their box seats and wave their tentacles to the crowd. What would you conclude about aliens from the planet Zork? Yes, that they may be Cardinals fans, but also that they are purple. You would reach that conclusion through inductive reasoning: every alien from Zork you have seen is purple; therefore aliens from Zork are generally purple. Your mind moves from the specific cases to derive a general law.

Can you be 100% sure? No you cannot. Your conclusion, “aliens from Zork are purple” is not guaranteed by your premise, “every alien from Zork I’ve seen is purple.” Imagine your surprise if you went to a Royals game and found that Zorks who are Royals fans are green! This gives us a more precise definition of inductive reasoning: If the premises are true, the conclusion may or may not be true.

This idea of “may or may not” deserves further discussion. The “may or may not” is established as a margin of error or probability of being correct. Inductive reasoning is not weak because it cannot lead to absolute certainty—it is effective because it applies to so much in our uncertain universe.

Indeed, inductive reasoning is at the heart of science. The beauty of science is that its premises are constantly being checked until we can be 99.999999% sure of the conclusions that science derives. Another way that science is persuasive is that if the premises eventually lead us into a dead end, we can get rid of the conclusion and discover one that leads us out of the dead end. The surety of
Barrett

Inductive conclusions is probabilistic and, in that way, it is perfectly suited to generate conclusions about a probabilistic universe. Before we move on to deductive reasoning, we will discuss one more attribute of this “may or may not.” If you are identifying the native colors of Zorks, 99% would seem to be a pretty good percentage. How about if you were building a bridge over an interstate highway? Would 99% be a good margin of error? Nope. How about if you’re a baseball player looking for a fastball? I imagine a 50% accuracy rate would lead to a ton of home runs. What’s good in baseball for hitting, 30%, is terrible if it’s your free throw percentage.

**Deductive Reasoning** starts with a general law and then applies that law to specific cases. LAW: All humans have DNA.

SPECIFIC: Joe Pellopi is a human.

CONCLUSION: Joe Pellopi has DNA.

One of the important distinctions between inductive and deductive reasoning is that deductive reasoning is a closed system, as opposed to the open, probabilistic system of inductive reasoning. In deductive reasoning, if the premises are true, the conclusion MUST be true—that’s 100% guaranteed. Consider this formulation: $A + B = B + A$. Is this true for $3 + 2 = 2 + 3$? Yes of course. How many cases does this apply to? That’s right, an infinite number of cases. Mathematics, computer programming, and philosophy often use deductive reasoning because they are axiomatic disciplines—their operations are conducted according to pre-set laws.

There are two other important things to mention about deductive reasoning. First, it can be valid without being a true depiction of reality.

LAW: All aliens from planet Zork sing the blues.

SPECIFIC: Joe Pellopi is from planet Zork.

CONCLUSION: Joe Pellopi sings the blues.

Although this is a valid logical syllogism, its “truth” is mere fantasy. It does not apply to any world we recognize.

Secondly, it is important to mention the limit of deductive systems. The mathematician Kurt Gödel discovered that if a deductive system is large enough to account for natural numbers, it will generate a statement that is inconsistent with its laws or incomplete given those laws. If you want your mind blown, look up Gödel’s Proof.

When you write an essay in which you make an argument, you will likely use both types of reasoning. You will develop your thesis from induction—looking at facts and sources of information and synthesizing your thesis from that material. Once you start writing though you will consider your thesis as a deductive law and work hard to ensure that all the material you include fits into...
the logical system of your argument.

b. What Are Valid Arguments?

One of my favorite definitions of a thesis, or proposition (that which you are trying to prove in an argument), is given by the Austrian philosopher Ludwig Wittgenstein. Wittgenstein’s definition of a proposition is that it is a depiction of reality. For the most part, arguments in The Academy concern (in a general sense) **truth-value** statements. A **truth-value** statement is a proposition that can be shown to be either true or false according to an evidential proof. In other words, it is a proposition that is supported by evidence that is arranged in a logically coherent way. For most of the arguments you write in The Academy, though, the proof you offer is not the 100% guaranteed surety of a deductive proof (no matter how much you think it is!). Remember Wittgenstein, “depiction of reality.” If you think about it at all, what “reality” is can be a very difficult question. Remember also, your ethos as a writer will also contribute to the reception of your argument by the audience.

The Academy is concerned with **truth-value** statements because one of its roles is to test propositions. Whether it’s in a laboratory, or at a desk with a stack of books, academics are interested in proposing and testing propositions. Statements of belief, “I believe the universe sits on the back of a tortoise,” are of little use in The Academy because they cannot be tested. Nor are subjective judgments, “I hate President Calvin Coolidge.” Of course, belief statements and subjective judgments might be important to you, and certainly culture encourages us to shout out such statements, but if the statements cannot be tested by objective scholars seeking depictions of reality, then they have little worth being exchanged in The Academy. When we offer an **opinion**, we are offering a claim with no support or warrant. Opinions have no place in The Academy as well.

One way to test whether or not your claim is arguable is to check if there is a possibility for the statement to be wrong. In science, this is called the **null hypothesis**. Take a subjective statement like, “Today I am happy.” No one really has the standing to say, “No you’re not.” Or if you hold up a quarter and say, “This is a quarter.” No one has any standing to say, “No it’s not.” In both of these cases, one a subjective statement and the other a statement of objective fact, there is no claim because there is no null hypothesis—those statements are not capable of being proven false. That is what makes a statement arguable—you can imagine it being proven false. Statements of belief are not arguable themselves for the same reason.

Of course, some people make the claim that their position is fact, as in “It
is a fact that playing first person shooter games makes teenagers more prone to violence,” but we must remember that it is not a fact until it is proven. In other words, an arguable claim that a proposition is a fact, is not a fact. Facts are facts 100% of the time.

c. Fallacies

In argument, oftentimes the persuader will use a logical trick that has no real logos value in order to persuade. When this happens, the persuader is using a fallacy. A logical fallacy is an error in logical thinking in service of persuasion. There are a huge number of fallacies listed in handbooks. We’ll illustrate a few below but always be on your guard, be ready to recognize fallacies in argument.

**Begging the question**—restating what the claim is without proving it: It is so hot because the temperature is so high. Note that what you are establishing in the subject (it is so hot) is merely restated rather than proven (because the temperature is so high) in the predicate.

**Ad Hominem**—attacking the speaker of the claim instead of the claim itself: Joe Pellopi is a stinky crude man in my math class. Therefore, when he says he has the right answer on a math test, he can’t be right. Note that a judgment is being made about a claim–Joe’s answer–based on Joe rather than his reasoning. The classical example of this was during the impeachment trial when Clinton was thought to be a bad president because he was an unethical fellow. Of course, you could make an argument about the fitness of such a fellow to be president without resorting to this fallacy.

**Appeal to authority**—relying on an authority’s gravity to persuade. We see this all the time with athletes and celebrities shilling everything in ads. Just because Jordan was a great basketball player doesn’t mean that the Ballpark Franks he represents are really good hot dogs. Do you remember, “I’m not a doctor but I play one on TV,” being used in an ad? This is a pretty egregious example of such a fallacy.

**Straw Man**—in this fallacy you make a complex argument into a simple argument by focusing on what’s easiest to claim. During the whole debate about welfare reform this fallacy was often in use. Someone would frequently bring up “The Welfare Queen,” a woman who got a number of checks and drove a Cadillac. To be sure, everyone thinks that a Welfare Queen is a bad thing but that doesn’t necessarily settle the welfare reform question. It was later discovered the Welfare Queen was a fictional creation.

**Post Hoc Ergo Propter**—this is Latin for, “after this therefore because of
I. Rhetoric and Writing with Purpose

Every time I wear my blue hat it rains. Today I will wear my blue hat; therefore, it will rain. Just because these events happen next to one another doesn’t mean that one event is causing the other.

**Hasty Generalization**—when you reach a conclusion based on too little evidence: Joe Pellopi is an Irishman and he’s sloppy; therefore, all Irishmen are slobs. Obviously, this is much too little evidence to base a conclusion on.

**Either/Or**—this fallacy indicates that there are only two mutually exclusive positions relative to an issue when in reality the issue is much more complicated: America—love it or leave it. To be sure, if we don’t like something about America, we can stay and work to change it for the better, but this fallacy would have us believe that if we are not unquestioningly patriotic we ought to leave the country.

d. Components of Arguments

A valid argument has three components: the **Claim**, **Support**, and the **Warrant**. The **claim** is the proposition you are trying to prove. The **support** is the evidence you marshal to prove your claim (we will discuss what constitutes valid support in the chapter on critical thinking). The **warrant** connects your support to your claim. The warrant is often an underlying assumption, unmentioned, that leads the reader to accept the thesis based on the support. For example.

**CLAIM:** Joe Pellopi has no manners.

**SUPPORT:** He is eating his dinner with his hands.

What is the warrant in this case? The warrant is the assumption that people with manners use utensils when they are eating. Since Mr. Pellopi uses no utensils, he has no manners. Do you see a problem with this warrant? Of course, he could be eating ribs or Ethiopian food which requires you to use your hands. When constructing your own arguments or reading the arguments of others, pay attention to the warrants. The assumptions that we make in connecting support to claims must be, themselves, valid.

e. Wittgenstein and Arrangement in Argument

Remember that Wittgenstein asserted that a proposition was a “depiction of reality”? He also believed that the elements of an argument were akin to counters (game pieces) in a game. The game was successful only if the counters were arranged properly. Let me explain what that means using Wittgenstein’s analogy.

Let’s say that you wanted to make a claim about an essay written by a journalist,
Joe Pellpopi, claiming that the effectiveness of community colleges ought to be measured in the same way that the effectiveness of businesses is measured. The title of the essay is, “What Is a College’s Bottom Line?” You recognize this line of thinking as the claim of Neoliberalism (look it up). How would you arrange your counters (ideas) to make that claim?

First you would need to define Neoliberalism, then present its attributes. Next you would need to show how Pellpopi’s claim about community colleges follows the Neoliberal way of thinking. Of course, if you want to argue that a Neoliberal approach to community colleges is a positive or negative thing would require other counters (ideas) to arrange, such as, what are the consequences of organizing community colleges according to Neoliberal ideals?

Another way to look at Wittgenstein’s insight is to think of a depiction of reality as an accurate picture, resemblance, of reality constructed as a puzzle. Only if all the pieces (ideas) are in the right places will that accurate picture emerge.

**B. A Final Word about Purpose**

Whenever possible when writing in response to an assignment, apply a principle I have used from the time I was a student to the present time when I teach: make the process work for you. Writing is an act of discovery and exploration. When you are given assignments, approach them as opportunities to explore ideas and subjects that excite you intellectually. Writing is difficult work—make that work work for you. Make sure that every time you write, the ultimate purpose is personal and intellectual growth.

Now that we have an idea of the purposes of writing and the kind of writing you’ll be asked to do in The Academy, let’s discover an efficient and effective way to construct essays.
II. How to Write an Essay

(Note: Throughout this chapter will be call-out sections—Pascoe’s Primer—which provide writing tips provided by Professor Dustin Pascoe.)

Now that you know about the rhetorical situation and the kinds of essays you’ll be writing about in The Academy, it’s time to get to the essence of the communicative act in The Academy—how to write a good essay.

We’ll start again with classical rhetoric. When making a speech (remember, much of classical rhetoric was a guide to effective speech-making) classical rhetoricians thought that the orator needed to go through five stages: Invention, Arrangement, Style, Memory, Delivery. I’ll define each of these stages and then adapt them to the more contemporary rhetoric of writing.

The word “Invention” comes from the Latin word “invenire” which means “to come upon.” For the classical rhetoricians speech-making began with the orator generating material to use in his or her speech. Using a deep, contemplative imagination, the orator first gathers the content, the substance of the speech. Then the orator organizes that material according to an Arrangement that will have the most profound effect on the audience. Once that material is generated and arranged, the orator matches the Style to the material and audience. Style includes metaphoric language, diction, allusions; in other words, the orator chooses a manner of speaking that will be the most persuasive. Consider it this way, a professor wouldn’t use the same style of speaking to a Freshman Philosophy class as she would to a seminar with doctoral students.

I could go on for volumes about the next stage, Memory, but I’ll keep it brief. In the memory stage, the orator memorizes the speech for fluent delivery. When reading accounts of classic and medieval rhetoric, the memory stage is often described as being in deep meditation; it seemed to be a contemplative state of preparation. Orators used many mnemonic devices in order to commit to memory prodigious speeches, and this in turn helped to develop their imagination.

The Delivery stage is when the orator would present the speech to the audience, using the appropriate modulation in tone and volume. The delivery stage included hand and facial gestures as well.

For writing an essay using contemporary rhetoric, the five offices of classical rhetoric have been condensed into three recursive stages: Invention, Drafting, and Revision.
A. Invention

Invention is the first critical stage in the writing process. In this stage, you study your writing assignment carefully (in The Academy, many rhetorical situations are assigned to you!) in order to discover what you are being asked to write. If the assignment requires research (more about those kinds of rhetorical situations later), then you should use the invention stage to narrow down your research focus.

There are many ways to generate ideas to write about in the invention stage. I’ll discuss and provide examples of a handful of the most commonly used techniques.

Freewriting: Freewriting is when you set yourself a time limit, say five minutes or so, provide yourself a prompt, and then write whatever comes to your mind about that prompt. For example, let’s say that your assignment was to write an essay about whether or not cell phones should be banned from classrooms. Your initial prompt might be something like: Cell phones are a hazard in class because… What follows would be whatever comes to your mind based on that prompt (believe me, I could write a mighty tome given that prompt). The purpose of freewriting is to unlock your brain and get yourself, without second-guessing or procrastination, to write. Writing takes commitment and is hard work—it takes persistence. Freewriting is one simple way to generate material.

Looping: Looping is modified version of freewriting. One thing you’ll discover quickly with freewriting is that the mind can very quickly move far afield from the original prompt. Looping is one way to avoid that wandering. When you practice looping, you freewrite for a brief period, then you look over the material you’ve generated. You take an idea from the first freewriting session and use that as a prompt for your next freewriting. Then you take an idea from the second freewrite and use that as a prompt for your next freewrite. You can do this as many times as is effective. Notice what happens in looping—you are focusing on promising ideas and then developing those ideas. As mentioned earlier, freewriting is effective for getting the juices flowing, but it has a tendency to drift; looping keeps the writer on task.

The Reporter’s Questions: No matter what you are writing about, asking the reporter’s questions—who, what, when, where, why, and how—are an effective place to begin. Let’s try them out with the cell phone issue.

Who: Students in class, and teachers
What: Cell phones and all their apps
When: During class
Where: In The Academy
II. How to Write an Essay

Why: The million dollar question—conditioning, disrespect, inattentiveness, cultural programming, robot conspiracy, etc

How: Institutional ban, just let students text, keep students busy so they can’t be distracted, etc.

You’ll notice in the example above that Why and How lead to multiple possibilities. Where there are multiple answers, there are multiple opportunities for interesting paper topics.

*Clustering.* Clustering, or idea mapping, is a visual way to generate ideas. You make the main idea a hub, and then ancillary ideas as spokes from the hub. Each ancillary idea, though, can be its own mini-hub with its own spokes. Using clustering as a way to invent material also helps you begin to develop and organize the material you generate.

As you can see, as the ideas are developed, they are also organized into subcategories. In this example, the first things I began to develop are the reasons why students look at cell phones in class. Two major reasons emerged—personal reasons and cultural reasons. Of course, each of the individual reasons under each category can also serve as hubs for further development.
Listing: Listing is the invention technique that I frequently use. After I have finished research, I list all the things I want to say. Then I cluster that list, putting ideas in relation to each other in order to produce a suitable arrangement for the material.

There are many other techniques for invention. The ones included here have been used successfully by students. You MUST begin with the invention stage. In The Academy, it is nearly impossible to sit at the computer and write an essay from the top of the page and the top of your head. You MUST have a roadmap before you begin the drafting stage. Recall classical rhetoric—immediately following the invention stage is the arrangement stage. For our purposes, invention ends in arrangement. Many people use outlines to arrange their material. I use lists or idea maps. Whatever you choose to use, YOU MUST HAVE A PLAN BEFORE YOU START TO DRAFT. In the following section, I’ll describe a very simple and extremely effective way to invent and arrange your essays before drafting.

1. A Simple and Efficient Plan for Arrangement

I learned this very simple and effective way to invent and arrange during a stint in graduate school as a commercial writer. I would be hired by businesses to ghostwrite articles for them to be published in their trade journals. At first, I had a difficult time writing in a style that was suitable for magazines. The problem was that I was used to the long paragraphs of academic writing and those paragraphs were out of place for the breezy writing style of magazines.

What I did to improve my drafts is something that film directors do all the time—they envision, at all times, what the scene they are filming will look like when it is on the screen in the movie theater. In other words, they keep a constant focus on the final product, even when in the preliminary stages. For me that meant setting the margins of my word processing file exactly as wide as the margin for each column of prose in the magazine. In this way, the number of characters per line as I drafted, would be the exact number of characters per line in the final product. In that way, as I wrote, I would see what my article would look like to the reading public.

a. Paragraphs

How does this work for you when writing an essay for The Academy? Before you learn this technique we need to discuss paragraphs.
II. How to Write an Essay

First, understand that paragraphs are the basic building blocks of your essay. They are the prime movers of your purpose no matter what that purpose is. Secondly, you must understand that, typically, paragraphs develop **one main idea**. When you were in secondary school, you probably learned about **topic sentences**. A topic sentence is to a paragraph what a thesis is for the essay—it succinctly states what the paragraph is going to develop. For example (topic sentence in italics):

> Internet trolls most likely suffered from lack of attention as children. **How else could you explain their unceasing need for attention?** We know that children, when needing attention will often resort to negative behavior in order to receive it. Internet trolls, under the disguise of anonymity, respond to posts with cruel, insensitive, and outlandish comments not as expressions of their personal views, but as a way to elicit negative responses from the more sincere members of a commentary community. Like a screaming child, they demand that others pay attention to them. Though they are adults, they seek the attention they never got as children.

As you can see, the topic sentence makes a promise (as theses do) that they rest of the paragraph will fulfill.

You should note that in The Academy, topic sentences are not a requirement. An essay that includes a topic sentence for every paragraph will read as if it were written by a machine. Style dictates that the presentation of the material matches the purpose and, unless the purpose demands the rigid construction of topic sentences for each paragraph (technical manuals for example), do not think you need to construct your essay that way. What is not negotiable, though, is that each paragraph needs to represent one main, developed idea.

**b. Using Key Words to Arrange**

One way to check if your paragraph does indeed represent one main idea is to try to reduce that idea to a key word and key phrase. (This technique is discussed in Joseph Williams’s book, *Style: Toward Clarity and Grace*). Indeed, this works in reverse as well; in the invention stage reduce each idea you will be discussing in the essay into a key word and phrase.

Once you are used to thinking of an essay in terms of its building blocks, paragraphs, you will be amazed, if you keep the final product in mind, how easy it is to complete the invention and arrangement stage. For example, say that you are asked to write a five page essay on the causes of the first Iraqi War. Generally speaking, there are three to five paragraphs per page of an essay. Therefore, the sum total of paragraphs you will need for the essay is approximately 20 paragraphs in all. Take away one paragraph for the introduction and conclusion (special paragraphs we’ll discuss in a bit). That leaves approximately 18
Barrett & Pascoe

1. Questions of strategic organization. “Strategic Organization” means arranging the information in the Middle for maximum clarity and effect. It may be that when drafting no thought was given to the order of the main points, or it has become apparent that the main points do not seem to have the internal coherence they need. If so, there are several ways to arrange main points. The writer should choose the method most rhetorically sensible for the task at hand.

a. Chronological. Like it sounds, this is an order based on time. It would possible, of course, to start in the past and work forward or vise versa, but it should be sequenced.

b. Spatial. Based on physical space, this strategy moves north to south, top to bottom, front to back, etc. Clearly, it would work best when a tangible object or area (like a car or the state of Missouri) are being discussed.

c. Problem-Solution. This strategy is best for persuasive works or studies of experiments. It can be slightly varied as problem-cause-solution.

d. Topical. This is the “catch-all” category as it includes any organization that doesn’t fit into one of the above strategies. Topical organization takes main points that are unrelated to each other and imposes a structure on them (For instance, a topical paper on the Beatles would have main ideas like their sense of fashion, the lyrics of their songs, and how Yoko broke them up). Topical is probably the most widely useful.

paragraphs left for the body. Now before you start the invention stage, keep this number in mind. As you do your research you know that you’ll have to generate 18 ideas relate to the causes of Operation Desert Storm. That sounds doable.

In addition, using this technique—keeping an eye on the final product throughout—helps you in the arrangement stage. After you do your research and isolate 18 related ideas to discuss, you can arrange those 18 key word or phrases in the order that you will treat them in your essay. So you have an arrangement scheme for the drafting stage. I and my students have used this technique for myriad essays. It makes the process efficient because throughout the process you are working toward a final product that you have considered and kept in mind every step of the way. No preliminary work is wasted.
II. How to Write an Essay

2. Introductions and Conclusions

What you learned in elementary school that an essay has three parts—an introduction, body, and conclusion—still applies to writing essays in The Academy. Introductions and conclusions serve a special purpose in the essay different from the body.

The introduction to your essay should grab your reader’s attention and make them want to read more. It should give your reader an idea of what’s ahead in the essay, and, most importantly, it ought to indicate what the purpose of the essay is. Not all essays require a thesis in the introduction. Why? Because we have defined a thesis as the claim an argument is trying to prove and not all essays have as their purpose to prove a claim. For example, self-expressive essays do not require a thesis statement but remember, all essays should make their purpose known early in the essay, preferably in the introduction.

If you look up, “How to write a conclusion,” I’m sure that you would generate a list of specific strategies such as: “re-state the thesis,” or “ask a question,” or “call your readers to action.” These can be effective strategies but their specificity ignores the general sense of what the conclusion ought to accomplish.

Pascoe’s Primer—Introductions

Here, the writer may accomplish five things: 1) get the reader’s attention [called exigency]; 2) explain what is happening [lab report, biography of Civil War general, analysis of poem, etc.]; 3) provide any background the reader will need to understand [key terms, concepts]; 4) preview the body/main ideas of the essay [a thesis statement]; and 5) provide a transition into the body.

My theory of conclusions is as follows: When you write an essay, you are creating a home-made intellectual world for your reader to reside in while they read your words. Your conclusion then should be the place in your essay where you give something from the essay to your readers to take with them when they leave your world and re-enter their own.

With this principle of conclusion, you may want to re-state the thesis, ask a question, or call to action, but that is not all. The conclusion is not a tactic but a strategy and should answer the question: What do you want to leave your readers from your essay? Think of the conclusion as the essay’s gift to the reader for reading.
B. Drafting

Once you have your scheme for arrangement, it is time to draft your essay. This stage is where difficulties often arise for a simple reason—**writing takes effort!**

Any number of writing manuals will give you advice on the best way to approach drafting—from the time of day to the locale where you do your writing. That is all fine and maybe even helpful, but the truth is you have to sit down and concentrate in following your arrangement. There are no shortcuts and numerous diversions. In the time between I wrote the title “Drafting” and this sentence, I’ve checked my email, petted my dog, and looked to see if the oven has reached its preheated temperature. That’s a lot of diversion for only five sentences.

<table>
<thead>
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<th>Pascoe’s Primer—Drafting</th>
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<tr>
<td>Here in stage two, it is time to begin putting things together in sentences and possibly paragraphs. Like in the Idea Generating stage, a student should not reject an idea here until it has been tried. This step is essentially creative.</td>
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1. **Main ideas.** The writer should decide on the most important aspects of information to be conveyed. Ideally, there should be between two and five main ideas (although a single main idea is possible). Any more than five and—depending on the length of the whole—it becomes difficult for the reader to keep them clearly in mind.

2. **Outlining.** While not every writer, or every project, needs an outline, it is a helpful tool in the drafting process because it allows the writer to turn simple ideas or phrases into complete sentences and sentences into paragraphs. It also helps prevent repetition or accidentally leaving something out. Again, for the visually-minded it looks like a map.

3. **Beginning, Middle and End.** All complete writings should have distinct beginnings, middles and ends, and this is the point at which to begin thinking about how to construct them. While there is no correspondence to paragraphs here, they should be separate from one another. For assignments that cannot reasonably include all three (very short abstracts or reports, for instance) the Middle is the bit that contains all the necessary information.

Yet here I sit, again, tending to the draft of this handbook. I have a mantra I tell my students, “one word in front of the other.” That is the only way to write. If you are always thinking about the page length or are counting words constantly
II. How to Write an Essay

to find out how much more you have to say (not a good idea) you’ll find it very
difficult to complete a draft. Concentrate on the word in front of you, then the
next word, and the next until you have a sentence. Keep at it until you have a
paragraph. With concentration and effort, you’ll discover that you have finished
the…hold on…I’ve got to check the oven.

C. Revision

Before we discuss the stage of revision in the writing process, let’s make
one critical distinction—writing is not a linear process (1,2,3 and done)—but is
a recursive process. A recursive process is a process that can be broken down
into sub-processes that may loop over each other. In programming, think of
a routine that is constructed from a series of sub-routines. To illustrate with
writing: imagine you are in the drafting stage and you write, “we ran from the
cops.” You stop and decide that “ran” is not a descriptive enough verb, so you
think of a better verb and come up with “fled.” You then delete “ran” and
replace it with “fled.” Can you detect the sub-routines here? You are drafting,
then inventing, then revising, then return to drafting.

Two resources that can help you revise your essay are your instructor and the
tutors in MACC’s Learning Centers. If you have a draft of your essay finished
before it’s due, bring it to your instructor during his or her office hours and
have them give you directions for revision. For sure, your instructor knows what
he or she is looking for from you. MACC’s Learning Centers are staffed with
tutors skilled in various subject areas. Go over your essays with tutors in order to
develop a plan for revision. Another set of eyes is always helpful when looking
over written work.

When revising your essay it is a commonplace to say that you start with
the macro issues, purpose, organization, paragraphing, and finish with the micro
issues like spelling and punctuation (i.e..proofreading). Revision is more than
proofreading it is a re-visioning of all aspect of your essay.

There are a number of effective strategies for revising your essay but I’ll tie
our strategy to MACC’s global communications rubric—which is how we as an
institution check to see whether or not our students are generating successful
writing. The rubric is organized according to outcomes. Note that some of these
outcomes apply only to argumentative essays.

The first outcome is general and focuses on effectively communicating your
purpose in language that is appropriate to The Academy
Outcome IA: The student will demonstrate effective written and/or oral communication considering audience and situation through invention, arrangement, drafting, revision, and delivery.

1. Is the essay’s purpose clear, complex, and explicitly expressed?
2. Is the text unified – each element effectively serving the purpose?
3. Is the text appropriately directed to an academic audience?
4. Is the language concrete and specific, as opposed to general and abstract?

The second outcome applies to argumentative essays and focuses on the effectiveness of the logic used in constructing the argument.

Outcome IB. The student will construct logical and ethical arguments with evidence to support the conclusions.

1. Does the text contain an explicit, concisely expressed, and original claim?
2. Is the claim buttressed by effective and varied support?
3. Are the warrants, stated or assumed, reasonable and free of fallacies?

The third outcome applies to the writing adhering to grammatical, usage, and stylistic principles.

Outcome IC. The student will conform to the rules of Standard English.

1. Does the text contain correct grammar?
2. Is the spelling correct?
3. Is the punctuation appropriate?

The fourth outcome concerns the effective synthesis of the essay’s material.

Outcome ID. The student will analyze, synthesize, and evaluate a variety of course material and points of view.

1. Does the text include a variety of appropriate material?
2. Has that material been appropriately analyzed?
3. Has that analysis led to a synthesis directly related to the essay’s purpose?

The fifth outcome concerns the ethos of the writer and how well the protocols of citation have been followed.
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Outcome IE. The student will accept academic responsibility for all work regarding issues of copyright, plagiarism, and fairness.

1. Is the text free of plagiarism?
2. Is the text free of copyright violations?
3. Are the sources properly cited in the appropriate citation format?
4. Is there a citation page?

1. Final Thoughts on Revision

In a poem I once wrote, I was thinking about the relationship between writing and our moral life. When we err morally, we can determine to do better next time, but we cannot change the past—our actions are inscribed in the book of time. When we write, though, our texts can accommodate as much time as we have to put into them. In addition, if we make a mistake, we can fix it—we can go back in time.

The line I wrote for my poem was, “Revision means forgiven.” Think about your text as an opportunity to create the most complete ethical act. And if you make a mistake, that’s ok, you can fix it; revision means forgiven.

2. Delivery

Do you want to know one key element in establishing ethos as a writer? TURN THE ASSIGNMENT IN ON TIME IN THE MANNER THE INSTRUCTOR REQUESTED! That may be in a Dropbox set up in the Learning Management System, or in hard copy to be handed in during class. If the instructor requests that the essay be handed in hardcopy, do not email it. Follow the instructions.

If there are special instructions for delivery, abide by those. MLA format for essays without ancillary material (like appendices or works cited pages) do not require a cover sheet and are to be formatted as illustrated on the following page (not to scale).
E. Mackey’s Maxim: Answering the “So, What?” Question

One way to think of the concluding paragraph of an essay written for a course taken in The Academy is to consider it as your opportunity to answer what I call the “So, what?” question. The answer to this question is a brief explanation of why the reader has spent the better part of half an hour (or longer!) reading your writing. Think of the answers to the “So, what?” question in terms of answers to other questions: What is the pay-off for the reader? What is the significance of the point you are trying to make? In the words of Dr. Barrett, what is “the essay’s gift to the reader for reading”? This discussion can be as brief as a sentence or two (or longer). It should be embedded gracefully within the concluding paragraph. It may or may not begin the concluding paragraph, but however you construct your concluding paragraph, the reader should be able to tell, in addition to looking, by your words and your tone that you are coming to the end of your essay. Examine the following concluding paragraph:
II. How to Write an Essay

The law is a natural and vital part of human society. Everyone, from beggars to kings, makes use of it or is affected by it. When the law is functioning as it should, each addition to it will help the whole of society, not just a select group who will exploit it for their own ends. It is designed for the benefit of someone, somewhere, and even those who openly defy it are influenced and protected, as seen in the United States where even the worst criminals are promised a speedy trial and protection from cruel and unusual punishment. That protection, that promise that it will do everything in its power to ensure a safe life for those under it, is what gives the law its jurisdiction.

–Thomas Stacey

You can probably infer from the opening sentence that this paragraph is from an essay on the function of law within our society. Notice how the writer seems to summarize the points made in the essay by each succeeding sentence—until, that is, the final sentence. Here is this writer’s answer to the “So, what?” question. His answer affirms the need for laws in a just society on the principle that we all want to be safe. No, it’s not rocket science; it’s more important. It’s the bedrock on which any just society is based. The fact that this student arrived at such a seemingly simple observation is music to a professor’s ears.
III. Clauses

In order to fix some common sentence errors, such as the run-on sentence and the sentence fragment, some definitions are required.

A **clause** is a group of words containing a subject and a predicate.

An **independent clause** can stand alone as a sentence. For example: *Polo is a video game aficionado.*

A **dependent clause** cannot stand on its own as a sentence. For example, *because there are bright colors and few cats*. Note: if a dependent clause is by itself, it is a **sentence fragment**.

A **relative clause** is a subordinate (dependent) clause that refers to a previous part of the sentence (most often a noun). A relative subordinate clause begins with a **relative pronoun**: *who, whom, which, that*. For example: *Polo, who is a dog, likes playing Call of Duty.*

Two independent clause can be linked by a semicolon or a **coordinating conjunction**:

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For example: *Polo is a video game aficionado, and likes playing Call of Duty.* Note: If two independent clauses are connected by a comma only or nothing at all in a sentence, that sentence is a **run-on**.

In a complex sentence, which is a sentence containing more than one clause, the clauses are always related somehow—that is why they find themselves in the same sentence. A dependent clause is linked to an independent clause with a **subordinating conjunction**. The subordinating conjunction (or subordinating word) not only links a dependent clause to the independent clause it depends on, it also indicates the kind of subordinate relationship it has to the independent clause. I call this relationship its logical relationship. The following table indicates the logical relationship and the subordinating words that are used to denote that relationship.
III. Clauses

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<th>Relationship</th>
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Note: Check all your sentences. If a sentence begins with a relative pronoun or a subordinating word, there must be an independent clause in the same sentence.

Here are some exercises to do to check if you understand the concepts.

1. Name the logical relation between the last two sentences. Combine them.
   Joe Pellopi is afraid of lizards.
   Joe Pellopi goes to the store.
   There are no lizards on the streets.

2. Combine these sentences, first through coordination, then through subordination. Name the logical relation.
   Monique washes her BMW.
   Monique listens to music.

3. Combine these sentences, first using both subordination and coordination, then using subordination only.
   The fog comes.
   Lizards crawl underneath their rocks.
   Joe Pellopi is able to go to the store.

4. Combine these sentences using coordination, subordination, and a semicolon.
   Mountains disappear in a snow storm.
   You can't see through the whiteness.
   It is a marvelous sight.
   Lizards are nowhere to be seen.
   BMW's are nowhere to be seen.
IV. The Comma “,”

Usually accepted as the most confusing of all punctuation marks, there are about seventeen rules guiding the use of commas, some of them apparently contradictory. For most common writing purposes, there are eight or nine major occasions to remember. Only some of these rules will actually obscure meaning when followed incorrectly, but the rest are no less important for that.

One of the key myths to dispel about commas is that they indicate breath stops or pauses, but they do not. Commas are not “stage directions” or instructions in how to “say” the text. Commas exist to separate units of meaning – or to make the connections between units clear to the reader. In short, they are grammatical, not “mood-based.”

So how can commas be used?

a. In specific dates: “On July 4, 1776, the Continental Congress signed the Declaration of Independence.”

Notice that the commas go before and after the year in a specific date. If you wrote “in the summer of 1776” that year would not need commas because it’s not a specific date.

b. In address/places. “The school is at 101 College Avenue, Moberly, Missouri, if you want to send them mail.”

Here, the commas are used to separate the street from the city and the city from the state. The names of states are like years in dates: if it is specific, commas will be needed before and after: “In Seattle, Washington, . . .” You do not need commas in a usage like “We like to go skiing in Washington.”

c. After an introductory phrase or clause. “If you use commas incorrectly, your readers may not take you seriously.”

An “introductory phrase or clause” is the kind of thing that often begins with a preposition (like “if” or “on” or “at”) or a subordinating word like “when” (“When you misuse commas, your readers will not take you seriously.”) or “while” (“While Rome burned, Nero fiddled.”).

d. With coordinating conjunctions. “Comma rules can be difficult to learn, but they are important to clear writing.”
IV. The Comma “,”

A “coordinating conjunction” means using one of seven words (for, and, nor, but, or, yet, so) to join together two (or more) complete thoughts (sentences). Notice how in the example both of the ideas on either side of the comma could stand alone as sentences. A comma is used before the conjunction in that instance.

e. When there are more than two items in a list. “To really appreciate a movie, you need popcorn, candy, a drink, a date, and lots of money to burn.”

(When using a list, the “Oxford” comma before the last “and” should be included.) You do not need a comma in a two-item list (“I’m going to take Bernie and Paul.”)

f. To set off non-essential or appositive elements in a sentence. “Soccer, the most popular sport in the world, is a very simple game.”

“Non-essential” means that the word, phrase, or clause is not necessary to the grammar of the sentence: take it out and the sentence reads the same (“Soccer is a very simple game.”) An “appositive” renames the preceding noun (“Detroit, the Motor City, has emerged from bankruptcy proceedings.”) This rule also applies for interrupter words that just comment on the sentence (“He did, however, confess to several other minor crimes” or “She was really surprised, obviously, to find she’d been living with such a disreputable character.”). Some writers treat non-essential elements and appositives as different things, which explains the hedging about “eight or nine” rules at the top of this section. That comma before “which,” by the way, is to separate a non-essential element. The commas around “by the way” are for an interrupter.

g. To separate coordinate adjectives. “Music critics have often praised the album’s simple, spare instrumentation.”

(Both of the adjectives modify “instrumentation”.) You would not write “It was a shaggy, German shepherd” because “shaggy” and “German” are not both modifying “shepherd,” but only “shaggy” was the adjective. Yet you could write “It was a shaggy, brown dog” where both “shaggy” and “brown” are both telling the readers something about the dog.

h. To introduce quoted speech. “President Kennedy said, ‘Ask not what your country can do for you’ in one of his more famous speeches.”
This rule asks you to treat the phrase or clause that explains the origin of the quote as a kind of separate element, so the comma would occur no matter where the quote occurred in the sentence (“Ask not what your country can do for you,” said President Kennedy in one of his more famous speeches.” Or “In one of his more famous speeches, President Kennedy said, ‘Ask not what your country can do for you.’”)

i. Common misuses of commas:

Do not use a comma between the subject and verb:
“I[,] threw the ball through the window.”
Do not use a comma *after* the coordinating conjunction:
“You did that, and[,] she got really upset later.”
Do not use a comma when the clauses are not both complete sentences:
“I grade the essays carefully[,] and then give all As.”
Do not use commas when the information is grammatically necessary:
“All the athletes[,] who have tested positive[,] must re-test.”
Do not use commas to introduce a list:
“Remember to take[,] a lamp, rope, duct tape, and a knife.”
IV. How to Use Apostrophes

A. Use an Apostrophe to Indicate Possession

Possession occurs when a noun shows a possessor and a noun shows the thing or person possessed.

<table>
<thead>
<tr>
<th>Possessor</th>
<th>Thing or person possessed</th>
<th>Possession</th>
</tr>
</thead>
<tbody>
<tr>
<td>woman</td>
<td>son</td>
<td>the woman’s son</td>
</tr>
<tr>
<td>Juanita</td>
<td>shovel</td>
<td>Juanita’s shovel</td>
</tr>
<tr>
<td>child</td>
<td>bright smile</td>
<td>the child’s bright smile</td>
</tr>
</tbody>
</table>

You can tell that possession is going on if you can indicate it using the preposition of:

- the son of the woman
- the shovel of Juanita
- the bright smile of the child

Is it apostrophe “s” or “s” apostrophe? It depends:

To make a singular noun possessive, add an apostrophe plus an “s”:

<table>
<thead>
<tr>
<th>singular noun</th>
<th>apostrophe</th>
<th>“s”</th>
<th>Sample Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>baby</td>
<td>‘</td>
<td></td>
<td>baby’s bottle</td>
</tr>
<tr>
<td>dog</td>
<td>‘</td>
<td></td>
<td>dog’s bone</td>
</tr>
<tr>
<td>horse</td>
<td>‘</td>
<td></td>
<td>horse’s stall</td>
</tr>
</tbody>
</table>

To make a plural noun possessive, add only an apostrophe to form the possessive case:

<table>
<thead>
<tr>
<th>plural noun</th>
<th>apostrophe</th>
<th>Sample Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>babies</td>
<td>babies’</td>
<td>the babies’ bottles</td>
</tr>
<tr>
<td>dogs</td>
<td>dogs’</td>
<td>the dogs’ bones</td>
</tr>
<tr>
<td>horses</td>
<td>horses’</td>
<td>the horses’ stalls</td>
</tr>
</tbody>
</table>

To make a collective noun possessive, add an apostrophe plus “s” to form the possessive:

<table>
<thead>
<tr>
<th>collective noun</th>
<th>apostrophe</th>
<th>“s”</th>
<th>Sample Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>men</td>
<td>’</td>
<td></td>
<td>men’s room</td>
</tr>
<tr>
<td>women</td>
<td>’</td>
<td></td>
<td>the women’s room</td>
</tr>
<tr>
<td>children</td>
<td>’</td>
<td></td>
<td>the children’s toys</td>
</tr>
</tbody>
</table>

To make most indefinite pronouns possessive, add an apostrophe plus an “s”:
### B. Watch Out for Common Misuses of the Apostrophe

Never use an apostrophe to form a plural noun:

- *The teacher’s asked the girl’s and boy’s for their attention.*  **WRONG**
- *The teachers asked the girls and boys for their attention.*  **RIGHT**

Never use an apostrophe with “s” to form the present tense of a verb used with a third-person singular subject (he, she, it, or a singular noun):

- *A professional singer need’s to practice different vocal techniques.*  **WRONG**
- *A professional singer needs to practice different vocal techniques.*  **RIGHT**

Never use an apostrophe with the possessive pronouns:

- *That cat of our’s is always sleeping.*  **WRONG**
- *That cat of ours is always sleeping.*  **RIGHT**
- *The dog buried it’s bone.*  **WRONG**
- *The dog buried its bone.*  **RIGHT**

### C. Use an apostrophe to form contractions

A contraction is a shortened word or group of words when some letters or sounds are omitted. In a contraction, the apostrophe serves as a substitute for the omitted letters.

<table>
<thead>
<tr>
<th>word or group of words</th>
<th>contraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>we have</td>
<td>we’ve</td>
</tr>
<tr>
<td>you are</td>
<td>you’re</td>
</tr>
<tr>
<td>there is</td>
<td>there’s</td>
</tr>
<tr>
<td>who is or who has</td>
<td>who’s</td>
</tr>
</tbody>
</table>

In informal writing, apostrophes can also substitute for omitted numbers in a decade:

*The nineties* can be written *the ’90s.* When writing formal papers, it is better to spell out the words.
V. Titles–Italics or Quotation Marks?

Titles of longer works are usually shown in italics. Titles of shorter works are enclosed within quotation marks. To put it another way, longer works with titles shown in italics indicate that these works have been published as themselves, such as a book or a record album. Shorter works, such as individual poems or songs, are published within a longer work, and this is indicated by the use of quotation marks around these titles.

See this table for examples:

<table>
<thead>
<tr>
<th>Source—the type</th>
<th>Italics—published as itself</th>
<th>Quotation Marks—published within a longer work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newspaper</td>
<td><em>New York Times</em></td>
<td>“In a Hot Market, Evictions for Renters Soar” (article in the newspaper)</td>
</tr>
<tr>
<td>Magazine</td>
<td><em>Newsweek</em></td>
<td>“Ebola’s Back Door to America” (article in the magazine)</td>
</tr>
<tr>
<td>Book</td>
<td><em>Trillion Year Spree: The History of Science Fiction</em></td>
<td>“XIII. The Men in their High Castles” (chapter title within the book)</td>
</tr>
<tr>
<td>Anthology</td>
<td><em>Chief Modern Poets of Britain and America</em></td>
<td>“Among School Children” (a poem by W. B. Yeats printed in the anthology)</td>
</tr>
<tr>
<td>Film</td>
<td><em>Jurassic Park</em></td>
<td></td>
</tr>
<tr>
<td>Record Album</td>
<td><em>Off the Wall</em></td>
<td>“Don’t Stop ‘til You Get Enough” (song on the album)</td>
</tr>
<tr>
<td>TV Show</td>
<td><em>The Simpsons</em></td>
<td>“Tree House of Horror” (title of an individual episode of the TV show)</td>
</tr>
<tr>
<td>Website</td>
<td><em>American Cancer Society</em></td>
<td>“How the American Cancer Society Fights Childhood Cancer” (an article on the website)</td>
</tr>
</tbody>
</table>

Please note that these are also italicized:
- Titles of ships: *Titanic*
- Legal Cases: *Brown v. Board of Education*
- Works of Art: *Michelangelo’s David*
• Foreign words: *mon ami*, *homo sapiens*

• Words when they are referred to as words: I really love the word *love*. 
VI. Emailing Your Instructor: An Illustration

----Message----
From: 190989@houndmail.macc.edu
To: dchallis@macc.edu
Sent: Monday, January 18, 2014 11:49:22 PM
Subject: absent
Hey,
i am in your class this semester but i missed the first 4 days do to some unexpected problems with work and family ;)
I would like 2 make up the work if u can send me the syllabus and all the handouts. and also if I missed any important info.
also will we b needing the book this semester because i am on a budget LOL.
Thx

Without your proper name in the address, subject line, or anywhere else in the email, your instructor has no way of knowing who sent this correspondence.

1. This greeting is inappropriate, especially so early in the semester. Open with something more formal and respectful: “Dear Professor Challis,” or “Good Morning,”

2. Use Standard English; this includes appropriate capitalization, spelling, and grammar.

3. Which class? Your instructor likely has at least 3-5 courses (100+ students).

4. If you have missed 4 days already, that is probably about 2 weeks of class. Your instructor will wonder why you haven’t emailed sooner.

5. There is nothing that warrants a “wink” in the previous sentence, nor do you have a familiar enough relationship with your instructor to be using emoticons.

6. Whether you intend it or not, this is offensive. The faculty members who are responsible for your education take pride in not wasting your tuition or time. Every class session is “important.”

7. Some instructors do under-utilize the required text(s) but you should
not assume that any class is textbook-optional.

8. Your “textspeak” and poor editing reflect badly on you, and at this point your instructor is likely debating whether to encourage your continued enrollment in his/her course.
VII. Writing the Research Paper

A. Determine the Purpose

When you are asked to write a ‘Research Paper,’ what first comes to your mind? Researching as much information on your topic as possible using the minimum number of sources to type up into a paper? Producing this type of paper may not be what your instructor is looking for.

Taking information you find from various sources and recording that information with no real purpose other than to inform your reader is what authors John D. Ramage, John C. Bean, and June Johnson of *Writing Arguments: A Rhetoric with Readings* term a ‘data dump.’ In essence, your paper says, “Here is all this information I found over my topic dumped into this paper for you to look over.” Instead, you should use the information you find to develop and support a specific purpose, claim with reasons, or thesis statement. This is more in line with what many college instructors expect their students to submit.

When you are first given any type of writing assignment requiring you to research, be it an informative paper, an analysis, a report, or research paper, one of the most important details that is often overlooked by students is what purpose the paper will serve. Understanding exactly what your instructor is expecting from you through your final product is key to ensuring that you will earn a grade you can be proud of. Many instructors have rubrics that detail how and where points will be earned and/or lost. Ask yourself these questions:

- What type of paper am I being asked to write?
- What does my instructor expect to see in my final draft?
- What skills and knowledge do I need to demonstrate through the information I present, and the manner in which I present it?

Knowing the type of paper you are writing and your instructor’s expectations before you begin working on the writing assignment will save you a lot of work in the amount of time you are given to complete the paper. You should look over your assignment as soon as you receive it so that you have time to ask your instructor questions if you need help understanding the purpose.

B. Be Aware of Your Timeline

Along with understanding your instructor’s expectations, another important factor that is often overlooked and affects your writing is being aware of how much time is needed to devote to the assignment to be successful, and then considering how much time you actually have before the assignment is due. This
may seem like a no-brainer, but many students will wait too long to beginning their writing projects, only to realize too late that in order to meet the instructor’s expectations in the amount of time they have left, they have far too much work to do in order to complete the assignment with the quality work they are actually capable of. This leads to rushing through a writing assignment in order to meet the deadline, and turning in a work that is far from the instructors’ expectations, and the students’ actual ability.

C. Choose a Topic

Now that you understand what your instructor expects of your assignment, and how much time you have to complete it, you are ready to choose a topic if one has not been provided for you. When choosing a topic, be sure that you select an issue or subject that you actually care about and are interested in. If you pick a topic that you do not have any interest in, your research and paper will certainly demonstrate that to your reader. On the other hand, if you choose a subject that you are really interested in learning about, or an issue that you feel strongly about, you will be more vested in what you are learning. In turn, your audience may get more out of reading your paper.

Caution: If you choose a topic that you feel so strongly about that you cannot look at it from an objective point of view and instead simply write a “rant,” this may not turn out very well for you from an instructor’s perspective. For formal academic research papers, instructors expect to read calm, reasoned work that considers multiple sides to a topic or issue, so be sure you pick a topic that you can research and write about in an appropriate academic tone and that you will not take criticism of the writing as a personal attack on the opinions and beliefs you use in the paper.

D. Complete Initial Research

Let’s be honest: researching requires time. Not only do you need to find multiple sources offering various perspectives on your topic, you need to read those sources a minimum of two times; once during the initial research stage, and again once you have focused your topic and developed a thesis statement. You may need to read them again to seek out specific quotes and information to use in your paper.
1. Exploring a Topic

Once you have your topic and before you jump into a topic search using your favorite internet browser, you need to begin by asking some initial questions. These questions will help you begin to focus your research:

1. Why are you interested in, or why did you choose this topic?
2. What do you already know about this topic?
3. What do you want to know, or what do you hope to learn about this topic?

After brainstorming and jotting down some initial answers to the above questions, reading through your answers will help you understand exactly what it is that you would like to learn about your topic and you can begin researching for some answers in order to have a better understanding of your topic in general.

Before you start plugging in that topic to search for information, remember that you need to have a well-rounded approach to your search so that you consider a variety of information and positions surrounding your topic. If you already feel strongly about your topic, you want to make sure not to dismiss any information you initially find that you do not agree with right off the bat. These sources that you do not agree with will actually help build your paper.

2. Developing More Specific Questions for Exploring

This a good place to begin developing more specific questions over the topic to seek out answers in the materials you find. There are many approaches you can take in order to develop these questions:

What is _________? Or What does ____________ mean?

How does __________ compare to other topics/issues that are like it?

How is ____________ different from other topics/issues?

Is __________ good or bad?

What does __________ cause? Or What are the effects of __________?

What should be done about __________?

Using some of these more specific questions can help you begin the process
of research by looking for answers, and not just reading through a bunch of information over your topic with no goal or purpose, or settling for the first few articles that come up when you type your topic into a search engine. This is what instructors term “exploring” a topic. Having questions about your topic will actually help you focus your research in the sea of information that is available. The next step is actually finding good information from reliable sources.

### 3. Finding and Evaluating Sources and Information

So you know your assignment, you have a topic, and you have thought about and written down some questions to help you research answers. There are actually many different “types” of information, and several different methods for finding that information.

Depending on your assignment and topic, your search for information will come from many different places. One important aspect to keep in mind is that some types of information are more reliable than others.

Generally, the most reliable types of information come from the following:

- **Books** (textbooks and academically reviewed and published books)
- **Studies or information pieces** published in professional journals
- **Discipline-specific articles** in academic journals

These sources are considered “stable” sources of information because they have been published in print and will not change over time. They can be obtained physically in the library, or found using a library’s database search.

- **Websites** that offer information that is sponsored by associations, government, or organizations that are reputable

Information from the internet is considered “nonstable” because it can change daily and there is not always a printed record of that information. For example, the online encyclopedia, or “Wikipedia” can be edited by almost anyone at any time. There are moderators for the site, but if information that was added or edited is biased and/or incorrect, the question is, how long will it take the moderators to notice the issue and fix it? This is true for any “Wiki” or blog site.

There are many other types of information:

- **Newspaper articles**
- **Observation or field research**
- **Information gathered from surveys**
- **Testimony, anecdotal stories, or hypothetical scenarios**
- **Information obtained using internet search engines**
VII. Writing the Research Paper

While these types of sources can offer good information for your research project, it is important to understand that these types of information are more likely to contain biased information, so you must carefully evaluate ALL information you find.

There are at least 4 specific elements of a source you need to examine in order to help you evaluate that the information contained within that source is reliable, and therefore, useful to you.

Remember in your earlier school days when you were asked to look for the 5 W’s to help you gather information (Who, What, When, Why and Where)? This is the same concept, but now that you are in college, we are going to give them a more specific perspective and purpose. The new perception for you to now consider and apply is termed **The Rhetorical Context**. Consider the following elements (TRAC):

a. Text: What is the media or genre of the source? (Is it a book, study, essay, government website, newspaper article, opinion piece, blog, etc.? Is it considered a “stable” or “unstable” source?) How is the text written? (In what style and tone is the information presented?)

b. Reader (or Audience): Who is the intended audience, or who was the source written to/for? How do you compare with the targeted audience? Are you a member of the target audience? How do you know?

c. Author: Who wrote the article? Why did the author write? How qualified is the author to write the information? Was there some motivating occasion that prompted the author to create this work?

d. Context: When and where was the article written/published? Is there a listed sponsor or corporation? If it is a web-based source, is there a date of last update (or a copyright date) on the site?

If you are able to answer each of the questions above, then you are more likely to have found a reliable source of information. Students often do not take the time to ask these important questions surrounding the sources that they find, but knowing this information will build your credibility as a researcher and writer of your paper.

Use this information to help you evaluate not only the information in the sources that you find, but the author who presents that information, the audience the information was originally written for, and also the aspects regarding publication and timing. These elements are also necessary when you create your
Works Cited page because these elements make up the required information needed for a bibliography entry.
VIII. Critical Reading

Critical reading, simply put, means thinking about, analyzing, and questioning a text before, during, and after you read it.

Important considerations for critical reading:

Critical reading is *active*. Active reading means that you engage with the reading: mentally, by thinking about what you read, and physically, by jotting notes in the margin, looking up unknown words and writing their definitions, writing down questions that arise as you read, and summarizing (condensing an author’s key points or ideas in your own words) or paraphrasing (restating an author’s idea in your own words and sentence structure).

**Skim for principal ideas**

Preview the length of a work so that you have an idea of how much time you will need to read it and what the key ideas are.

Next, preview the title, headings, first sentences in paragraphs, words in bold, and any illustrations, photographs, charts, or tables to help identify the author’s key ideas.

Read the concluding paragraph or summary of the text to reinforce the principal ideas.

**Read for comprehension**

When reading for comprehension, read for the author’s main ideas. Try to comprehend the essence of the text, making sure to mark any section that you don’t understand.

During this reading, take your time and annotate (write notes in) the text. Look for the author’s main point (thesis) and supporting details, and make sure to define any unknown words.

**Summarize for recall**

After you read, summarizing an author’s main points in your own words can help you remember them. In a summary, focus on writing the main ideas and principal supporting details; you may omit detailed evidence here. The point is to help you gain mastery of the ideas.

A. Bloom’s Taxonomy

Developed by Benjamin Bloom and a group of educational psychologists to identify important learning behaviors, Bloom’s Taxonomy contains six increasingly complex levels of critical thinking skills. The taxonomy can help readers develop the habit of thinking about an author’s ideas, evidence, and
reasoning, rather than come to quick, superficial conclusions about texts. The following six levels of Bloom's Taxonomy comprise the revision that Lorin W. Anderson and David R. Krathwol devised in 2001.

**Level 1: Remembering**
At this level, readers recall facts and basic concepts. Common questions used at this level are who? what? where? when? and why? Students recall and recognize at level 1.

**Level 2: Understanding**
At this level, readers explain ideas and concepts using their own words. Explaining, summarizing, and paraphrasing a reading selection show that readers understand what they have read. Students interpret, give examples, classify, summarize, infer, compare, and explain at this level.

**Level 3: Applying**
At this level, readers can use information in new situations, or they can solve problems with it. Finding the main idea or the organizational pattern in a reading falls in this category. Students execute tasks and implement knowledge at this level.

**Level 4: Analyzing**
At this level, readers make connections between ideas, and they separate something into its parts or elements to better understand it. Comparing and contrasting, differentiating major and minor details, and distinguishing between facts and opinions are examples of analyzing. Students differentiate and organize at this level.

**Level 5: Evaluating**
At this level, readers can justify a stand or a decision. Weighing evidence an author has used to support a claim and deciding whether or not to agree is evaluating. Students check (does this make sense?) and critique (does this author support the main ideas well?) at this level.

**Level 6: Creating**
At this level, readers create original or new work or draw original conclusions. Making predictions or synthesizing sources into a new idea are both examples of creating. When writing a paper, you use level 6. Students generate, plan, or produce at this level.

**B. Increasing Your Reading Rate**

*Chunking* is a strategy for increasing your reading rate. It involves taking a lengthy, complex sentence or passage and grouping it into phrases and clauses according to their meaning. Grouping words into units according to their meaning
VIII. Critical Reading

increases both your comprehension and your reading rate.

If we look at these sentences from Jared Diamond’s *Guns, Germs, and Steel*, we can see how chunking works:

We all know that history has proceeded very differently for peoples from different parts of the globe. In the 13,000 years since the end of the last Ice Age, some parts of the world developed literate industrial societies with metal tools, other parts developed only nonliterate farming societies, and still others retained societies of hunter gatherers with stone tools. (13)

Experienced readers don’t read these sentences word by word; rather, they might break into phrases and clauses like this:

We all know
that history has proceeded very differently
for peoples from different parts of the globe.
In the 13,000 years since the end of the Ice Age,
some parts of the world
developed literate industrial societies with metal tools,
other parts developed only nonliterate farming societies,
and still other retained societies of hunter gatherers with stone tools.

To develop the skill of chunking as you read, make a conscious effort to group words and phrases together according to their meaning. The more you practice chunking, the more words you will be able to put in a meaning group, which means you will both read faster and comprehend better. Remember that punctuation can be a helpful tool in chunking, because commas, semicolons, dashes, and periods all indicate logical units of thought.

C. Using Context to Define Words

Using context means that we use the words and sentences around an unknown word to figure out its meaning. By consciously thinking about sentences that come before or after an unknown word, we can often determine its meaning so that we don’t have to consult a dictionary every time we encounter a new word.

Synonyms, antonyms, and examples are three common context clues, and often we can recognize of each of them by typical introductory words or phrases.

Synonyms are words that have the same or similar meaning as the unknown word—elated and joyful are synonyms. In addition to synonyms, authors may also use comparison (showing similarities) or definition to clarify an unknown word. Common words that tell us an author is using comparison or definition may include like, also, as well, in other words, means, i.e. (that is), similar to, and similarly, as in:

Josie’s attendance is sporadic, i.e., some days she’s here and some days she’s not.
From this example we may infer that *sporadic* means “random.”

Also, marks of punctuation such as dashes and parentheses may indicate either synonyms or definitions.

*Goats and raccoons are omnivorous (animals that eat both plants and animals).*

**Antonyms** are words that have the opposite meanings—*rare* and *common* are antonyms. Often, authors will use antonyms to define unknown words, such as

*Mary was *outgoing*, but her sister Sarah was *diffident*. Here we can see that *outgoing* and *diffident* are contrasted, so we are able to infer that diffident means “shy.”

Common words and phrases that indicate contrast include *but, rather, yet, although, instead, on the other hand, conversely, however, in contrast, on the other hand.*

A third type of context clue is the *example*, when the author gives us specific instances, cases, or illustrations to clarify a word’s meaning. Common words and phrases that indicate examples include *for instance, for example, to illustrate, and such as.* Also, authors may use a colon to introduce a series of examples.

*Movies are often of different genres: romance, drama, action, gore, and sci-fi, to name a few.*

Idioms such as “raining cats and dogs” and “spill the beans” often confuse people who are just learning English.

Finally, effective readers use their own personal context when reading; they connect what they’re reading to their previous knowledge on the subject and make logical inferences—they draw conclusions—based on what they know as they read.

## D. Denotation and Connotation

A word’s **denotation** is its explicit dictionary meaning—what it stands for without any emotional associations.

A word’s **connotation** are the emotional, social, political associations it has in addition to its denotative meaning.

For example, *assertive, aggressive,* and *pushy,* although all related, have somewhat different denotations and connotations. Most writing require a combination of connotative and denotative language.

How do denotation and connotation fit in with reading comprehension? Sometimes while we are interpreting context clues to understand what we’re reading, we can also determine if a given word has positive, negative, or neutral connotations. On occasion, just knowing that a word has positive or negative connotations enables us to keep reading with sufficient comprehension, and we don’t have to stop and look up every single unknown word.
E. Vocabulary Study Using Word Parts

Learning word parts such as roots (which carry the word's main meaning), prefixes (which come in front of the root), and suffixes (which come after the root) can expand and broaden our vocabulary.

Many of the words you encounter in college are based on Latin and Greek roots. For example, biology contains the Greek root *bio-*, meaning “life,” and the suffix *-ology*, meaning “the study of.”

**Root**—A root is a word from which other words are formed. For example, *manufacture* and *manual* both come from the Latin root *manu*, meaning “hand.”

**Prefix**—a letter or group of letters placed at the beginning of a word that changes its meaning. Prefixes are not words and cannot be used alone in a sentence. Adding the prefix *sur*, which means “above” or “over” to *real* gives us *surreal*, meaning “unreal” or “fantastic.”

**Suffix**—a group of letters placed at the end of a word. A suffix often changes a word from word class to another. For example, if we add the suffix *-able* to the word *like, like* (a verb) becomes *likeable* (an adjective).

Here is a list of common Latin and Greek roots, prefixes, and suffixes to help you learn new words through recognizing these parts.

### 1. Common root words and meanings

<table>
<thead>
<tr>
<th>Latin Roots</th>
<th>Meanings</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>amare</td>
<td>to love</td>
<td>amiable</td>
</tr>
<tr>
<td>annus</td>
<td>year</td>
<td>annual</td>
</tr>
<tr>
<td>audire</td>
<td>to hear</td>
<td>audible</td>
</tr>
<tr>
<td>capere</td>
<td>to take</td>
<td>capture</td>
</tr>
<tr>
<td>caput</td>
<td>head</td>
<td>capital</td>
</tr>
<tr>
<td>dict</td>
<td>to say</td>
<td>diction</td>
</tr>
<tr>
<td>duc, ductum</td>
<td>to lead</td>
<td>aqueduct</td>
</tr>
<tr>
<td>facere, factum</td>
<td>to make, to do</td>
<td>factory</td>
</tr>
<tr>
<td>loqui, log</td>
<td>to speak</td>
<td>eloquent</td>
</tr>
<tr>
<td>lucere</td>
<td>to light</td>
<td>translucent</td>
</tr>
<tr>
<td>manu</td>
<td>hand</td>
<td>manuscript</td>
</tr>
<tr>
<td>medius</td>
<td>middle</td>
<td>mediate</td>
</tr>
<tr>
<td>mittere, miss</td>
<td>to send</td>
<td>admit, mission</td>
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<tr>
<td>omni</td>
<td>all</td>
<td>omnipotent</td>
</tr>
<tr>
<td>port</td>
<td>to carry</td>
<td>portable</td>
</tr>
<tr>
<td>scrib, script</td>
<td>to write</td>
<td>scribble</td>
</tr>
<tr>
<td>sent</td>
<td>to feel</td>
<td>sense</td>
</tr>
<tr>
<td>spec</td>
<td>to look</td>
<td>inspect</td>
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<tr>
<td>spir</td>
<td>to breathe</td>
<td>expire</td>
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<tr>
<td>verb</td>
<td>word</td>
<td>verbiage</td>
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2. Prefixes indicating number

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Meaning</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>uni</td>
<td>one</td>
<td>unity</td>
</tr>
<tr>
<td>bi</td>
<td>two</td>
<td>bimonthly</td>
</tr>
<tr>
<td>duo</td>
<td>two</td>
<td>duet</td>
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<td>tri</td>
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<td>poly</td>
<td>many</td>
<td>polygamy</td>
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### 3. Prefixes indicating space and sequence

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<tr>
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<th>Meaning</th>
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<td>before</td>
<td>antebellum</td>
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<td>circum</td>
<td>around</td>
<td>circumscribe</td>
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<tr>
<td>con</td>
<td>together, with</td>
<td>congregation</td>
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<tr>
<td>ex</td>
<td>out, from</td>
<td>exhale</td>
</tr>
<tr>
<td>in</td>
<td>in, into</td>
<td>exhale</td>
</tr>
<tr>
<td>intra</td>
<td>between</td>
<td>intramural</td>
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### 4. Prefixes indicating negation

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Meaning</th>
<th>Example</th>
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</thead>
<tbody>
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<td>against</td>
<td>antibiotic</td>
</tr>
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<td>contra</td>
<td>against</td>
<td>contradict</td>
</tr>
<tr>
<td>counter</td>
<td>opposing</td>
<td>counterclockwise</td>
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<tr>
<td>dis</td>
<td>not</td>
<td>disregard</td>
</tr>
<tr>
<td>il, ir</td>
<td>not</td>
<td>illegitimate, irregular</td>
</tr>
<tr>
<td>in, im,</td>
<td>not</td>
<td>immature, incapacity</td>
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### Verb Suffixes

<table>
<thead>
<tr>
<th>Suffix</th>
<th>Meaning</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>-en</td>
<td>to cause</td>
<td>redden, cheapen</td>
</tr>
<tr>
<td>-ate</td>
<td>to cause to be</td>
<td>animate</td>
</tr>
<tr>
<td>-ify</td>
<td>to make or cause</td>
<td>fortify</td>
</tr>
</tbody>
</table>

### Adjective Suffixes

<table>
<thead>
<tr>
<th>Suffix</th>
<th>Meaning</th>
<th>Example</th>
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</thead>
<tbody>
<tr>
<td>-ic</td>
<td>pertaining to</td>
<td>democratic</td>
</tr>
<tr>
<td>-ous, -ose</td>
<td>full of</td>
<td>verbose, fibrous</td>
</tr>
<tr>
<td>-ish</td>
<td>having qualities of</td>
<td>childish</td>
</tr>
<tr>
<td>-ize</td>
<td>to make</td>
<td>modernize</td>
</tr>
<tr>
<td>-ly</td>
<td>at specific intervals</td>
<td>quarterly</td>
</tr>
<tr>
<td>-ology</td>
<td>the study of</td>
<td>psychology</td>
</tr>
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### Note-taking Strategies

A well-developed system for taking notes while you read has several advantages. First, it keeps you actively engaged with the material you’re reading. Second, it helps you monitor your understanding and notice when you’re not
VIII. Critical Reading

comprehending an author’s point or when you have questions. Finally, good note-taking skills help you identify important information that you can later review for a test.

If you highlight, make sure to include the author’s main point, major supporting details, and key terms. Mark about 20% of the reading. If you highlight too much information, you will end up reading more than necessary when you are reviewing the material.

When annotating (writing explanatory notes in the margins or between the lines of the text), develop a system of shorthand that works for you, and make sure that your system helps you differentiate among main ideas, major details, minor details, steps in a process, important terms and examples, your personal reactions, and any questions you may have about the material.

G. SQ3R and Cornell Notes

Two well-known systems for reading and note taking are SQ3R and Cornell notes.

SQ3R is an acronym for its major steps: survey, question, read, recite, and review.

Survey—before you read, survey the title, introduction, and conclusion, any headings, visuals (photos, maps, charts, illustrations) and their captions, and the summary.

Question—turn the titles, headings, and subheadings into questions. Ask yourself what you already know about the subject. You may write these questions if helpful.

Read—look for answers to the questions you raised and to questions at the end of sections or chapters, read difficult sections more slowly, reread any parts that aren’t clear, note words in bold or in italics, read captions under pictures and other graphics, and read one section at a time.

Recite—after you read a section, orally ask yourself questions about it and answer in your own words, take notes in your own words, summarize, and underline or highlight main points.

Review—after you finish reading a section, go back over the questions you’ve created and see if you can still answer them. If not, refresh your memory. Create a study sheet containing the main points of the reading selection, and periodically review it so you don’t have to cram for an exam.

SQ3R is an effective reading and note-taking strategy because it involves seeing, saying, hearing, and writing.

Cornell Notes is an effective note-taking strategy which is helpful both for lectures and for reading. First, divide your notebook into two columns: the
smaller column on the left of the page for main ideas, important terms, and questions; the larger column on the right of the page for details, examples, and explanations. Reserve space at the bottom of the page to write a summary of the section, chapter, or page of notes. One of the advantages of Cornell Notes is that they create built-in flashcards for review. When preparing for a test, you simply cover up the right-hand side of the page and quiz yourself about the main ideas. This is an effective and time-efficient study strategy.

Chapter 4: Title of Chapter

<table>
<thead>
<tr>
<th>Main Idea</th>
<th>Elaboration of Main Idea–definitions, characteristics, details, etc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notice that the elaboration of the main idea needs to line up on the page across from the main idea on the left.</td>
<td></td>
</tr>
<tr>
<td>Main Idea</td>
<td>Elaboration of Main Idea–definitions, characteristics, details, etc</td>
</tr>
<tr>
<td>Main Idea</td>
<td>Elaboration of Main Idea–definitions, characteristics, details, etc</td>
</tr>
</tbody>
</table>

At the end of the notes for the assigned reading, write a brief summary for yourself of what the reading was about—the important details and how it all works together.

Leave plenty of space on your page. This allows you to add notes about these ideas and concepts during class lecture.
IX. Critical Thinking

In education, you often hear of the need to teach “critical thinking.” It seems strange to say that we even can teach someone to think, not even to mention the critical part. Isn’t thinking something we do naturally, without thinking? Yes and no. I’m sure you can recall a time that you faced a thorny problem and, through conscious deliberation, managed to solve the problem, thereby gaining a feeling of satisfaction and accomplishment. I’m sure you can also recall a time that you faced a thorny problem and charged right into it without a thought. Perhaps you got lucky and reached a resolution, most likely the result did not lead to a satisfying feeling.

If we can define critical thinking, we can get to the difference between “conscious deliberation” and “charging right in.” (BTW, can you develop scenarios where it might be best to charge right in?)

MACC is not the first institution to try to define critical thinking. There are numerous definitions available. I’ll provide a few here to give you an idea of the variety:

We understand critical thinking to be purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based. CT is essential as a tool of inquiry…While not synonymous with good thinking, CT is a pervasive and self-rectifying human phenomenon. The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit. Thus, educating good critical thinkers means working toward this ideal. It combines developing CT skills with nurturing those dispositions which consistently yield useful insights and which are the basis of a rational and democratic society.

from: Complete American Philosophical Association Delphi Research Report

Critical thinking is the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action. In its exemplary form, it is based on universal intellectual values that transcend subject matter divisions: clarity, accuracy, precision, consistency, relevance, sound evidence, good reasons, depth, breadth, and fairness.

National Council for Excellence in Critical Thinking Instruction
Critical thinking is a habit of mind characterized by the comprehensive exploration of issues, ideas, artifacts, and events before accepting or formulating an opinion or conclusion.

*Association of American Colleges and Universities*

Critical thinking is that mode of thinking—about any subject, content, or problem—in which the thinker improves the quality of his or her thinking by skillfully taking charge of the structures inherent in thinking and imposing intellectual standards upon them.

*Elder & Paul*

Fair enough; it is a difficult concept to define. Can we cut through the bureaucratic mumbo-jumbo and develop a definition that is easy to understand, visualize, and use? I think so.

The first thing to note, and all these definitions imply it, is that critical thinking is a **behavior**. It is a way of acting—a way that you consciously act on your mind. It is a behavior that, with practice, becomes **habitual** and can be applied to a variety of problems in a wide range of subjects and situations. And, as with writing and reading, the behavior begins with a **telos**, or purpose. What is the reason you direct your mind to critically think? We’ll start answering these questions with a graphic of critical thinking developed for this handbook. We’ll describe each part and provide some case studies of how critical thinking is enacted.
A. An Overview

Critical thinking is a behavior engaged by a telos where the thinker uses revisable strategies to gather and process information, then applies the results to fulfill the telos.

Most likely, you engage in critical thinking without knowing it. Let’s say that your dishwasher becomes unmoored from your counter and when you open the door, it tips forward, spilling dishes and silverware on the floor. You pick up the dishes and look underneath the counter and discover two small tabs with holes in them for screws used, you presume, to attach the dishwasher to the counter.

Aha. There are no screws there. So you go to your garage and get two wood screws (not sheet metals screws, nails, or bolts). They both fit easily into the pre-drilled holes in the counter. Not good. So you return and get two thicker screws. You try screwing them in but the screwdriver’s head is too small. You get a bigger screwdriver; screw the screws in, and there you go, you have secured the dishwasher using critical thinking.

What began this process? We use the classical Greek word—telos—to describe what engages the process. Telos means the end, purpose, or goal. In the case above, the telos was to fix the dishwasher. In all cases, critical thinking is engaged when you lack what you need to fulfill your telos. In most cases, critical thinking gathers information to solve a problem. As anyone who has lived in this complex world knows, problems come in all shapes and sizes.

Sometimes those problems are given to you in your college courses:
Solve for X

What are three causes of the War of 1812?
What happens to demand for a product when it becomes more expensive?
What is the ideal pH level for this specific organism to thrive?
How do you find a short in a complicated circuit?
If you drop a ball from 300 feet, how long will it take for it to hit the ground?
How do you program a self-replicating system?
Sometimes those problems are moral:
A friend asks you to lie for him, should you?
You’re “kind of” seeing someone, and someone you like asks you out, is it ok to go?
You need your job to support your sick child and discover your employer is engaged in illegal, but not very damaging, activity, should you report her?
You witness a friend cheating on their spouse? Should you tell the spouse?
You find $10,000 in cash in a field while hiking, what should you do with the money?
Sometimes those problems appear when considering your life:
How do you maximize your potential as a student?
What career should you choose?
Should you remain with your church, find a new one, or stop attending entirely?
What’s the best way to stay fit given your schedule?
What kind of car should you buy?
Is it time to get married?

We can generate an endless number of problems. Each class you take in college can generate an endless number of problems. Each stage of your life can generate an endless number of problems.

What characteristic do these problems share? Each requires purposeful action. Each requires that the person gather information, process that information, and then apply the result of the process to the problem at hand. Each problem requires the behavior of critical thinking. Even if critical thinking is engaged in speculation, the critical thinker speculates because she doesn’t know as much as she’d like—she uses critical thinking to expand her knowledge.

Critical thinking requires a strategy at each stage. It is common sense that you should only want to gather information that pertains to the problem at hand. You should only want to use a process or processes that operate effectively on what you’ve gathered, and, of course, you need to apply the results to the appropriate problem. You wouldn’t want your doctor to put a cast on your right arm if the diagnosis is that the left arm is broken.

A strategy is a reason-based and deliberate method to achieve your telos. One of the goals of this handbook is to survey a range of strategies that work in critical thinking situations. Ideally, you want your strategy to accomplish the
IX. Critical Thinking

most for the least amount of energy—it is in the nature of critical thinking to be seeking efficiencies at every stage. *Did you hear the one about four engineers who spent 10 hours figuring out how to cut 10 minutes out of a 20 minute task?* Our engineering friends know all about strategy. Strategy is **revisable**. You should be constantly improving your strategy. Indeed, that is the “critical” part of critical thinking. You are not only trying to solve a problem when you critically think, you are trying to figure out the most efficient and effective way to solve it. If your efforts do not result in a solution, you need to figure out how to fix your strategy so that it does.

**B. Recursivity**

You revise strategy because you cannot achieve your telos until you get the right kind of information, the right kind of process and the right kind of application. This highlights another aspect of critical thinking—it is a **recursive** process, not a **linear** process. A linear process is like climbing stairs—first step, second step, third step, and so on until you reach your destination. A **recursive** process is a process that engages subroutines. For example—take the first step, if you land with your right foot take two steps down, if you land with your left foot, take two steps up, then proceed to the next step. Nested inside the main process are other processes.

We talked about recursive processes when discussing writing—the same idea applies to critical thinking (indeed, you may noticed that reading, writing, and critical thinking share many of the same cognitive features). You may have to gather (revise strategy), gather (revise strategy), gather (revise strategy), before you can move on to the process stage where you may have to revise your strategy again—that is the nature of recursive processes. The clever student might argue that you are using the entire process of critical thinking when you choose how to revise your strategy. Yes. That’s the nature of recursive processes: the big process is made up of a number of smaller processes that may look like the big process.

**C. The Gathering Stage**

All gathering involves sensory activity at some point, but observation is not always the origin of gathering. For example, you will be asked in a number of classes to write research papers. In that case, the gathering will be collecting sources to use in your essay (of course you’ll have to use your eyes to read what
those sources have to say). For scientists, a well-thought out experiment gathers significant results that can then be passed over to the processing stage. For an economist, gathering may mean searching datasets of economic activity. For a sociologist it may be designing, handing out, and collecting surveys. For a mathematician gathering may mean looking at a group of problems to learn what rule governs that set.

You need a strategy for gathering information because you need the right kind of information. For example, while collecting sources for your research paper, you'll need those sources to be unbiased. The scientist's experiment will need to follow the protocols for experimentation, as will the design of the sociologist's survey. The mathematician's problem set needs to be consistent and the economist's dataset up to date.

Let's think about gathering in the dishwasher problem. First you had to discover what was wrong. You did this through observing how the dishwasher should be attached to the counter. But why didn’t you start by looking at the bottom of the dishwasher? Or under the sink? Because you wanted to maximize the amount of pertinent information you receive from your observation, so you started looking at a natural place to attach the dishwasher to the counter. That was your strategy. In order to maximize the efficiency of gathering, you need to figure out what you need to look for, and how to look for it, before you start looking.

Imagine you’re in a child development class which requires you to spend time in a daycare center. Your assignment is to write a report, based on your observations, on how 3-4 year olds interact with each other. What will be your strategy? First, you’ll want to set yourself up in the room where 3-4 year olds play. Second, you’ll need to be there when they interact. Third, you’ll need to figure out where to position yourself to observe the fullest range of interaction. Fourth, you’ll want to either videotape their interactions or take notes. When you have decided on each of those issues (your strategy) you’ll be ready to observe (gather).

Maybe the first day of observation you discover that the children keep coming up to you to look at the camera you are recording them with and they interact with you more than they interact with each other. So the next time you observe, you take notes instead of videotaping—you revise your gathering strategy.

1. Objectivity

In the section on writing we discussed the necessity of being objective when engaging in certain kinds of rhetorical situations. Gathering without bias (as well
as gathering unbiased information) is essential to critical thinking. If you only gather information that supports what you already know, you won’t ever learn anything.

Let’s think about the situation described above. Maybe when you were four years old you were bullied by a blond-haired boy and there is a blond-haired boy in the playroom you are to observe. Will you watch him like a hawk to observe his bullying behavior? If you did, you wouldn’t be objective and, no matter how effectively you process and apply your observations, your project will be flawed because of your bias against blond-haired four year olds. *Bias in/bias out.*

It takes a certain kind of rigor to observe objectively. First, that rigor is sensory. It requires careful attention. Observation cannot be one part of a “multi-task.” It is only effective if it is a “uni-task”—the sole object of your energy and focus.

Second, that rigor is, I would argue, moral. You have to remove your self, your ego, from the object of your observation. This is no easy task, particularly in a culture that encourages us to share how things affect us, not how they are in themselves.

I observe this phenomenon in my composition class. When we are learning how to write objectively, I project images of figures, including Christ, Satan, current politicians and entertainers, on the wall. I ask students to objectively describe these figures, emphasizing that I should not be able to tell how the students feel about or judge these figures. I get about a 40-50% success rate—in other words, at least half the students cannot get themselves out of the way when observing. If you want to be able to critically think effectively, you’ll need to check your ego (not your head) and remain open at all times to what you are gathering.

2. What Is an Open Mind?

In any case (and in all three stages of the critical thinking process) you will need to keep an open mind, for example, by accepting the fact that not all four-year old blonde boys are bullies.

But what really is an open mind? An open mind is a mind capacious enough to accept all matter of information—even information that is surprising, shocking, confusing, and contradictory to your previous knowledge or belief. I have a litmus test for students to see if they have an open mind. Can you explain a proposition, its support and warrants, so that someone can understand it? Sure. Here’s the difficult part—can you explain a proposition, its supports and warrants, even if you do not assent to the proposition? Is your mind capacious enough to
comprehend something you don’t believe? Is it open enough to understand how someone can assent to a proposition you don’t assent to?

To really understand what it means to have an open mind, and to retain it, you must have some notion of what ideology is.

Ideology is difficult to define. Here’s my definition, and it takes a while. First off, assume all aspects of culture (except for one) can be traced back to some material need. Nutrition, clothing, shelter (needs of the individual body), reproduction, social interaction (needs of the species), are those basic material needs.

Over time, systems accrue; institutions evolve, in order to take care of those basic needs. The accrual of systems and values, the evolution of institutions into their present state, comprise ideology. Ideologies provide the structure of culture as well as its narratives. Let’s take Valentine’s Day, for example. Obviously, the material need is reproduction, but ideology tells us that it’s really about love, romanticism, lovey-dovey interactions with a significant other who receives flowers and candy. Let’s look more deeply at reproduction. Ideology tells us the appropriate way to reproduce is to establish yourself in the world, court or be courted, marry (with all the rituals and customs therein) and then reproduce.

But perhaps before reproducing you ought to secure a shelter. What is the ideology of shelter in America? It is the value of home ownership where you get a good job, work hard, get married, and buy a house. What does it take to buy a house? Take out an enormous loan that will last for 30 years in some cases. Then think about what happens to that loan. It gets bundled with other loans and sold as a security. Insurance companies insure the efficacy of those securities. Some will buy those securities as an investment. Others take bets on whether those securities will hold their value. In our economy, that original loan, let’s say for $100,000, might generate many many more dollars’ worth of fictional value in derivatives and market bets. Sound familiar? That kind of economic ideology of home ownership led to the market collapse of 2008.

Ideology isn’t right or wrong; it just is. We all live according to ideology. Of course, people frequently believe that their ideology is the correct or true one. Think about wars. Ideologies organize people and machines to kill each other and each side claims righteous truth. This does not mean that all ideologies are as equally valid. Ideologies can be subject to objective or moral testing. Whether or not its adherents will accept the results of those tests is another issue entirely. Ideology in/Ideology out.

Here’s another way to define ideology. You take all the energy each person has to achieve the basic material needs necessary for each person to live. Sum all the energy of all people in a society and call it “social energy.” Simply put,
IX. Critical Thinking

*Ideology directs social energy.* Want shelter? In America the energy is directed to home ownership. Have a deep spiritual need? That energy is directed to a number of religious practices. Want to reproduce? Better be adept at poetry starting with, “Roses are red…”

If we are to be in the practice of having an open mind, we must be able to discern the ideology that shapes our understanding of the material world. Indeed, it is very difficult to practice critical thinking on social, economic, psychological, and political issues without a deep understanding of what ideology is and what ideologies are at work in our culture and in us.

Let’s return to our example of daycare observation. Let’s say you adhere to an ideology that assumes females are biologically programmed to act a certain way as opposed to the way males are programmed to act. If you observe the children act in ways that swerve from that ideology, you may then process their behavior as being deviant rather than natural—you process their behavior to match what ideology has told you about their behavior. *Ideology in/ideology out.*

Once you understand what ideology is and how it shapes your world-view, you have created mental space, the open mind necessary to critically think. In addition, another benefit of an open mind is that an open mind is *curious* because it always can accommodate the new information we habitually seek.

### 3. How Much Gathering is Enough?

The answer to this question is always given by the telos. The simple answer is: Enough to fulfill the telos. The dishwasher problem required a few minutes. The paper for the child development class probably came with its own direction for the required amount of time to observe the children at play.

When a problem is given within a specific discipline, that discipline most likely has established protocols for the amount of information to be gathered, in what form, and by what means. In statistics for example, a variety of formulas can be used to determine the confidence interval according to a sample size relative to the targeted population. In the humanities, the amount of research required is less determinate. What is required is that the author’s position in the research is in context of the research that has already been done. In the natural sciences there are protocols for what constitutes appropriate research. Most research and scholarship is published in “peer-reviewed” journals. That way, the research and scholarship has been vetted, and, in many cases, commented upon and amended before being published. In other words, it has been processed by peers in the field before being applied.

The idea of “confidence” in the information you gather is both a specific
objective value, and also a subjective one. In other words, in statistics you can conduct a survey that has a specific value for the confidence interval of your findings. If you’re working through a moral dilemma, that confidence value is much more difficult to determine and is based on the feeling that you have done enough reflection and consideration.

In practical terms, when you are given an assignment that involves critical thinking in college, how much gathering you need is usually included in the instructions. Those instructions are also included in protocols developed for research and industry in whatever field of endeavor you’re engaged in. When you are critically thinking outside of pre-determined protocols, you’ll have to rely on your experience and practice. If that sounds nebulous, don’t worry. After the first go-around, if you have not gathered enough, or the right, information, you can revise your strategy. Remember, the gathering stage is **revisable** and **recursive**.

4. **Gathering: What We Learned**

a. The purpose of the gathering stage is to collect pertinent information to be processed.

b. You should have a strategy of how you will go about gathering.

c. That strategy is revisable.

d. You revise strategy in order to achieve maximum efficiency for minimum energy.

e. The processes of critical thinking, the gathering stage, and revising strategies are all recursive processes.

f. A recursive process is a large process composed of smaller processes that may be similar to the large one.

g. You must gather information objectively, that is, without bias.

h. **Bias in/Bias out.**

i. Ideology is the foundation of a culture evolved to take care of material needs.

j. Ideology directs social energy.

k. Recognize ideology at work in your gathering.

l. **Ideology in/Ideology out.**

m. Keep an open mind.

n. An open mind is a curious mind.

o. Are there protocols for how you should go about gathering information? If so, follow them.

p. If you don’t get all the information you need to solve your problem, revise
5. Gathering: A Case Study

It is difficult to choose a favorite pre-modern astronomer from the pantheon of Copernicus, Kepler, Galileo and Newton, but for “believe it or not” facts, no one beats Tycho Brahe. Brahe was a Danish nobleman (1546-1601) whose careful observation and measurement of planetary courses enabled Kepler to induce his three laws of planetary motion. But before we get to his gathering, let’s explore a couple of the oddities of Brahe’s life and death.

As a young man Brahe got into an argument with a peer over a mathematical formula. It was decided that they would resolve this conflict, not through mathematical induction, but a duel with swords. Brahe’s opponent struck the bridge of his nose clean off. Not wanting to live with a disfigured face, Brahe crafted himself a prosthetic nose. Historians speculated on what material that nose was crafted out of and discovered, after exhuming his body in the 20th century, that his nose was made of brass.

Brahe’s death is odd as well because it seems to be the result of excessive manners. Brahe was at a great feast that went on forever. Apparently, he had to urinate badly but felt bound by etiquette to remain in his seat until it was appropriate to leave the table. He died a few days later from a bladder that burst that evening during the feast.

Brahe was one of the last great naked-eye astronomers, for telescopes had not yet been developed. Brahe’s observations achieved a level of detail and accuracy that was astounding for his era. He was able to achieve this level of accuracy through careful planning, trial and error, patience, and precise instrumentation. He planned to exact specifications, and built, an observatory, Uraniborg, on a small island to afford him the widest range of views. Through dedicated engineering, he designed and crafted numerous instruments to aid his observations and calculations. Brahe’s work resulted in numerous tables which represented the movement of planets, comets and stars.

While Brahe was a genius at gathering information, he was not as skilled at processing that information. Kepler, Brahe’s student, clearly saw that Brahe’s data supported a heliocentric model of the solar system—the planets, and the earth, orbited around the sun. The Church, at the time, had declared that the heliocentric model was contradictory to the scriptures and ecclesiastical teaching. Brahe developed a hybrid model to explain the data—the sun revolved around the earth while the other planets revolved around the sun.

Brahe’s work also illustrates the role of ideology—his religious ideology
Barrett

prevented him from interpreting the information he gathered in the most accurate way. Kepler further developed astronomy as a discipline because he was not bound by that ideology. But it’s not surprising that Brahe was held back by his ideology. If you think about it, his death was ideological. His body was telling him to pee, but the ideology of behavior for a nobleman kept him at the table until his bladder burst. I suppose there’s a lesson there for us critical thinkers.

Many of the instruments can be seen as reproductions in the Cal-tech library archive and the Royal Danish library’s exhibition on Tycho Brahe. http://www.kb.dk/en/nb/tema/webudstillinger/brabe_mechanica/introduktion.html.

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Brahe’s tables on the orbit of Mars used by Kepler
D. The Processing Stage

Once you have the pertinent information from the gathering stage of critical thinking, it is time you processed that information in order to solve the problem determined by your telos.

You already know that you need a strategy to process the information you gathered and that strategy is revisable. There are many ways to process information; we’ll just look at a few broad categories and some examples in each category.

There’s a rather large philosophical issue that we’ll handle briefly here at the beginning. (If it interests you enough to explore more deeply, look into Roger Penrose’s *Road to Reality: A Complete Guide to the Laws of the Universe.*) The assumption we make here is that the universe is formalistic (I did not say deterministic). In other words, there is a form to the content of the reality we experience. In the process stage, we use strategies in order to reveal the form in the information we gather. Once that form is revealed, we can figure out how to apply what we learned from that revelation to fulfill our telos.

While we’re on the topic of large philosophical issues handled briefly, it should be noted that computational theory explores the limits of machine-based problem-solving. It remains an open question in computational theory whether computers will be able to solve all problems (including the problem of deciding if computers can solve all problems!). But until such time as the machines take-over with their awesome critical thinking skills, we can trust our brain to process many of our problems (even though we may outsource much of the processing to computers).
1. Separating Information from Noise

No matter how efficient our information gathering process is, not all the information we gather will be usable. This principle is one of the foundations of Information Theory, developed by Claude Shannon in the 1930s and 40s. Shannon developed a mathematical model of how information is coded, transmitted, and decoded. One of his insights was that the transmission of information always includes noise.

Recall the case study where you are observing children interacting in a daycare? Maybe one day your notes read, “The boys and girls are waving their hands constantly in front of their heads today. Perhaps non-verbal communication.” Well, if that goes into your report for your child development class, it may seem like an insight into the close-knit group of children, but in reality it was just noise. One of the children had left a banana peel inside a plastic train three days previous which subsequently found its way to the bottom of the toy box where it served to host the reproduction of myriad fruit flies. Those children are trying to play but have to keep swiping at those tiny pesky bugs flying around. That certainly would count as information to an exterminator, but for your telos, those hand gestures are just noise.

So the first thing you have to do is to determine what information you have gathered is usable. Here’s a message: Can you determine what is information and what is noise?

IONIFSOERNMOAITSIEON

If you found information, good for you. If you found noise, good for you as well. If you didn’t, keep looking for the information in the noise. The clever student might say, “Here the noise is information as well.” Yes, there is noise in the information and information in the noise.

I go through this filtering process every time I write a research paper. First, when I take notes, not every idea of every source gets its own note. Second, when I begin to write, I start in the Invention stage by typing out all the notes I think will make it to the final draft of the essay. Not all the notes I wrote make it past this step. Then, when I draft the essay, I do not use all the notes I typed out. I find that writing a research paper is as much about leaving research out as it is putting research in.

Consider data mining as large scale information filtering. Programmers write code to sift through an unfathomable amount of information generated by online activity, data transmissions, and economic transactions in order to separate out usable information from noise. Whether the telos is the NSA looking for terrorists, or Macy’s searching for potential customers, this filtering activity is a
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cornerstone, for better or worse, of modern life.

One of the more interesting projects involving the separation of information from noise takes place at the SETI Institute. SETI stands for Search for Extra-Terrestrial Intelligence. Now I certainly don’t endorse the notion that ancient aliens caused everything from the pyramids to velcro, but I keep an open mind about intelligent life elsewhere in the universe. The SETI Institute has set up a dish receiver array to collect radio waves from space. All kinds of cosmic phenomena produce radio waves, from quasars to black holes. One of the projects SETI engages in is analyzing these transmissions for signs of intelligent life.

I imagine the SETI Institute uses many of the processing methods we’re about to discuss in order to find that needle in the cosmic-sized haystack. This reinforces another truth about processing in critical thinking—it often involves a number of approaches in order to fulfill the telos.

2. The Processing Stage Overview: What We Learned

a. Our assumption is that it’s a formalistic universe.

b. Computational theory speculates on the ability of computers to solve problems.

c. First you need to filter out noise from the information you’ve gathered.

d. Data mining is a prevalent example of this filtering.

e. SETI looks for information in cosmic radio waves.

3. Analysis

When we hear the word “anatomy” we think of a diagram of the human body, but that has not always been its primary definition. To conduct an anatomy used to mean to thoroughly examine the constituent parts of a whole. A famous example from the Renaissance was Robert Burton’s *Anatomy of Melancholy* whose subtitle describes the process of anatomy—*What it is: With all the Kinds, Causes, Symptomes, Prognostickes, and Several Cures of it. In Three Maine Partitions with their several Sections, Members, and Subsections. Philosophically, Medicinally, Historically, Opened and Cut Up*. That is certainly an extensive examination. Another name for an extensive examination is **analysis**. Indeed, Burton includes an analysis of the book itself in the subtitle (“with three main partitions…”).

Burton’s *Anatomy* is precisely what you do when you analyze. You take something apart in order to examine it. For example, you analyze in biology class
when you dissect an organism in pursuit of learning about it. As with all aspects of critical thinking, you have a reason why you are engaging in analysis—you take apart with a purpose in mind.

Why is analysis such an effective way of processing information? Perhaps it is because the information you need is often hidden in or obscured by the whole. So you take apart the whole to reveal the information you need. Two examples of this “hiding” in the whole are due to time-scale and space-scale. Let’s show what this means with time-scale.

Say you are a throws coach for a local track team and you have an athlete who is explosive and strong, yet she doesn’t seem to be throwing the shot-put near her potential. You keep watching her throw but you can’t figure out what is holding her back, so you decide to analyze her throw by recording her at practice. When you get home you play back her throw in slow motion—this way you can carefully examine each component of the throw, stopping the action whenever you want. At this attenuated time-scale you notice that just as she’s about to release the shot, she drops her right shoulder, losing significant power. What was hidden in real-time, was exposed in a slow-motion analysis. The information gained from the process of analysis can now be applied to the thrower to help her achieve her potential.

Problems also often hide in the space of the whole. Imagine you have a leaky faucet in the bathroom. When you stare at the thing, though, you just cannot see what is wrong. So you decide you need to take it apart to analyze what’s wrong (don’t forget to turn off the water source to the faucet first). You know what would be helpful as you do this? A diagram.

The diagram will not only help you take apart the faucet handle to diagnose the problem, it will also help you put it back together in the right order. A diagram such as the one to the left is a visualization of the analysis process.

Analysis can start after a very short gathering process or a long one. For example, consider an autopsy. The gathering is short—put the cadaver on the table and prepare the instruments. On the other hand, think about the SETI project—gathering radio waves from the universe is an enormous and
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time-consuming gathering process.

It is important to note that analysis is often used in conjunction with some other processing technique. If you identify what’s wrong with your leaky faucet, you still have to figure out how to fix it. Analysis can frequently be seen as a process that precedes the one we’ll discuss in the next section: synthesis.

4. Analysis: What We Learned

a. An anatomy is an extensive examination by analysis.
b. To analyze means to take apart with a purpose.
c. Sometimes information hides in the whole because of time-scale or space-scale.
d. Diagrams can help us analyze.
e. Analysis is often accompanied by synthesis.

5. Synthesis

If in analysis you take the whole apart in order to reveal the information you need, in synthesis you need to discover a whole that will contain the parts at hand. Analysis and synthesis are closely related because sometimes analysis only gets you half way to solving the problem—an autopsy can help to discover the cause of death, but the manner of death takes a synthetic act of mind. Consider the work of an archaeologist. He will analyze individual artifacts in order to discover what the culture was like that produced those artifacts. The movement, from individual artifacts to a vision of the culture that produced them, is synthesis.

Let’s look at a simple example of synthesis. If the parts are red, blue, orange, green, what is one way to find a whole to contain these parts? It’s easy—color. When the parts are more complex and more numerous, this process is not that obvious. Essentially, synthesis is uncovering an appropriate context that places components together. This can be a difficult activity because there can be many contexts that suggest themselves for the individual parts.

In many cases, providing a synthesis is an act of imagination—you visualize a context and check to see if that context accounts for what’s known. This ability to visualize in order to check is one of the critical thinker’s most powerful tools and can be used with a number of other processes—the trial and error visualization. One of the gifts given to us by our frontal lobe is that we are not prisoners of the present moment. We can imagine the results of an action before it occurs. In our trial and error attempts to reach a solution, we do not have to actually fail in order to learn from the failure.
In deciding on a demonstrative example for synthetic visualization, I’ll refer to personal experience—coaching youth football. A whistle is my favorite fashion accessory, accompanied by a matching clipboard.

Here are the individual components for a youth football team: 25 players of vastly different size, skill, and motivation. 11 positions on defense, offense, and special teams (kickoff, kick return, punt, punt return); each position with specific responsibilities and physical demands. A league rule that each player must play at least eight plays a game. A defensive and offensive arrangement within the rules of football. Determining lineups before each game was an exercise in synthetic visualization. I would make many draft lineups and compare them side-by-side to the roster before settling on one that fulfilled all the requirements. My strategy in constructing the lineups was revised according to the performance on the field and post-game analysis. As the season progressed this strategy became more efficient and less time-consuming.

I believe that synthesis is not really something that you can teach as in “follow these procedures and you’ll reach the solution.” In reality, it takes practice, and what you need for practice are situations that require synthesis. Be on the lookout for these situations in school and your life. And, if you come across a foolproof offensive scheme for 6th graders, let me know.

6. Synthesis: What We Learned

a. Synthesis is discovering a whole among the parts you’ve gathered.
b. Synthesis is finding a context to provide a network of meaning for individual parts.
c. Use trial and error visualization in order to choose an appropriate synthesis.
d. Creating football lineups is an example of synthesis.

7. Analysis and Synthesis Together: A Case Study

Although this procedure is written for an assignment where the student must analyze a short story, it can be adapted for any research writing assignment. The key assumption is that you do not know your thesis until you have done your research. You start with a research question, but of course you cannot answer it until you have gathered all your information. If you choose a question you already think you know the answer to, it is most likely ideology at work.

Once you have your research question, you comb through sources finding pertinent information that will help you answer your question. Essentially, you are analyzing the sources to collect information. Once you have all that information,
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from all those sources, you need to synthesize the information into a thesis that will then organize your essay.

Here are nine steps towards writing an essay of literary analysis:

1. Read the story with an eye toward a good topic.

2. Choose a topic--about any aspect of the story's form or content. Note that a topic is a general subject--you will need to turn that into a thesis later on in this process. Turn the topic into a question. For example, if your topic is characterization in “Where Are You Going Where Have You Been,” turn the topic into the question: “How does Oates portray Arnold Friend?” Once you have turned the topic into a question, the rest of the steps will become easier.

3. Re-read the story with your topic as a filter. In this way, you will be uncovering passages from the story that relate to your topic. In other words, find passages that help you answer your research question.

4. Mark passages in the story that relate to your topic (and it would be helpful to, afterward, type these into a word processing file).

5. Analyze these passages and develop a thesis from them (the thesis is your arguable proposition about your topic).

6. Organize the passages in order to most effectively support your thesis (don't feel you need to follow the same order that they appear in the story).

7. Properly introduce, present, and interpret each passage. When you introduce a passage you are preparing your reader for it--giving them an idea of what to read it for. The presentation properly uses MLA citation format. The interpretation relates how that passage supports your thesis. Thus, all three elements of argument--CLAIM, WARRANT, SUPPORT, are included. The claim is your thesis. The support is each passage. The warrant (which connects support to claim) is how you read or interpret the passage so that it is used as evidence for your thesis.

8. Link your passages with proper transitions (each ¶ analyzing one or two passages) and write your introduction (see directions below) and conclusion

9. Revise.

You can use this technique to write any essay that requires you to support a thesis using sources. You analyze material in order to synthesize your thesis, and then organize your essay accordingly.

8. Finding Patterns

The book, *The Riddle of the Labyrinth* by Margalit Fox tells the absorbing true story of the attempt to decipher what was known as Linear B—a script found in-situ and in tablets on the island of Crete dating from the second millennium
B.C.E. At least the Egyptologists had the Rosetta Stone to help them decipher hieroglyphics. Scholars who attempted to decipher Linear B had only the script itself. It was eventually deciphered by a British architect named Michael Ventris, but only after long, arduous, and patient work by the American Alice Kober.

Kober essentially constructed a home-made database out of cigarette boxes to file and sort the script, as well as organizing the script’s signs into tables and charts. Tragically, she was nearing decipherment at the time of her death. The story of her work and the work of others in deciphering Linear B is an exemplar of how to find a pattern in the information you gather.

You can look at attempts to find a pattern as a kind of decoding. The information on the surface is a mask for the structure (or code) underneath. Finding a pattern is similar to synthesis (in some cases it is synthesis). In synthesis you have to imagine a context that gives your information meaning. In finding a pattern you have to imagine a pattern that gives your information meaning. For example, I will list a series of numbers; can you find the pattern that orders their sequence?

75 15 25 5 15 3

How do you go about solving the problem? Certainly Alice Kober didn’t just stare at facsimiles of the tablets until she figured something out—she started organizing the information. In the synthesis section, we discussed trial and error visualization. Organizing information externally (and provisionally) is a way to conduct trial and error visualization. Let’s do that with this sequence. Start with the first two numbers. What is their relationship? Yes, $3 \times 5 = 15$. Let’s put “X5” between those numbers. Do any other numbers share the same relationship? As it turns out, yes. Let’s mark them in the same way. Now let’s look at the second and third number. What is their relationship? Yes, take 10 away from 15 you’re left with 5. Let’s mark that underneath the line of numbers, as well as any other pairs of numbers that share that relationship.

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We have found the pattern. You multiply by five then subtract by 10.

One of the reasons why we may want to find a pattern is to make a prediction—consistency is what makes a pattern a pattern. Once we have discovered the pattern controlling the numbers above, we can apply the pattern

 Spoiler Alert: Ideology was at work in deciphering Linear B. Archaeologists assumed that the Minoan culture that produced Linear B was far advanced of other Greek cultures at the time, so they thought they were looking at a unique language. Turns out it was plain old Greek phonetically transcribed with Minoan script.
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infinitely forwards or backwards. In the same way, if more tablets of Linear B were found, they could be immediately deciphered.

External visualization is effective in almost every case of pattern detection. Why? Because our visio motor system has evolved to be looking for, and analyzing patterns. (Is that a tiger in the grass or just a pattern of shade?) If you want to be successful at finding patterns, then you’ll need to become adept at turning the information you gather into a graphic representation.

Here is a set of ordered pairs. What’s the easiest way to reveal the pattern? (.5, 2.75); (1, 4.5); (1.5, 5.25).

A graph will show the logic beneath these ordered pairs. (It’s a linear equation y=3.5x + 1.)

Spatial and temporal information is especially amenable to graphic representation because both can be converted fairly easily into two dimensions—think of a train schedule and a map. Indeed, the most effective models of graphic representation can reveal patterns in space-time, which is four dimensions. The ability to create graphs, scatter-shot plots, time series illustrations, small multiple representations, tables and charts, will greatly enhance your ability to detect patterns. The creation of these visual aids is always provisional—that is, part of a trial and error procedure—the strategy at each stage, of each process, is revisable.

Not all information is given visually. Think of listening for patterns in music (if you can read music though, you can find patterns by looking at the score). Again, you are aided by your oculomotor system that is attuned to patterns as well. Our oculomotor system is sensitive to patterns in order to separate information from noise.

9. Finding Patterns: What We Learned

a. The story of deciphering Linear B.
b. Finding a pattern is a kind of decoding.
c. Finding a pattern is looking beneath the surface mask to discover the hidden order.
d. Organize your information externally and provisionally.
e. Graphic representation helps you organize and visualize your information.

10. Finding Relationships

Relationships can be found in patterns, and through synthesis—all three processes are related and can be identical.

![Venn diagram with three overlapping circles labeled synthesis, finding patterns, and finding relationships]

Now, can you remember back to the chapter on rhetoric, the section on reasoning, and use your synthetic imagination to think of a large circle that will contain all three circles in the Venn diagram above?

Yes, inductive reasoning. When we engage in inductive reasoning, we move from a number of specific cases in order to derive a provisional rule that governs those cases. This movement from specific to general is synthesis. The grounds for moving from the specific to the general may be the detection of a pattern or discovery of a relation.

Therefore we use inductive reasoning to find relationships. What kinds of relationships are there to find? Innumerable kinds. Things can be related temporally, spatially, structurally, and analogically. They can be related according to their origins, their destinations, and their routes to get there. Think of it this way—if you have two things that share a category of attributes, those things can be put into relation.
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To consider the mathematical limits of relations imagine that you have information you’ve gathered into a database. The database has 100 records and each record has 10 fields. Each field is a separate attribute or feature of the whole the record represents. First, you can combine those 10 attributes in $2^{10}$ possible ways within each record (take away one for the empty set and 10 for sets with individual attributes—1013 ways, more precisely). This does not mean that the attributes are related in 1013 ways, but that is the limit of their possible relations. Second, how many ways can we relate the 100 records, each with 10 attributes? It’s a number too big to count.

Finding relations is only limited by the complexity of the things we want to put in relation, and our imagination. According to Percy Shelley, the 19th century English poet, the work of the imagination is to reveal the “unapprehended relations of things.” In other words, the creative imagination can see relations no one had seen before.

When we critically think, we are usually not looking for any kind of relationship, but a specific one. A common relation that we gather information to discover is a causal relation. In a causal relation, one phenomenon causes another—one phenomenon is the input (cause) and the other the output (effect). For example, if you wanted to check to see if prison recidivism decreased when the inmates had access to education you would need to check the recidivism rates among those prisoners who received education and those who didn’t. Education would be the input and recidivism the output. The clever student may warn, “Correlation isn’t causation,” and is correct—to an extent. In the example above, maybe only inmates with sentences for minor, nonviolent crimes were offered education. Perhaps it was the kind of crime committed that determined recidivism rate and not education. You need to scrutinize all factors before determining a causal relation. And though it is true that correlation does not mean causation, remember that there is no causation without correlation.

If your information gathering is a large dataset, you can use the statistical method of regression analysis to determine causal relations among variables. Essentially you construct a mathematical model of the reality you intend to analyze. That model includes variables that signify attributes of the world you want to query to test if they are causally related. If your model is constructed properly, regression analysis will help you determine those relations. Regression analysis is the kind of processing where computers make our critical thinking much more efficient.

Another kind of relation is taxonomic. Taxonomy is the discipline of classification. Imagine your job is to go to a state park and, over a week period,
chronicle all the wildlife you see while walking the trails. One way to organize that information would with biological taxonomy. That taxonomic organization is set up according to common factors in the structure of living beings. By using taxonomic organization you would show the relationship between the environment and the species in it.

Taxonomy is essentially a form to be filled to show relation. Regression is an automated statistical equation to discover relations. How else can you discover relationships within information you’ve gathered? It is no different from synthesis and finding a pattern—visualize the information externally. The Venn diagram at the beginning of this section (unwieldy though it is) does exactly that—it shows the relations among the three kinds of processing. It may take a number of strategies and revisions to find the kind of graphic representation that reveals relations, so it helps to be deliberate and patient.

A trivial example will help illustrate this. Imagine your house is heated by gas and you want to scrutinize your energy usage. Different time-scales will reveal different kinds of information. For example, if you graphed usage week-to-week, a relation would reveal itself—you use more energy in the winter months.

Would it ever make sense to use the time scale of days of the week? Yes. Now that the general relationship between energy usage and time is established, you can decrease the time-scale for more precise information about relations. Take the 10 weeks of heaviest energy usage and list the amount of energy by day of the week—perhaps a relationship will be revealed about which days of the week you consume the most energy. You can do it for hours as well. The point is that these relations are only revealed if you choose the right kind of graphic representation with the right kind of interval scale. The same thing goes for spatial scale. If you wanted to discover where the ants in your cupboard are coming from, you wouldn’t use a map of the United States—besides, you can spot a Missouri ant a mile away.

If you’re interested in the math of relationships, find an introductory text to set theory and discover how infinite sets can be put in relation. If you’re interested in using the creative imagination in the way that Shelley describes, read literature. A fresh metaphor always reveals the “unapprehended relations of things.”

11. Finding Relationships: What We Learned

a. Synthesis, finding patterns, finding relationships are all examples of induction.

b. There are innumerable relationships to be found based on common
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attributes.

c. Possible relationships can grow exponentially.

d. You will often look for causal relationships between inputs (causes) and outputs (effects).

e. Correlation isn’t causation but it’s present in every example of causation.

f. Regression analysis uses formulas and computing to discover relationships among inputs and outputs.

g. Differing scales in graphic representation can reveal relationships.

h. Set theory is a mathematical discipline of relationships.

12. Finding Relationships: A Case Study

At the end of August in 1854 a breakout of cholera occurred in central London. Cholera then was a fatal disease characterized by catastrophic diarrhea. This was the time before bacteria were discovered and epidemiology was in its infancy. It was thought that cholera was spread through the air, maybe even from vapors emanating from the buried whom died of the plague (note the faulty causal thinking—because some attributes of the plague and cholera are associated, the onset of the disease is assumed to be causally related).

Dr. John Snow had been studying epidemics and gathered the death certificates of 83 people who had died during this particular outbreak. As Edward Tufte points out, Snow did not plot these deaths in time series graphs for those would not reveal a cause. Dr. Snow plotted these deaths on a map of central London that included the locations of water pumps.

When Snow plotted these deaths on the map he discovered that the vast majority of those who died of cholera died in the vicinity of a water pump on Broad Street. Snow made a presentation of his findings to the area leaders and they removed the handle of the Broad Street pump. The epidemic petered out. There is some debate about whether or not the epidemic was subsiding when the pump handle was removed, but Snow’s graphic representation most assuredly revealed the relationship between contaminated water consumption and cholera.

There were a few anomalies in Snow’s map that he investigated and explained. For example some young girls who did not live in the Broad Street area died during the epidemic. It was discovered they went to school nearby and would drink from the pump on their way home. A brewery a mere block from the pump experienced no deaths among its workers. Can you guess why? Yes, gentle
reader, those workers drank beer on their breaks.

Snow’s work in processing the information he gathered, those death certificates, demonstrates the importance of finding the appropriate graphical representation to reveal relationships. In addition, his work points to the application stage—because his work was accurate and persuasive, he was able to convince authorities to take action. Tufte compares Snow’s work to the graphic representations attempting to show a causal relationship between O-ring deterioration and low temperatures during launches of the space shuttle. Those graphics were not as accurate as they could have been and were not persuasive at all. As a consequence, the space shuttle Challenger was launched in freezing temperatures and was destroyed 73 seconds later, killing the seven crew members. Sometimes finding the correct relationship in information is a matter of life and death.

13. The Workspace

It should be apparent now that almost every example of processing demands an external workspace. Why is this? Because critical thinking problems require you to account for many variables at once and it is very difficult to keep all of them organized in your “working memory” (think of the brain’s RAM). When we externally visualize the information through graphic representation, our focused sight keeps track of and organizes information. This is the same way written language functions—it is an external workspace as well. Using an external representation of information allows us to move from gathering to processing in fractions of a second. It is also very recursive because we can quickly revise our strategies with each glance. We constantly revise, active in our external workspace, as we question and sharpen the efficacy of our strategies. When I write poetry, the poem itself is the workspace, rewritten, slightly altered, many times in a notebook. I look forward right now onto an external workspace, a computer screen, lit up in a Microsoft Word file called “criticalthinking3.”

Not all workspaces are visual. A car is the external workspace to a mechanic. Musicians use their hearing and kinesthetic sense while playing their instruments. Athletes use their kinesthetic sense as well—their environment is the workspace interacting with their nervous system.

*You should prepare an external workspace when you critically think.*
14. Rule-based Processing

Rule-based processing is based on a deductive reasoning. As you may recall, deductive reasoning dictates that if the premises are true, the conclusion must be true. In a basic sense, deduction applies a general rule, already established, to a specific case. You show the general law implies (because it applies to) the specific case. Where inductive reasoning leads to a conclusion within a confidence interval, deductive reasoning leads to conclusions which are always true—within the structure of the deductive system.

Let’s start with a simple example. Given that an integer N is even if N/2 is an integer. Then 8 is even and 9 is not, because 4 is an integer and 4.5 is not. This rule applies to an infinite amount of numbers (but not all numbers).

Here’s another simple illustration of rule-based processing. How do you go about solving this problem? \(4^2 \times (8-2) + 3 \times (9-2)\) = Which operations do we do first? Since math is a rule-based system, you do not need to worry—just apply the problem to the already established rules for operations:

1. Parentheses
2. Exponents
3. Multiplication and division
4. Addition and subtraction

\(4^2 \times 6 + 3 \times 7\)
\(16 \times 6 + 3 \times 7\)
\(96 + 21\)
\(117\)

This does not mean you cannot be wrong when using deduction. You could draw inferences from faulty premises or infer poorly from sound premises. Some logical proofs are pages of complex notation; errors can occur. If a proof is valid though, it will check out as valid every time, no matter how many times checked.

It’s impossible to discuss rule-based processing without mentioning computers. I’ll leave it to a programmer to discuss how to gather, process, and apply when solving programming problems. I suspect that it’s important for college students to learn how to program, or at least be introduced to computer logic. A computer can only do what it’s programmed to do—it follows the code it’s given, given its hardware. It operates deductively.

The field of computational complexity is an interesting use of deductive reasoning—its proofs

To get an idea of what these classes of problems are like and how they are related, take a look at the online Complexity Zoo which organizes problems and their classes. Its “zookeeper” is Scott Aaronson whose book Quantum Computing since Democritus is a good introduction to these issues. www.complexityzoo.uwaterloo.ca
show how one problem is like another problem is like another problem. The telos often is not to solve a problem by computation (the problem may be presently unsolvable), but to show that if you could solve that problem, you could solve all the problems in that computational class. It’s an abstract and demanding exercise in problem solving without solving the problem. Within that procedure is deduction distilled—showing how all cases in a class, are one case.

Logic and the rules of inference govern deductive reasoning. For example, one basic rule of inference is that If N implies M and you are given N, then M is implied. Let’s fill the letters with specific cases. N=humans and M=rational animals. Therefore if Joe Pellopi is a human, he is a rational animal. What else can we fill these letters with? If N=humans and M=having DNA then if Joe Pellopi is a human, he has DNA. Essentially the rules of inference turn logical structures into formulas whose variables can be assigned to an infinite number of particulars—the formulas are foundational and given; they do not change.

Deductive reasoning is not only useful in closed systems like mathematics, computer programming and symbolic logic, but also in other modes of processing. It can be used to test the logical consistency of theses, even if the theses are drawn inductively. Imagine that through your gathering and processing you have found a relationship between gaming over 10 hours a day and a 5% drop in IQ. What does this imply? Because IQ tests purport to provide a quotient of the brain’s processing power, your thesis logically implies that gaming has an effect on the brain of the gamer. To follow up on your thesis you may want to look into neuroscience studies that show the effect of gaming.

Let’s look at another example of implication (this time negative) in “the dismal science,” otherwise known as economics. Classical macroeconomics tells us that as the economy’s money supply increases, so does inflation (If M then N). (The simple definition of inflation is “too much money chasing too few goods.”) But because the economy is a very open system with numerous variables and all kinds of stochasticity (randomness), the logical formulation An increase in the money supply implies an increase in inflation is not 100% guaranteed. Since the recession of 2008, the money supply has increased but there has not been the kind of inflation associated with that increase. This fact implies that there are other factors at work. First, the American workforce’s amazing productivity has a dampening effect on
IX. Critical Thinking

inflation, as does the strong dollar. Furthermore, banks and corporations are holding enormous amounts of cash—if that cash isn’t circulating, it won’t lead to inflation.

Deductive reasoning can also be used outside closed systems to test the logical consistency of theses. A Congresswoman argues for a flat income tax because, she says, the current progressive taxing system becomes more unfair the more money you make. “The government should not give special benefits to one group or another,” she argues. On the other hand, she fights for enormous tax breaks for corporations whose headquarters are in her district. You are running against her in an election and during the debate you make sure to note the logical inconsistency of her position. “Are you a socialist?” she asks. “No,” you reply, “I am a deductive logic-ist!” The crowd roars its approval and you win by a landslide.

By the way, which do you think is more powerfully persuasive to people, ideology or logic?

If you said “ideology,” you are probably right. How do we change that? If you said, “teach critical thinking,” you are certainly right.

It’s helpful to sharpen your deductive skills by practicing on problems within manageable deductive systems. Some problems I give students in Composition class are derived from Raymond Smullyan’s book Lady or the Tiger? Here’s one of them:

You are an insane asylum inspector. In the asylums you inspect, the inhabitants are patients or doctors. The patients and the doctors can be either sane or insane. Those inhabitants (patients or doctors) who are sane always tell the truth. Those inhabitants (patients or doctors) who are insane always lie. Your job is to discover if there is something wrong with the insane asylum.

Before we go any further, let’s consider what the inspector might be looking for. What is the case when there is something wrong with the asylum? Of course, when a doctor is insane, or a patient is sane. The first step in these types of problems is to figure what we are looking for.

Here’s a situation that demands an answer. The inspector visits one asylum whereupon the inhabitant he interviews says one sentence by which the inspector can tell that the speaker is a sane patient; therefore something is wrong with the asylum. What is that statement?

So, we are looking for a single statement. We ought to prepare a work space. What would be a good workspace for this problem? Start by figuring out what we know and how we can use it. We know that any individual inhabitant can be one of four things: an Insane Doctor (ID), Sane Doctor (SD), Insane Patient
(IP), Sane Patient (SP). Ironically enough, probably the best strategy to solve this deductive problem is to use inductive processing. We can try some individual cases to see which one satisfies our general requirement. What would be the simplest, most intuitive statement to start with? “I am a sane patient.” Let’s put together a workspace.

<table>
<thead>
<tr>
<th>I am a sane patient.</th>
<th>SD</th>
<th>ID</th>
<th>SP</th>
<th>IP</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ID</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP</td>
<td>Yes</td>
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<td></td>
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<tr>
<td>IP</td>
<td>Yes</td>
<td></td>
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</tr>
</tbody>
</table>

Can a SD make that statement? No because it would be a lie and sane inhabitants don’t lie. Can an ID make that statement? Yes because it would be a lie and insane inhabitants always lie. We can now fill out the rest of the chart.

<table>
<thead>
<tr>
<th>I am a sane patient.</th>
<th>SD</th>
<th>ID</th>
<th>SP</th>
<th>IP</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>No</td>
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<td>ID</td>
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<td>IP</td>
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Can you now tell why, “I am a sane patient” is not the right statement? That’s right. Three of the four possible inhabitants can make that statement.

By trying out a case, we have properly set up our workspace as well as isolated what we will be looking for: a “Yes” next to “SP” and a “No” in the other three slots. Now, if the question were, “What is a statement that only the sane doctor cannot say?” you have your answer above and, as it turns out, a hint to the original question.

This practice problem again highlights the necessity of developing a workspace to organize the information that you are given and to set up the solution. It would be very difficult to hold the attributes of all four possible inhabitants in your head at once, as well as the possibility of their answers. As should be apparent by now as well, when you have set up your workspace and you cannot find the solution, you have to revise your strategy by re-designing the workspace.

If you can recall your experience in high school geometry, making deductive proofs is hard, and sometimes frustrating work. The benefit is that when you finally get it right, all the elements fall into place, and the feeling of personal satisfaction is great. And maybe the best thing about it is, every time you look at your solution, you’re still right.
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15. Rule-based Processing: What We Learned

a. Deductive reasoning is rule-based processing.
b. Mathematics is an example of a deductive discipline.
c. Computers operate on rule-based processing.
d. Computer complexity seeks to show how problems are related within a class and how those classes are related.
e. Rules of inference govern logic.
f. You can apply logic to these formed inductively.
g. Economic reasoning works through chains of implications.
h. Use logic to test the consistency of intellectual positions.
i. Set up truth tables when applicable to logic problems.
j. Rule-based processing is difficult but rewarding.

E. Creation and Innovation

Sometimes for the critical thinker, the telos is to make something better, or to create something original. We can adapt some of the processing strategies we’ve discussed to show how they apply to the telos of creation and innovation. But before we look at these strategies, it would help to mention two attitudes toward the process that, in my experience, are necessary to innovate and create. First, be brave. No fear—do not be held back by ideology, by contempt of failure, by convention. Do not be held back by the desire for attention—it is limiting. Second, because you are released from fear, you are free to play. A ludic spirit is willing to try anything, to take risks. Creativity follows those who are playful and without fear.

1. Analysis

A term from 20th century literary criticism is useful here—deconstruction. When you deconstruct something creatively, you take it apart to uncover hidden assumptions and to reveal something brand new about the thing you take apart. You make something new through analysis.

Our example will come from the painting movement called cubism during the first quarter of the 20th century. Cubist art foregrounds the two-dimensionality of the medium (painting on a canvas) instead of trying to trick the viewer’s eye into thinking that she is looking at three dimensions.

Cubist painters deconstructed (analyzed) a three dimensional scene (or sometimes a four dimensional scene) and, through the technique of collage,
reassembled the geometric planes of observation into a compositional whole. Let’s look at a painting by Pablo Picasso (1881-1973), Les Demoiselles d’Avignon, from 1907 that helped usher in Cubism.

This painting was made before cubist principles were conventionalized, but the analytical style is in play. Notice how these figures are abstracted into basic shapes that signify planar relationships as well as “female body.” Can you find the shaded triangle that is part of the figure in the lower right’s back? The convention of showing painterly skill by draping cloth over a figure is transformed into a few shapes on the lower left.

I suppose the painting is jarring if you desire to see the majesty of the human body, but the constructed composition (out of analyzed elements), how the angles and colors interact, is a different kind of beauty. By deconstructing conventional expectations for a painting, Picasso teaches us how to look at art in a new way.
IX. Critical Thinking

There’s one other thing I’ll mention about the painting. The two women along the right edge of the painting have their faces rendered in a very stylized way. Picasso rendered their faces as African masks, finding a powerful vitality there.

2. Synthesis

When the transistor was invented in 1947 it paved the way for the electronic age. A transistor uses a semiconductor, like silicon, to amplify a signal or function as a switch. Even though the transistor was a great improvement over the vacuum tube, there remained pressure to keep miniaturizing the components of a circuit.

Jack Kilby was a new hire at Texas Instruments when the company took its two week vacation en masse, so he was not afforded the time off. Alone with time to think, he had an idea for making an integrated circuit—a synthesized circuit made of one piece of material. His gathering stage was several months of sketching in his notebook before he was ready to assemble. He did so on Sep 12, 1958 and successfully tested the first integrated circuit.

At nearly the same time, Robert Noyce, who was working for Fairchild Semiconductor, developed his own integrated circuit. He went on to found, with Gordon Moore, the Intel Corporation which makes microprocessors for computers.

How many integrated circuits do you imagine there are within a 10 foot radius of your body right now? Integrated circuits were revolutionary and have deeply impacted our lives. The development of the integrated circuit also highlights two issues for our purposes. First, the inventors were free to gather and speculate for a long time before they built their prototypes. Second, integration is an act of synthesis—all the separate parts that were used to make circuits cold now be fabricated on a single chip.

3. Finding Patterns

The motif of this section is varying patterns. If you want to create something new, take an intact pattern and vary it, loosen it up, transform it. Something
completely new will result.
For creation through varying patterns, we’ll look at an example from poetry and music.
Wallace Stevens’s poem, “Thirteen Ways of Looking at a Blackbird” puts a blackbird in every section and develops variations of themes on perception, image, and object. I’ll reproduce the first seven.

I
Among twenty snowy mountains,
The only moving thing
Was the eye of the blackbird.

II
I was of three minds,
Like a tree
In which there are three blackbirds.

III
The blackbird whirled in the autumn winds.
It was a small part of the pantomime.

IV
A man and a woman
Are one.
A man and a woman and a blackbird
Are one.

V
I do not know which to prefer,
The beauty of inflections
Or the beauty of innuendoes,
The blackbird whistling
Or just after.

VI
Icicles filled the long window
With barbaric glass.
The shadow of the blackbird
Crossed it, to and fro.
IX. Critical Thinking

The mood
Traced in the shadow
An indecipherable cause.

VII
O thin men of Haddam,
Why do you imagine golden birds?
Do you not see how the blackbird
Walks around the feet
Of the women about you?

A further iteration of what Stevens is doing here—taking a theme and varying it—can be done with Stevens’s poem itself. For example, create a new poem called “Variations on a Theme By Stevens” with the line, “The beauty of innuendoes” as its epigraph.

Of course, music takes melodic themes and varies them. The improvisatory genius of jazz is especially adept at this (for a more mathematic approach to variations, listen to Bach). Often, jazz takes the 12 bar or 16 bar structure of the blues and transforms it rhythmically and sonically in astonishingly creative ways. The example that I’ll provide links to is not the transformation of a blues tune, but jazz saxophonist John Coltrane’s transformation of a sweet melody from Rodger’s and Hammerstein’s musical The Sound of Music.

Coltrane creates 13 minutes of lyrical jazz out of Rodgers and Hammerstein’s two minute and thirty second show tune, yet in all that free improvisatory play, he never loses the basic melodic theme. (McCoy Tyner on piano.)

4. Finding Relationships

When we discussed how to find relationships as a critical thinking process, the focus was on ways to find patterns in information you’ve gathered. In considering the broad assumption at the beginning of this chapter on processing, we assume that these relations are implicit in the structure of our formalistic universe. But what about putting things together that have hitherto no relationship with each other? That is the work of metaphor.

Renaissance alchemists saw the universe metaphorically. There was a base ambition for alchemists: they wanted to turn objects, such as lead, into gold. But
they also were forerunners of scientists who experimented in order to create. Their belief was that the cosmos was held together by sympathetic correspondences and it was a form of magic to reveal those hidden correspondences. Remember Shelley—art reveals “the unapprehended relations of things.” Freud accomplished this when he conjured a relationship between dreams and the psyche. Adam Smith did this when he conjectured on the cause of the wealth of nations. Gertrude Stein did this when she contrived a way to write that followed the flow of cognition. In Western culture it’s hard to find a mind more congenial to putting things together in new ways, in making metaphor, than another figure from the Renaissance--Shakespeare.

You can go to any play by Shakespeare to mine metaphors, but I choose a passage from *Macbeth*. Macbeth and his wife have plotted and murdered their way nearly to the kingship, but things are falling apart. Mad with grief and guilt, Lady Macbeth kills herself. When Macbeth finds out, he speaks these words:

She should have died hereafter.
There would have been a time for such a word.
Tomorrow, and tomorrow, and tomorrow,
Creeps in this petty pace from day to day
To the last syllable of recorded time,
And all our yesterdays have lighted fools
The way to dusty death. Out, out, brief candle!
Life’s but a walking shadow, a poor player
That struts and frets his hour upon the stage
And then is heard no more. It is a tale
Told by an idiot, full of sound and fury,
Signifying nothing.

A quick inventory of these metaphors:
1. tomorrow “creeps”
2. time moves as words in history books, “last syllable”
3. yesterday glows from the past to light our way to death
4. life’s a brief candle
5. life’s a walking shadow
6. the shadow’s an actor
7. life is a tale
8. the teller of the tale’s an idiot
9. life’s a tale that’s full of sound and fury.

If we look at this speech we see the energy of Macbeth’s mind as it ranges
IX. Critical Thinking

over these desperate and sober musings. We can’t help but think of the play itself that reflected his and his wife’s machinations to gain power. For all the creativity of this passage in making metaphor it ends signifying “nothing,” which is exactly what Macbeth realizes he has.

The ability to put things together in a new way is at the heart of creation and invention. You can try it when you cook, when you dance, when you dress, when you write...when you do anything. Living creatively is a practice of forging new relations.

5. Rule-based Processing

Alfred North Whitehead and Bertrand Russell were two British philosophers who had a grand ambition. Their goal was to use axiomatic symbolic logic, with a foundation of set theory, to derive a deductive system to account for all of mathematics. If they were to achieve their goal, they would demonstrate that mathematics was a closed, complete, and consistent system.

The fruit of their intense labor was a three-volume book, published first in 1910, called *Principia Mathematica*. *Principia Mathematica* was an immense intellectual accomplishment but there were some questions and issues that were not settled. It was their belief that, over time, these problems would be solved.

One of these issues plagued the founder of set theory, Georg Cantor, as well. The paradox, in a nutshell is: imagine you have a set, N, which is the set of all sets that do not include themselves as members. If N does not have itself as a member, then it belongs in the set of all sets that do not include themselves as a member. Now it’s in the set, which means it has itself as a member. We have reached a contradiction. My naïve way at looking at the set of all sets paradox is that if you build any closed referential system you, if you press long enough, can find its limits but can’t, within that system, leap beyond those limits—you can’t see beyond the system that grants you sight.

In 1931 a German mathematician and philosopher, Kurt Gödel, proved that Whitehead and Russell’s entire project was impossible to complete. He proved that if a deductive system is consistent, it couldn’t be complete (that is there would be propositions generated by the system that would not be logically accounted for). He also proved that for deductive systems large enough to account for number theory, then the system wouldn’t be consistent.
His proof is a wonder of logical genius and, in a way, borrows its concept from the set of all sets paradox by inputting the system itself as a proposition to be proved. Mathematically, it’s beyond my reference system (my brain) to explain, but fortunately, there’s an old rhetorical paradox that it is similar to.

Gödel’s proof was akin to the old Cretan’s paradox. One rule of inference is that any proposition A cannot be A and not-A at the same time. For example you can’t be here and not-here at the same time (unless you’re in quantum superposition but we’ll ignore that possibility). The Cretan paradox goes like this: what if proposition A is given by a Cretan (someone from the isle of Crete) and the proposition is “Cretan’s always lie.” So if Proposition A is true it’s a lie, and if it’s a lie, then it’s true—we have a logical paradox. Gödel did the Cretan number on *Principia Mathematica*.

I include the story of Whitehead, Russell, and Gödel in this section on innovation and creation because Gödel’s proof is one of the most important and innovative ideas of the 20th century and has profound implications for computation and Artificial Intelligence. Secondly, this paradox about systems and frames of reference has been fruitful terrain for science fiction writers like Philip K. Dick whose shorts stories gave us *Blade Runner*, *Total Recall*, *Minority Report*, and *Through a Scanner Darkly*. This kind of thinking around, and about, the edge of what is known and knowable yields much creative insight.

6. Creation and Innovation: What We Learned

a. Have no fear when creating.
b. Play when creating.
c. Deconstruct as a way to construct.
d. Cubism is an example of creative deconstruction.
e. Creative synthesis integrates, puts new things together in a unified way.
f. The integrated circuit is an example of such synthesis.
g. Innovators need plenty of free time to gather.
h. Take patterns and vary those patterns to make something new.
i. Wallace Stevens’s poem, “13 Ways of Looking at a Blackbird,” conducts variations on the themes of perception and image.
j. You can take something already created and use it as a theme to conduct variations on.
k. Jazz transforms rhythm and melody through improvisation.
l. John Coltrane turns a two minute thirty second show tune into a 14 minute jazz masterpiece.
m. Metaphors put things in new relationships.
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n. Alchemy tried to take metaphors literally and materially.
o. One passage from Shakespeare has 9 metaphors in 12 lines.
p. Can the set of all sets have itself as a member?
q. Gödel’s proof shows the limits of large deductive systems.
r. His proof is a mathematical version of the Cretan’s Paradox.
s. Science fiction and speculative art plays on the furthest edge of referential systems.

7. Creation and Innovation: A Case Study

For classic rock lovers, Brian Eno was one of the early members of the glam rock band Roxy Music (which also gave us Bryan Ferry). If you’re a member of the younger club and rave set, Brian Eno’s innovation in producing played a fundamental role in the development of EDM. He has produced bands such as Cold Play and U2 and is known as an innovative and creative producer, arranger, and engineer.

A technique that Eno uses to encourage innovation and creation in the studio was first developed with the late English painter Peter Schmidt in 1975. It was a deck of cards called “Oblique Strategies.” The decks were produced in a small printing run. On each card was a brief aphorism meant to encourage risk-taking in creation. I’ll reprint a few from the 1978 edition:

- Abandon normal instruments
- Accept Advice
- Accretion
- Breathe More Deeply
- Cut a Vital Connection
- Discover the recipes you are using and abandon them
- Don’t break the silence
- Go outside. Shut the door
- Infinitesimal Gradations
- Only one element of each kind
- Reverse
- Spectrum analysis
- Tidy up

The various editions and a brief overview can be found at rtqe.net. When looking at the aphorisms, you get the sense that they are used to help the artist get out of a rut, to look at the project from different angles, to try different scales. It encourages the creator to innovate.

There’s another aspect of Oblique Strategies I have found it to be useful
in my work as a poet. The reason the strategies were put in a deck was because it introduces an element of randomness in the proceedings. You pick out a random card and then follow that advice. In artistic creation using randomness is called the aleatory. The Dadaist and Surrealist used this technique, cutting up texts mixing them together, then composing a poem by pulling the cut-ups out randomly. John Cage did this by putting objects in a piano’s wires, then playing compositions. When James Joyce wrote his masterpiece *Ulysses*, the printer made mistakes in the prepublication drafts and Joyce kept some of them in because the text was improved by these chance occurrences. Being open to creation and innovation means being open to the gifts that randomness brings.
F. The Applying Stage

_In my beginning is my end_

T.S. Eliot from “The Four Quartets”

We’ve gone to the edge of the universe and back in this chapter to get to this final stage, yet we’ve never lost sight of it because we have kept our telos in mind at every moment of the recursive processes. The answer to how to apply what we’ve learned in the processing stage has been our focus all along. Therefore, we’ll discuss this stage a little more practically than we have in the previous sections.

Generally, you can categorize the result of your processing in one of three ways. It can lead to an artifact. It can lead to a belief. Or it can lead to an action. An artifact is something tangible that you have produced like a report, essay, painting, or integrated circuit. A belief is a conviction that you’ve come to have about some aspect of reality—in other words, you decide on a depiction of reality that you’ll stick with. An action is something you do with your body like conduct civil disobedience, replace the rotors on your brakes, or ask someone to marry you.

For each of the results there are three considerations we will discuss: when is it time to apply; how or, in what form will you apply, and what is your quality control in applying.

1. When?

When you’re in college and using critical thinking to complete assignments, you are essentially turning in artifacts. The answer to the question “when” is pretty obvious. The application stage is completed when you turn the assignment
In considering deadlines, I’ll remind you of what was written over the oracle’s temple in ancient Greece (you went to the oracle to hear your future). Before you entered the temple you were reminded to “Know Thyself.” This is great advice when thinking about future deadlines. Are you a procrastinator? Know yourself and get an early start. Do you work best under pressure? Then put yourself under pressure with a long gathering and processing stage. If you have trouble turning your artifacts in on time, revise your strategy.

Is there a deadline for beliefs? There could be. Maybe there’s an election coming up and you want to decide which candidate best serves your district or country. Maybe you are required to take an oath and want to be sure you can do so in good conscience. Often, though, beliefs develop slowly, over time, as information accumulates and is processed. But the process wouldn’t have started in the first place if you didn’t have the desire to believe.

Actions also emerge from the telos that has directed them. Some calls to action are indeterminate—I will get my driver’s license when I am confident in my driving. Some are according to a long deadline—I am training to climb a mountain next summer. Some are immediate—I have to fix my brake system this weekend so I can drive to work on Monday.

If there is not a strict deadline, it takes strategy to determine when to present your artifact or action. I suppose that the higher the stakes of the application, the more confident you want to be that your telos will be fulfilled. On the other hand, under a tight deadline, or in an emergency, you would want to launch your action at some threshold of confidence.

If you recall Jack Kilby and the development of the integrated circuit, he spent months sketching out the physics, and design before he put it together. When he showed it to his managers and colleagues, it worked. He was confident it would for he had done enough gathering and processing to be ensured of his application. I wonder if he knew how close Robert Noyce was to making his own integrated circuits would he have made the prototype earlier?

2. In What Form?

In the brief Texas Instruments documentary about Jack Kilby, Kilby remarked that his prototype integrated circuit looked crude. He said that if he knew how groundbreaking his invention would be, he would have made it look prettier. The form of application matters.

If the artifact is required in school or industry, then it’s likely that the form has been predetermined. For example, if you turn in an essay in a literature class
you are expected to cite using MLA format. If you turn an essay in a psychology class, you are expected to use APA format. Business reports ought to avoid emoticons and you shouldn’t wear a tuxedo to a mud run you’ve been training for. It’s highly unlikely that you haven’t thought about “in what form” while you’re processing. For example, if you are writing a short story, before you send it out to be published, you have already written it. The characters are developed, the point of view established, the plot complete. So now the question is—where do you want it published? Is it fan fiction that has a place on the internet? Is it literary fiction seeking a literary magazine? Is it science fiction? Each kind of story has a particular audience and vehicle for publication. Before you submit you should have already worked this strategy out and prepared your story in the form demanded by your market.

In what form do you manifest your belief? It depends on how important it is to you that others know your belief. After processing the issue, you could quietly hold onto a conviction that Ford makes the best truck, or put one of those Calvin and Hobbes stickers on your back windshield that shows Calvin doing what Tycho Brahe didn’t, on a Chevy. You could join an organization that shares your belief or use that belief as the telos to producing an artifact that serves as a testimonial. Above all, that belief should manifest itself in the actions you take within that belief’s purview.

Athletes think about the application of their bodies to fulfill their telos all the time, often having a mantra that repeats certain baseline actions: “eyes on the ball,” “shoulders square,” “look up at release.”

When the action is moral, or involves interpersonal relations, it’s best to remember what you’ve learned in the section on rhetoric and the rhetorical situation. What should be your demeanor? How formal should your speech be? Should you be sitting down or standing up? I imagine there would be intense strategy involved if you were to ask your significant other for their hand in marriage. Essentially, how you apply the result of your processing is akin to the delivery stage of rhetoric.

3. Quality Control

I don’t mean to diminish the behavior of critical thinking by using a term from manufacturing to contextualize its application but it is, I think, a good way to think about what we’ve done when we’ve finished a cycle of critical thinking. Every stage in critical should be undergoing quality control. Each strategy in each stage is subject to scrutiny. The application stage is no different and subject to the same kind of search for efficiencies.
If you look at our graphic for critical thinking you’ll notice that sometimes the application stage leads right back to the gathering stage. In that case, we gather the entire process we have gone through in order to process it. If the telos is unfulfilled at application, the entire process is examined and processed in order to make sure the telos is fulfilled the next time. When we were processing the logical problem from *Lady or the Tiger?*, we set up the truth table knowing in advance the first test sentence probably wouldn’t work. We were making sure the process worked.

Many applications are provisional and are run to shake down the process, to generate information to use in the next go around. I encourage my students to turn in work before the deadline so they can get my, and their other teachers,’ feedback on assignments. Otherwise, quality control after the application is entirely out of their hands, ultimately finding its way to the gradebook.

In general, having another set of eyes will help you produce quality work. Someone else may see something that you aren’t seeing. Seek out colleagues and mentors to you improve your strategies.

How do we conduct quality control on a belief? This is where the critical thinker encounters the most resistance. Once a proposition passes into belief it tends to stay there unless there is compelling evidence that the belief is misguided, and that still often isn’t enough. Why not? Because the belief becomes part of ideology. That is why keeping an open and curious mind is so essential to critical thinking.

Conducting quality control on an action depends on the context of the action. We’ll look at two different time-scales. First, imagine you find yourself in one of the moral quandaries we generated at the beginning of the Critical Thinking chapter: *You need your job to support your sick child and discover your employer is engaged in illegal, but not very damaging, activity, should you report her?* In the gathering stage you got some evidence of what she was doing. You researched your own culpability in not reporting her. You processed it long and hard and decided to help your boss out of the moral hazard. You talk to your boss in such a way that you demonstrate you know what is going on but, rhetorically, make it seem as if your assumption is that she doesn’t know what she’s doing is illegal. So you give her an out. Maybe your boss fires you anyway. Maybe your boss promotes you.

In any case it will probably be a long time, if ever, that you are confronted again with that kind of moral dilemma. If you are, you can take the consequences into consideration, but it’s unlikely you’ll ever have to. On the other hand, imagine you are a surgeon specializing in the hand. You have a thriving practice so you operate three days a week, four times each of those days. Throughout your practice you are adjusting your approach—changing your hand position, moving
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lighting, buying innovative instruments. The stakes are high each operation so it’s paramount that you improve your technique to improve your success rate.

“Continuous improvement”: before it was trite, was true. Manufacturing used to put its quality control resources at the end of the production process; it is by now a commonplace that improving the quality of your process takes place at every stage, at every moment. As we’ve said before, critical thinking is no different. And though critical thinking can be itself a recursive process, there is something especially fulfilling and exciting when you put effort in gathering and processing in order to achieve your telos, and then, when the time is right, you send the result of your labors out into the world.

4. The Applying Stage: What We Learned

a. In the beginning is my end.
b. Critical thinking generally results in an artifact, belief, or action.
c. When to apply your results is a critical issue.
d. How (in what form) you apply your results is a critical issue.
e. How you conduct quality control on your application is a critical issue.
f. Often the “when” is determined by a deadline.
g. “Know Thyself” when it comes to deadlines.
h. There’s a wide range of appropriate times to apply beliefs.
i. Follow the form when it’s given.
j. Know the context for your application.
k. What can you do with a belief?
l. Watch out for ideology.
m. Remember the rhetorical situation.
n. I use an unfortunate manufacturing term.
o. Sometimes the entire critical thinking behavior gets passed to the gathering stage to be revised.
p. Seek another set of eyes, or a mentor for your projects.
q. Strive for continuous improvement, though not all situations require it.
r. It’s good to finish something.