



A Writing Guidebook for the Natural Sciences

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Forestry
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Foreword

Dean Jack Saddler established a task force to investigate and report on the options available for improving the written and oral communication skills of undergraduate students in the five degree programs in the Faculty of Forestry. This writing guidebook is one of the outcomes of this initiative. It was produced under the guidance of the Faculty of Forestry Communication Skills Task Force in cooperation with faculty members, students, and other individuals on campus. Support for this project has been provided by a grant from the University of British Columbia's Teaching and Learning Enhancement Fund.

Communication Skills Task Force
October 2006

Preface

The Impetus

This guidebook derives its impetus from the intersection of two foundational assertions. The first is that writing is important. Most academics agree that writing is important because writing is a central component of what they do. Professional scholars do a lot of different things in a lot of different disciplines, but all of them write. They all write because, regardless of the specific nature of their research, they are all engaged in the production of new ideas. These ideas are then communicated in things like books, journal articles, and conference papers. There are exceptions, but most academics think writing is important because it is part of their job and part of their daily life. They consider it to be among the skills that they see as having enabled their professional success.

Most university students also think writing is important, but this opinion is, at least partially, a function of the fact that professional academics think writing is important. Academics design programs and courses that challenge students to develop effective written communication skills. As a result, students understand that weak written communication skills can create barriers to their success. They think writing is important because they know that there are consequences in failing to write effectively.

Compelling as these reasons are, however, they can't quite substantiate the claim that writing is *universally* important. An explanation of what it is that writing *does* is needed. It is relatively easy to understand what writing is for, but what writing does is something different. What writing does, in the simplest terms, is communicate. What writing communicates can really be anything, but it's usually things like thoughts, ideas, and concepts. These are the kinds of things people write about because they are the kinds of things people like to communicate. Ideas, thoughts, and concepts are sometimes independently important, but they are equally often trivial or esoteric. It is not that these things are being communicated that makes writing

universally important, but that they are being written. It is what writing does with thoughts, ideas, and concepts that is important.

Thoughts can be nebulous, hazy, ambiguous things. They need to be given shape and definition in order to be articulated in writing. Effective writing therefore demands clear thinking. Thoughts that can't be articulated in writing are meaningless; they have no shape or substance. Similarly, failing to communicate a concept clearly and effectively is the same as failing to understand it. This is why writing is important. Thinking with critical acumen and writing clearly, effectively, and persuasively are part of the same activity. As such, they are equivalent in importance.

The second assertion that drives the impetus for this guidebook is that writing is a difficult thing to do and an extraordinarily difficult thing to do well. Most people don't need much convincing on this point because writing is such a constant source of anxiety for so many students, scholars, and professionals. Anyone with a university degree who says they have never stared at a blank computer screen trying to coax out that elusive, but all important first sentence, is probably either lying to you or to themselves. The same is true of anyone who says they've never suffered that moment of doubt or hesitation before pressing 'send' or 'print.' These experiences are so ubiquitous because vexation and frustration are intrinsic to the process of composition.

Part of the reason writing is such a hard thing to do is also the primary reason it's so important. Effective composition demands that writers organize their thoughts in such a way that they can be communicated as complete sentences. Since thoughts don't always fit neatly into clear, coherent sentences, there can be a substantial challenge in this process alone, but there is also the problem of constructing sentences that function as part of a system of sentences forming a paragraph. Flow and continuity are considerations that can complicate the process of composition significantly. This process is then further complicated by the fact that, in addition to being well structured and organized internally, each paragraph must fit within the architecture of an argument and the general structure of a complete document.

This guidebook is designed to help students writing in the natural science disciplines create documents that are clear, readable, and well organized on each of these three compositional strata. Its purpose and its impetus derive from the same two assertions: writing is hard and writing is important.

About This Guidebook

The natural science disciplines present some unique challenges for writers. Students working in these disciplines are expected to be able to write both in strictly scientific modes and in genres that are more characteristic of the social sciences. In order to accommodate the complexities inherent in the dualistic nature of writing in the natural sciences, this guidebook is focused primarily on those features of effective writing that are common to all academic disciplines. It emphasizes clarity, precise control of language, simplicity, and the exclusive use of direct, unambiguous constructions.

The first chapter of this guidebook is devoted entirely to the sentence, as a unit of composition. Issues of clarity, diction, punctuation, and mechanics are discussed in detail. This chapter comes first because dysfunctional sentences guarantee dysfunctional paragraphs and dysfunctional documents. The second chapter focuses on paragraphs and includes a discussion of the correct use of evidence in academic writing. This chapter stresses the importance of structure and organization in the construction of effective paragraphs. Together, these first two chapters are designed to provide a thorough examination of the elements of composition that are generic to academic writing and may potentially be areas of weakness or sources of confusion for students writing in the natural science disciplines.

The third chapter diverges from this generic approach in the interest of providing a discussion of the structural and stylistic features that characterize specific academic genres. This section is organized in congruence with the natural science–social science dichotomy that runs through the *applied* natural science disciplines. Genres are categorized as either essays or reports according to the stylistic binary that delineates strictly scientific writing from more social science-oriented genres. The purpose of this chapter is to help students recognize some of the

broader compositional issues they will face in the production of documents that conform to the various structural and stylistic conventions of specific academic genres.

These three chapters are designed to be read in sequence. They are structured in such a way as to provide students with an intuitive progression, whereby they can develop the ability to control their written language and organize their thoughts on increasingly larger compositional scales. This is not, however, the only way this guidebook should be used. It should also serve as an 'off-the-shelf' reference tool for students who choose to use it as an aid in the writing process.

Chapter 1:

Sentences



Basic Sentence Structure

A sentence is more than a group of words that begins with a capital letter and ends with a period. It is a unit of language that is characterized by the presence of two specific components. The first is the **subject** and the second is a **verb**. These two components comprise a sentence because, where there is a subject and a corresponding verb, there is a single, complete, fully articulated thought. This means that a thought, when expressed as a sentence, is functionally autonomous. All the requisite information is in place for it to make sense by itself. Sentences are, in fact, the smallest unit of language that achieves this distinction.

All of the individual components of a sentence can have *meaning* by themselves, but they cannot *make sense* without more information. This is why the grammar of sentences is important. A grammatically complete sentence is a functional sentence; it is a sentence that works. A sentence that lacks either a subject or a verb, however, fails to stand on its own as a functional thought. These sentences don't work and, as a result, they impede the clarity and comprehensibility of the paragraphs of which they are a part. Complete, functional sentences are essential if you are going to write complete, functional paragraphs.

Subjects and Predicates

Both subjects and predicates can be individual words or they can be phrases. A **phrase** is simply a sequence of two or more words that function as a unit, but don't form a sentence. This means that subjects and predicates can include many different parts of speech. The nucleus of a subject, however, is always a **noun** or **pronoun**. Similarly, the nucleus of a predicate is always a verb. These two words are called the 'simple subject' and 'simple predicate.' Whatever else you have in a sentence, you always need to have these two words.

Subjects

The simple subject in a sentence is easy to identify. Consider the following sentence:

The student is tall.

This sentence is about ‘the student.’ Anything that follows the simple subject, in this case the noun ‘student,’ must describe something about the student. The ‘complete subject’ can sometimes be more difficult to identify because it includes all the words that modify the simple subject. These words refine the subject by adding information. Often the complete subject can consist of a noun, one or more **adjectives**, and an **article**. Since there are only three articles in the English language (a, an, and the), you might think of them as serving the same function as an adjective. They indicate the **version** (specific or generic) of the noun that will be the subject of the sentence. In doing so they modify the noun, just like an adjective (Finnabogason and Valleau 2006). If you think about it in these terms, the simplest subjects really only have a noun and a few modifiers.¹ Things can, however, get more complicated when you start adding **conjunctions**.

Generally, if there is a conjunction in the complete subject of a sentence, it is a ‘compound subject.’ Compound subjects consist of two or more simple subjects linked together by a conjunction. A simple example of a sentence with a compound subject would be the following:

Everyone who lived in the Totem Park residences, and some of the people who lived in the Vanier residences, went to the Forestry beer garden.

Although, in this case, the subject may be slightly more difficult to identify, it remains the thing the sentence is about: the students in the two residence complexes.

Predicates

If a sentence is *about* its subject, then its ‘complete predicate’ is essentially everything else. It is the action of the sentence. It includes the verb and all of the objects, complements, and various modifiers that provide the information as to what is happening in the sentence. Unless a sentence is missing a subject (in which case it is not a sentence), the predicate is always easy to identify. If the subject is ‘the tree,’ then the predicate is the answer to the question: ‘what about the tree?’

¹For more on modifiers consult the section titled ‘Dysfunctional Modifiers.’

Of course, things aren't always this simple. Like subjects, predicates are rendered slightly more complicated by the addition of a conjunction:

Frank studied in his room **and** listened to music.

This is an example of a compound predicate. The complete predicate is underlined with the conjunction (in this case a 'coordinating' conjunction) in bold. Notice that it is composed of two simple predicates, namely the verbs 'studied' and 'listened.'

Direct and Indirect Objects

The objects of sentences are always part of the predicate. They describe the person, place, or thing (i.e. noun or pronoun) that receives the action of the verb. In doing so, they complete verbs like 'listened' that don't make sense without more information. The two types of objects are direct objects and indirect objects. In the preceding example, the phrase 'to music' is a direct object because it *directly* identifies the **receiver** of the verb 'listened.' Indirect objects work with direct objects to answer questions like 'for whom,' or 'to where.' Consider the following sentence:

Miriam bought an assortment of refreshments for the party.

In this case the direct object is 'an assortment of refreshments' and the indirect object is 'for the party.' Together, the direct object and the indirect object receive and complete the verb "bought."

Subject and Object Complements

The other category of information that can be added to a sentence to complete its meaning is called the 'complement.' In grammar, the term 'complement' is used in a variety of different, sometimes conflicting ways. This is the result of an unfortunate tension between what the word means as a grammar term and its ordinary semantic function. Because anything can be complemented (in the sense that a belt can complement a pair of shoes), almost every sentence element can have a complement, if the term is used loosely. For the purposes of this chapter, the stricter definition is more useful: complements are words or word groups that complete the meaning of a sentence element by adding informa-

tion to a verb. Complements, as a category, sometimes overlap with the other ways of adding information to a sentence, but they can be distinguished by their close relationship with the verb. They always come after verbs and add information to the action of the sentence. The two important types of complements are 'subject complements' and 'object complements,' both of which (confusingly) are part of the predicate.

Subject complements are words or phrases that describe or identify the subject. They follow verbs like 'is' and complete sentences like 'the student is tall' by describing what the student is: tall. Object complements are words or phrases that describe or identify objects. These can be a little bit more challenging to identify. They generally follow right after direct objects and complete the action in sentences like the following:

Frank described the party as good clean fun.

In this sentence 'the party' is the object and the phrase 'as good clean fun' is the object complement because it completes the object by adding information to the verb 'described.'

Dependent and Independent Clauses

Clauses are distinguished from phrases and sentences by the fact that they have both a subject and a verb, but are not punctuated like a sentence. Although a phrase must have both a subject and a verb in order to be a complete sentence, not all phrases that have these two components *are* complete sentences. Sometimes phrases have both a subject and a verb, but still do not express a complete thought. These are called 'dependent clauses' because they *depend* on some other piece of information in order to express a complete thought. The following phrase is an example of a dependent clause:

When Miriam arrived at her morning class the day after the party...

Without the word 'when' this phrase would be complete. It would therefore constitute an independent clause. All independent clauses *can* be sentences by themselves.² The phrase, as

² There can also be more than one independent clause in on one sentence, but only if the appropriate punctuation is in place. For more information on the pitfalls of joining two or more independent clauses in a single sentence, please see the section titled 'Comma Splices, Run-on Sentences, and Fused Sentences.'

it is written, is not an independent clause because it needs more information:

When Miriam arrived at her morning class the day after the party, she was glad she had not stayed out too late.

The difference is that a dependent clause always has a word that signals its dependency. Words like 'since,' 'although,' 'however,' 'until,' 'before,' 'unless,' and 'when' (among a great many others) tell readers that more information is coming. As a result, these words also mean that a sentence is incomplete without that information.

Types of Sentences

When a sentence consists of only one independent clause it is called a 'simple sentence.' Naturally, these sentences are both the easiest to write and the easiest for readers to understand. They are also relatively rare in academic writing. This is not because they lack sophistication. Simple sentences work well. The reason they are uncommon in academic writing, despite their efficacy, is that they do not accommodate very much information. This limits their utility. One of the fundamental challenges of writing in the natural sciences is explaining complex ideas and concepts without writing convoluted sentences. This challenge compels students in these disciplines to try and write sentences that communicate a lot of information at once. In their efforts to write sentences that do more, students frequently end up with awkward, ambiguous, and opaque sentences.

Simple sentences are not always more desirable than complex or compound sentences. A paragraph that is dominated by short, simple sentences can sound choppy and disjointed. More intricate sentences can often weave a tighter fabric by forcing the reader to acknowledge the connections between pieces of evidence or closely related inferences. If these sentences are successful, it is because they follow certain rules. The cardinal rule remains that there must always be a subject and a corresponding verb. Beyond this foundational principle the issue becomes a question of what type of sentence you want to write. In addition to simple sentences, there are two other options: complex sentences and compound sentences.

Complex Sentences

Complex sentences have one independent clause and one dependent clause. They are used when you want to signify a specific kind of relationship between two pieces of information. This relationship is usually described by a subordinating conjunction.³

The simplest kinds of complex sentences do not need punctuation. This is sometimes the case when the independent clause precedes the dependent clause. Consider the following example:

Miriam thought that she might have had trouble staying awake in class if she had stayed out late.

Here the independent clause is in italics and the dependent clause is underlined. The subordinating conjunction ('that') explains the relationship between the two clauses. More often than not, dependent clauses need to be identified with punctuation (almost always a comma). The following two examples show dependent clauses 'set off' by commas:

Frank, who was in his fourth year as a Forestry student, had long ago learned his lesson about staying out too late.

If you attend a party that ends late in the evening, paying attention in class the next day can be challenging.

Again, the independent clauses are in italics and the dependent clauses are underlined. In both of these examples the dependent clause is placed in a subordinated position that helps to explain how it relates to the main clause. In the second example the conjunction 'if' serves this function, while in the first example the pronoun 'who' replaces the conjunction and describes the relationship between the two clauses.

Compound Sentences

Compound sentences are both less common and less complicated than complex sentences. They are characterized by more than one independent clause and either a semicolon or a coordi-

³Subordinating conjunctions are words like 'once,' 'since,' 'after,' 'before,' 'when,' 'where,' 'then,' and 'that.' They are used to link dependent (subordinate) clauses with the main clause of a sentence.

nating conjunction, typically preceded by a comma.⁴ Since both (or all) of the parts of a compound sentence have equal grammatical weight, these sentences cannot have any dependent clauses. Consider the following two examples:

Frank and Miriam usually go to parties on Friday nights; they don't like to be tired in class.

The Forestry students often socialize with the students in Land and Food Systems, **but** rarely with Engineering students.

Both of these sentences are composed of two separate independent clauses that are joined together because they each express part of a single thought. These types of sentences are only appropriate if this is the case, because each of their constituent clauses could be its own sentence. When you are deciding whether or not to use a compound sentence, remember that it is almost always preferable to write two simple, clear sentences, rather than one unnecessarily convoluted sentence. If you do write a compound sentence, you should have a good reason.

The Tibbetts Model

Simple sentences, compound sentences, and complex sentences are not the only kinds of sentences you can write in the English language. There are an almost infinite number of permutations of each of these two basic models and the models themselves can also be combined. This would yield what is called a compound-complex sentence, with more than one independent clause, at least one dependent clause, and a lot of punctuation. Because of the diversity and variety found in English sentences, it's a considerable challenge to explain the rules that govern their structure as a series of 'cans' and 'can'ts.' One solution to this problem can be found in the approach pioneered by A. M. and Charlene Tibbetts in their 1987 grammar book titled *Strategies of Rhetoric*.

This 'strategy' is effective because it emphasizes the subject

⁴ Coordinating conjunctions (like 'and,' 'but,' and 'or') join together words, clauses, or phrases of equal grammatical value. They cannot be used to join sentence components that have an element of subordination in their relationship.

and predicate as the foundation of the sentence. According to the Tibbetts model, every sentence starts as a basic subject and predicate, to which additional information can be added in three ways. These three ways are labeled as (a) openers, (b) interruptions, and (c) closers. They are inserted into an independent clause at the beginning, in the middle, and at the end, respectively. Two such independent clauses could then potentially be joined together to form a compound sentence.

One of the strengths of this model is that it shows how, with adequate punctuation, additions can be made to any sentence in a wide variety of different ways, without compromising clarity. The following is an example of a sentence that has been categorized using the Tibbetts model:

After Miriam left her residence building in Totem Park, her friends, *who knew it was her birthday the next day*, prepared cards and decorations for her, despite her insistence that she didn't want any celebrations.

Here the opener is in bold, the interruption is in italics, and the closer is underlined. This sentence is grammatically correct and succeeds in conveying a lot of information, but it might not be the best way to express this thought. The Tibbetts model is useful for understanding how sentences can be made more complex correctly, but whether or not the sentence benefits from the additional information is a discretionary issue. You will find that clarity and complexity are often trade-offs.

Common Problems

Dysfunctional sentences are, more often than not, attributable to one of two things. Either the sentence is incomplete or it has multiple clauses without adequate punctuation. The former is a case of too little information and the latter is a case of too much information. Both of these problems can be avoided by reviewing a dysfunctional sentence and asking the question: 'where is my subject and where is my predicate?' If your sentence is incomplete, the answer will be that you are missing one of these two things. Similarly, if what you have written is under-punctuated or unnecessarily complicated, you will have trouble separating these two things from the rest of the sentence.

Fragments

Most people who use Microsoft Office software on their computers are familiar with the term 'fragment.' The 'grammar check' function built into Microsoft Word labels most of the dysfunctional sentences that it finds as 'fragments,' making this term a familiar critique. It does this because it is based on a relatively crude dictionary. Whenever you insert a period, the program checks all the words you have written since the last period to make sure there is a noun and a verb. The software is able to read slightly more complex grammatical patterns than a simple subject-verb pair, but it is not designed to be an automatic proofreader. Its capabilities are very limited. Consider the following phrase:

Tree falls.

The Microsoft Word 2003 grammar check function considers this to be a complete sentence, which it is not. If it didn't, it would have labeled these two words as a 'fragment,' which it doesn't. The following is a phrase that it does consider to be a fragment:

Tree fall.

Microsoft Word thinks that this phrase is a fragment because both words are nouns, which could be true if the word 'fall' referred to a season.

Both phrases are in fact fragments because both are incomplete as sentences. The term 'fragment' can be narrowly defined as a sentence that lacks either a subject or a verb, but it can also be more broadly defined as an incomplete sentence. Any phrase or clause that lacks any of the criteria that qualify sentences is a fragment. Fragments are, as such, easy to identify even without the help of the Microsoft Office grammar check. They are also easy to fix. All you have to do is attach your fragment, if it is a dependent clause, to the independent clause on which it depends. Alternatively, you can simply add whatever it is that would turn your phrase or clause into a sentence (Kane and Ogden 1993). If there is a subordinating conjunction that you do not need, just remove it. This problem is easy to avoid, as long as you do not rely on your word processing software to identify it. Having no green,

wavy lines in your text does not mean that you do not have any fragments.

Comma Splices, Run-on Sentences, and Fused Sentences
'Comma splices,' 'run-on sentences,' and 'fused sentences' are all, to a certain extent, the same thing. These terms are used to describe compound sentences that are punctuated either insufficiently or incorrectly. A comma splice is two independent clauses joined only by a comma, a run-on sentence is two independent clauses that are not joined by any kind of linking device at all, and both types of faults are technically fused sentences. The simplest way to fix these sentences is to make them into two sentences. In the alternative, you can apply the correct punctuation. This solution, however, should only be used if there is a good reason to keep your two independent clauses together as a compound. If they are two very closely related ideas that fit naturally together, you might want to retain the compound structure of your sentence. The same might be true if your two clauses serve to create emphatic repetition. If you do have a good reason to link two independent clauses, you have three options, according to the University of Purdue's 'Online Writing Lab':⁵

1. You can link clauses using a coordinating conjunction and a comma.

_____ , but _____

2. You can link clauses using a semicolon.

_____ ; _____

3. You can link clauses using a semicolon and some other linking word.⁶

_____ ; however, _____

⁵*The Owl at Purdue*. 2006. Available at <http://owl.english.purdue.edu/owl/>

⁶This third option is grammatically identical to the second option; however, it is useful if you find that it is important to use the word 'however.' Some writers try to avoid using conjunctions to begin sentences, so they write compound sentences when they want to use an inverting conjunction like 'however' or 'but.' Using conjunctions to begin sentences is relatively common in all but the most formal discourses and disciplines.

Punctuation

Punctuation is important. It's important not only because it controls what a sentence means and how a sentence should be read, but also because, with the right punctuation, you can write precise, clear, and concise complex sentences. This is important when writing in the natural sciences because communicating complex ideas often requires complex sentences. Punctuation enables you to write these kinds of sentences because, without it, complex sentences can take on a multiplicity of meanings and a hopeless dearth of **readability**.

In a recent book on punctuation, called *Eats, Shoots & Leaves: The Zero Tolerance Approach to Punctuation*, Lynn Truss explains why punctuation is important. She writes: "Punctuation herds words together, keeps others apart. Punctuation directs you how to read, in the way musical notation directs a musician how to play." She uses another analogy to explain what happens when punctuation is forgotten or abused. She compares it to traffic signals, without which words, like cars, crash into each other and fall into chaos (2003). While this 'zero tolerance approach' might seem a little heavy-handed, it is difficult to overstate how crucial punctuation can be to the meaning and function of a sentence. Punctuation faults can make an otherwise completely lucid sentence utterly incomprehensible. They are also the most common type of mistake instructors find in their students' writing. The ability to use punctuation correctly is, therefore, a very valuable skill.

Commas ,

Commas are the most versatile pieces of punctuation a writer has at his or her disposal. They can be used to do a lot of different things, most of which fall into two categories. Although 'separating' and 'isolating' may seem like the same kind of activity, they are actually very different applications for commas. Commas for separating do exactly that, they separate. Commas for isolating bring specific words or constructions together by 'setting them off' from the rest of the sentence. All commas, however, have part of their function in common because all

commas are read as a pause.

Truss uses an anecdote to describe this comma commonality. The story focuses on a debate between a writer named James Thurber and an editor named Harold Ross, who worked for *The New Yorker* in the 1930s and 1940s. Ross claimed that sentences could never have too many commas, while Thurber found them to be far less useful. According to Truss, Thurber was once asked why there was a comma in the sentence, ‘after dinner, the men went into the living room.’ He reportedly answered, “this particular comma was Ross’ way of giving the men time to push back their chairs and stand up” (2003). The sentence in question was evidently something that Thurber had written and Ross had edited. The point is that a comma is a **phonetic** marker as much as it is a grammatical device. It is a pause, not as long a pause as a period, but a pause nonetheless.

Commas to Separate

Commas are used to separate in a variety of different applications. One such application is in combination with a coordinating conjunction, where it is used to separate two independent clauses in a compound sentence. Another is observable where a comma separates an introductory phrase from the main clause of a sentence:

After their afternoon classes, Frank and Miriam went home for the day.

Introductory phrases can be anything, really. They can be adverbs that modify either the main verb or the whole main clause, they can be phrases that work like an adverb, they can be phrases that work like adjectives, or they can be anything else that adds information at the beginning of the sentence (an opener).⁷ The only criterion is that they are not essential to the basic meaning of the main clause; they must be a ‘non-restrictive element.’ Commas are used to separate non-restrictive elements because the main clause is then easier to identify and the sentence becomes more readable.

⁷ Phrases that work like adverbs are called ‘adverbials.’

Commas to Isolate

Commas are used to isolate, or set off, when there is a non-restrictive element that needs to be identified and organized. They should not be used to set off restrictive elements. Restrictive elements are features of the sentence that are not part of the main clause, but are essential to its meaning. The following two examples illustrate the difference between restrictive and non-restrictive elements:

Frank, *who didn't want to miss his favorite TV show*, walked home quickly.

A person *who is fit* will be able to walk quickly.

The first example is a sentence where a non-restrictive element (in italics) is set off by commas. The second example is a sentence that has a restrictive element (again in italics) that is essential to the meaning of the main clause and no commas.

Commas are used for setting off and isolating more than for any other purpose because there is a very long list of things they can set off. This list includes transitional expressions, parenthetical expressions, and little explanatory interjections, just to name a few (Finnabogason and Valteau 2006). As is the case with commas that separate introductory phrases, the most important thing is that the information that is isolated by the comma(s) is not essential to the meaning of the main clause.

More Uses of Commas

As an extension of their separating function, commas are used to organize the terms in a series. A series is a list comprised of three or more terms. The two most common kinds of 'series' are lists of nouns and lists of adjectives. In both cases a comma follows each term in the series. If there is no comma between two terms they will be read as one term. Consider the following examples:

Frank's favorite TV personalities are Anderson Cooper, Bill O'Reilly, and Geraldo.

Miriam was smart, funny, and always ready for a good time.

Each term in the series can be anything from a single word to a long phrase, so long as it is separated from the other terms by a comma. Commas can also be used wherever they can make a sentence clearer or easier to read by setting off some peripheral element. This must be done with caution, though, because a comma that isolates a central piece of information from the main clause can make the sentence much more difficult to read.

Misuse of Commas

Commas are easily misused because there are so many different ways they can be used correctly. For each of the above correct applications there are corresponding incorrect applications. Commas should never be used to set off restrictive elements or be inserted after the last term in a series. Other situations where commas are frequently misused are illustrated by the following examples (the offending commas are in parentheses):

Frank is a nice, courteous(,) guy.

These are called ‘cumulative adjectives.’ The second comma should never be used.

Neither Frank nor Miriam had much studying to do, so they dropped off their books(,) and headed to the Pit Pub for half-price mojitos.

Never use a comma with a coordinating conjunction that joins words or phrases that are not clauses.⁸

“This sure is a tasty mojito!(,)” Frank exclaimed.

Never use a comma in conjunction with a question mark or an exclamation mark.

Later that night, Miriam said(,) that she didn’t really like yuppie cocktails; she preferred beer.

This is called an ‘indirect quotation.’ Commas should never be used to set off indirect quotations.

⁸ Commas used to separate terms in a list are the only exception. When listing three or more terms in a list, a conjunction should follow immediately after the last comma, e.g., _____, and _____.

Colons and Semicolons

Colons :

Colons are used primarily for introducing things like quotations and lists. In both of these cases it is often in the interest of clarity and flow to avoid them. This is because colons are very 'hard' punctuation devices. They can be distracting to the reader or interrupt the reader's concentration because they seem to stand in for awkward constructions. It is not incorrect to use colons to introduce lists or quotations, but you should consider ways to integrate your quotation or list with the syntax of the sentence. Consider the following:

The explanation for this phenomenon is straightforward:
water flows downhill.

In this example, the colon is used correctly, but it adds an awkward break in the sentence. It could be rephrased in a clearer, smoother sentence, such as:

This phenomenon can be explained by the fact that water
flows downhill.

Colons can also be used to add emphasis to an explanation or an appositive (Finnabogason and Valteau 2006).⁹ They should, however, only be used in this application if you are confident that the trade-off of clarity and flow is warranted.

Semicolons ;

Semicolons are a much-maligned and much-debated device. The controversy stems primarily from the fact that they are rarely actually needed. Their only two uses are the separation of independent clauses in compound sentences and the separation of terms in a very specific kind of series. This first function is redundant because, if the two clauses are closely enough related to warrant the formation of a compound, they can be joined by a coordinating conjunction and a comma, and if they are not very closely related, they should be independent sentences anyway. The semicolon's second function is to separate

⁹ Appositives are nouns or noun phrases that are isolated from the main clause of a sentence, but paired with an equivalent noun or noun phrase in the main clause. They provide supplementary information by presenting their pair in a different way.

the terms in a series where one or more of the individual terms contains a comma. The following is an example of one such list:

Miriam and Frank met three other students at the pub:
Jose, who was originally from Brooklyn; Sander, who
was from Caracas; and Julie, who was from Stockholm.

Semicolons are used in this series because it would be unclear if they were not. This is the only time semicolons should be used in a list.

Many skilled writers are able to avoid using semicolons. Others use them habitually in applications where an alternative would be just as correct. Unless you are confident that it offers some **rhetorical** or **emphatic** advantage, it might be wise to limit your usage of this enigmatic device to cases where there is no alternative.

More Punctuation

Parentheses () and Brackets []

Parentheses identify insertions. They are entirely removed from the grammar of the sentence in which they are used and, as such, frequently serve to add supplementary information that cannot be worked into the sentence. Because they can be used with no regard for the grammatical structure of the sentence, some editors consider parentheses to be indicative of sloppy or lazy writing. They can also be very useful for the same reason.

Brackets look like square parentheses and are usually used to identify insertions that modify quotations. They are helpful if you are trying to modify the syntax of a quote so that it will make sense as part of a sentence. For example:

Dworkin also argues that, “arguments of principle [as compared to ‘arguments of policy’] are rights-based.”

In this example the square brackets contain the words that have been inserted into the quotation.

Quotation Marks ‘ ’ “ ”

There are a few basic rules that govern the use of quotation marks. The first is that double quotation marks are only used to

identify direct quotations. These are quotations that are copied exactly as they appear elsewhere. Remember that quotations that are copied incorrectly reflect very poorly on you as an author. The next rule is that the closing quotation must follow all internal punctuation, unless a parenthetical reference is included. Also, if your quotation is long (longer than a couple of lines), it should be isolated using indents and extra line spacing, and if you have a quotation within your quotation, use single quotation marks for the enclosed quotation. You can also use single quotation marks to draw attention to any word or phrase drawn from some other specific context that you want to discuss.

Dashes – — and Hyphens -

The dash is another controversial punctuation mark. It is often used in contemporary writing as a substitute for other types of punctuation, like colons and semicolons. Some renowned writers actually seem to use the dash as a kind of universal hard punctuation mark. It is a lot like a comma, but somehow ‘stronger.’ It signifies either that the information that is set off is so far removed from the central point of the sentence that a comma could not suffice for isolation, or that a clause or phrase is so difficult to reconcile with the flow of the sentence that it warrants a more significant pause. If this is a common trend in the discipline in which you are writing, you might consider using dashes this way. Otherwise, caution is advisable. Here are a few examples of dashes used this way:

Miriam doesn’t like mojitos – or so she says.

Forestry students – a sedate and cautious breed – usually drink virgin mojitos.

Hyphens are interesting punctuation marks because, despite seeming somewhat trivial, they can actually change the meaning of a sentence. Truss uses the example of the phrase extra-marital sex (as opposed to extra marital sex). She observes that, without the hyphen, the phrase becomes “quite a different bunch of coconuts” (2003). Generally, hyphens are used for spelling out compound numbers, joining compound words, adding uncommon prefixes or suffixes, and placing an adjective directly before a noun (as in ‘the mojito-drinking yuppie’).

Ellipses ...

Ellipsis marks indicate where information is missing. They are commonly used to signify a kind of trailing-off effect. They consist of three points (...) and never more. Ellipses can also be used in quotations to identify omitted information:

Ellipses... identify omitted information.

Apostrophes ’

Apostrophes are another frequently abused punctuation mark. The most common mistake is to use an apostrophe to indicate the possessive form of a personal pronoun:

Its is the possessive form of **it**.

It’s means **it is**.

If you are forming the possessive of a singular noun, use an apostrophe followed by the letter ‘s’ (as in ‘the yuppie’s mojito’). If you are forming the possessive of a plural noun, add only an apostrophe after the letter ‘s’ (as in ‘the ‘yuppies’ mojitos’).

End Punctuation . ? !

End punctuation is the simplest kind of punctuation. There can only ever be a period (.), a question mark (?), or an exclamation point (!) at the end of a sentence. In academic writing it is very rarely appropriate to use anything but a period. Rhetorical questions are a hallmark of amateurish, underdeveloped writing unless they are used **very** sparingly and exclamation points hardly ever have a place in serious prose. Both of these devices should only be used if they are absolutely necessary, since they can damage your credibility.

Clarity

Clarity is a difficult thing to achieve in academic writing. It is also one of the things that instructors look for most when they evaluate their students’ writing. Clear writing is often equated with good writing because an ability to explain something

clearly is interpreted as indicative of complete and thorough comprehension. Writing clearly, challenging as it may be, is therefore in every student's best interest.

Concise Sentences

The easiest way to be sure you are writing clear sentences is to be sure you are writing concise sentences. A concise sentence is not simply a brief sentence. It is a sentence that uses the fewest words possible to express a given thought with the appropriate level of detail and precision (Kane and Ogden 1993). When writing in the natural sciences, you will sometimes find the most concise sentence you can write is a long and complex sentence. If, however, it *is* the most concise sentence you can write, it is certainly also the clearest sentence you can write.

Most university libraries have entire sections full of books claiming to be able to help students write better; UBC's is no exception. Many of these books offer advice as to how students should go about learning to write more concise sentences. This advice often takes the form of a series of tips, some of which are useful. However helpful tips and lists of things to remember may be, they always boil down to a very simple point. If you can use fewer words, you should.

Nouns, Actions, and Agency

Nominalization

One of the things that few people recognize about verbs is that they can all be turned into nouns. Sometimes this is accomplished without even changing the word. 'Writing' is a form of the verb 'to write,' and 'writing' is a noun referring to something written. 'Help' is a verb, and 'help' is a noun. In both of these cases the two words mean similar, but marginally different things. Sometimes, if this difference is negligible, writers substitute the noun for the verb. This practice, called 'nominalization,' is to be avoided. Writers do this because they think the sentence sounds better, maybe more sophisticated, with the 'nominalized' verb in place of the action. The problem is that turning a verb into a noun often necessitates an awkward construction. The following examples illustrate the difference:

Frequent nominalization can inhibit the realization of the goals of the sentence.

vs.

Nominalizing can make it hard to realize your goals.

Too Little Action

The other problem that writers encounter when they turn too many of their verbs into nouns is a sentence that has too little action for the number of nouns. Noun-heavy sentences are not always the result of nominalization, but they are always unclear. Verbs are what make sentences make sense. They give purpose to sentences by giving purpose to subjects. Wherever possible, nouns should have their own verbs. Consider the following sentence:

Frank's final essay constituted an analysis of the impacts of the exploitation and the mismanagement of the wood resources and other natural capital in the Squamish River basin.

This sentence makes sense and sometimes you may have no choice but to write sentences like this. The problem is that the only *action* is the transitive verb 'constituted.' 'Analysis,' 'exploitation,' and 'mismanagement' are all nouns that could have been verbs. If possible, a sentence like this should be broken up so that these words can become actions and not just things lost in a long list of terms.

The Passive Voice

Some writers think that using the passive voice makes their work sound more authoritative. They choose, for example, to write something like 'it was discovered that...' instead of 'I discovered that...' This is an effort to purge the sentence of any evidence of the author's **agency**. In some types of technical and scientific writing, this is appropriate. In these cases, the passive voice is used to project objectivity. In most kinds of academic writing, however, it is neither plausible, nor desirable to claim objectivity. There is nothing wrong with personal pronouns. They admit to your reader something that he/she already knows and that you should not try to conceal: you are a person

who has engaged critically with the material you are writing about. Subjectivity is not a rhetorical handicap; it is the cornerstone of academic discourse.

Agreement

All sentences have a variety of different components that need to be coordinated in order to ensure that related words and phrases are in 'agreement.' This means that associated words must be 'formed' the same way so that the reader understands their relationship. Among the different pairs of components that must agree with one another are pronouns and antecedents, subjects and verbs. These pairs only agree if both words are formed with the same tense, person, and number. When two words in an agreeing pair do not take the same form, their relationship becomes unclear, and the sentence becomes difficult to understand.

Subject–Verb Agreement

Verbs must always take the same number and person as their subjects. If they do not, it will seem as though the sentence's main action is without a corresponding noun. The following table shows the different variants of tense and person for the verb 'to be:'

	Singular	Plural
1st Person	I <i>am</i>	We <i>are</i>
2nd Person	You <i>are</i>	You <i>are</i>
3rd Person	He/She/It <i>is</i>	They <i>are</i>

These subject–verb pairs provide a simplified example. It's relatively easy to avoid constructions like 'they *is*.' A mistake like this is a simple grammatical error. Agreement can, however become an issue of clarity when it becomes a problem in complex sentences. Multiple independent clauses come with multiple subject–verb pairs. This can create confusion for your reader. If you are working on a complex sentence and the relationships between your subjects and verbs seem to be murky or ambiguous, you might be wise to break it up into two or more smaller sentences. This reduces the risk of faulty agreement.

Pronouns

Pronoun–**antecedent** agreement is a common problem because writers often find it awkward to use the same noun repeatedly. Since pronouns stand in for nouns, they always have a specific relationship with a specific noun. This noun is called the antecedent. It is tempting to overuse pronouns because if, for instance, you are writing a paragraph about a male person, it is always easier and often simpler to name the person at the beginning of the paragraph and then refer to him as ‘him’ throughout the rest of the paragraph. The problem with this is that you are likely to use other masculine nouns at some point in your paragraph. Once you have introduced another noun that could be referred to as ‘he’ it becomes unclear who you are referring to if you continue to use the pronoun without re-naming its antecedent. Writers often fail to do this because they think it interrupts their flow or makes their paragraph seem choppy. A little bit of finesse might be required to overcome these problems but, ultimately, if ever you have a pronoun that could refer to multiple antecedents, you have no choice but to name the correct noun.

Dysfunctional Modifiers

Modifiers are words or phrases that *modify* other words or phrases. They add information that makes other words or phrases more specific, and often more colorful. Adjectives and adverbs are modifiers, as are all dependent clauses. The only thing that qualifies a modifier as a modifier is that it modifies something. If it doesn’t, or if its relationship to that which it modifies is unclear, it is a dysfunctional modifier. It is rare for writers to construct sentences that have adjectives or adverbs that do not seem to modify anything in particular, because such a mistake would be glaring and easy to catch. The more common type of dysfunctional modifier is called a ‘dangling modifier.’ These words and phrases are usually non-restrictive elements that are set off by commas and appear to be ‘dangling’ by their commas. They are ‘dangling’ because they are not firmly attached to the main clause by a clear relationship with the element of the sentence that they modify. Dangling modifiers, like

most dysfunctional modifiers, are simple problems to fix. There is always some missing piece of information that clarifies the modifier's relationship to that which it modifies. Adding this information creates a functional modifier. Consider the following examples of dysfunctional modifiers and their fixes:

Dangling modifier:

Having finished his mojito, White Snake* was playing.

Fix:

Having finished his mojito, Frank hit the dance floor where White Snake was playing.

* The eighties hair-metal champs White Snake did not drink the mojitos.

Dangling modifier:

The evening* was a lot of fun, cutting up the dance floor.

Fix:

The evening was a lot of fun, Frank and Miriam were cutting up the dance floor.

* The evening didn't cut up the dance floor, Frank and Miriam did – prompting rumors of a burgeoning romance.

Diction

Diction can be a difficult thing to get right. There is always a multitude of different ways to say something and the best choice is not always obvious. The only thing available to guide a writer toward the right choice of words is a sense of what they want the right word to be able to *do*. Because all words have a meaning, all words have something that they are able to do for the writer. Meaning, in this case, does not refer to the word's original usage or a current *Oxford English Dictionary* definition. These 'definitions' are rarely incorrect, but they can be incomplete. Meaning is only ever the significance that is invested in a word by the way people

use it in a given context (Kane and Ogden 1993). In academic writing, it is the way contemporary scholars use a word that gives it meaning. This meaning is what the writer is able to do with the word. The only thing that distinguishes a good diction choice from a poor diction choice is control over what the word does.

Controlling what a word does is challenging because words do a lot of different things. The first thing they do is 'denote.' This is the function that is closely related to their primary *meaning* (something like their definition in a dictionary). Words are designed to denote. The other thing they do is 'connote.' Connotation is the whole galaxy of associations a word can draw into itself. It includes everything a word implies, suggests, or even just hints at in the mind of your reader (Kane and Ogden 1993). Of these two things, connotation is the more difficult function to control. Academics usually try to use the most specific and precise words available to them in order to have the strictest possible control over what their words do for their sentences. This controls connotation. As a strategy, this only works if you are completely immersed in the literature of your discipline and you are confident you know what your specific, precise words are doing. It is a lot easier to misuse (or lose control of) a specific word than it is to misuse a generic word.

The Right Word

The right word is always purpose-specific. The most important question to ask yourself is whether the word you are using fulfills its intended purpose without bringing along any unintended connotations. The next criterion you can use in choosing the right word is the answer to the question, 'what is my context?' Words have all sorts of properties like tone, mood, tenor, register, field, and mode. These properties all pertain to the way a word fits in its context and the way a word's context influences what it does. The study of these properties is a very dense field of linguistics that tries to explain why some words are appropriate for certain tasks in certain contexts, while others are not. Fortunately, you do not have to understand this study in order to find the right word. You need only to ensure that it is as precise as it can be without being wrong, and that it is appropriate for the discourse that makes up its context. For students, this discourse is usually com-

prised of things like course readings, classroom discussions, and lectures. If you are ever unsure as to whether the word you want to use is appropriate, it is safer to err on the side of formality.

The Wrong Word

One of the pitfalls of writing in English is the unfortunate plurality and diversity of ways a word can be wrong. Poorly chosen words are not simply words that denote something other than what you want to say. You also need to consider all of the different conventions and protocols that determine good, clear, precise academic writing. A short list of the most important among these is provided:

1. **Colloquialisms:** Colloquial words are words that you would use in everyday conversation, but are generally not appropriate for academic writing. They can be used to foreground specific elements or to add emphasis, but only very rarely.
2. **Clichés:** Clichés are words or expressions that have been drained of their meaning by over-use. 'Dead' metaphors (like 'Mother Nature') will often be received as cliché by your reader. This kind of diction should be avoided.
3. **Hyperbolic Expressions:** Excessive hyperbole is often used to emphasize certain ideas that an author may deem to be very important (i.e. 'the biggest environmental issue facing our world today'). These kinds of expressions can make your writing seem like it is driven more by passion than by reason and should usually be reconsidered.
4. **Jargon:** Technical language is sometimes appropriate if it is used correctly. If it is used incorrectly or outside the appropriate context it is called 'jargon.' Technical language is usually very specific and misusing it can derail a whole sentence.
5. **Pretentious Expressions:** Pretentiousness results from an effort to use fancy, impressive diction where simple expressions can do the job (e.g. words like 'thus' and 'hence' are often read as pretentious). These types of expressions should be avoided in the interest of simplicity and clarity.

Using a Thesaurus

Thesauri are valuable tools if they are used properly. They can be very helpful when, for instance, you feel that you are using a word or expression too frequently and you are looking for a good synonym. The only rule that should determine how you use a thesaurus is that you should always know precisely what you want the word you are looking for to be able to do. With the convenience of online and Microsoft Word thesauri, some writers choose to consult a thesaurus when they are not quite sure what they want to say. This is a mistake that is likely to produce a poor diction choice. If you are not sure how to say what you mean, a thesaurus might be able to help; if you are not sure what you *mean*, patience is always the better solution.

Chapter 2:

Paragraphs



Introduction

Paragraphs are everywhere. Almost every form of written language, from sonnets to newspaper articles, is organized according to the principle that readers have an easier time following a sequence of ideas if it is broken up into logical, intuitive units. Patterns that mirror the way paragraphs work are even found in music and computer code, both of which also follow a specific structure in order to be more readily comprehensible to more people. What constitutes a paragraph depends on the medium in which it is being constructed, but the idea that individual sentences, lines, or notes that are designed to work together should be set off as a unit is almost universal. The reason is simple. People always find it easier to understand and assimilate small units of information than large units of information. Paragraphs allow readers to consume texts one bite at a time; without them, long texts become too much to swallow.

Paragraphs also have another important function. They force writers to organize their thoughts – or sentences – into sub-topics. An appropriate analogy might be that of a filing cabinet. If a report or an essay is a filing cabinet, and sentences are individual documents, then paragraphs are file folders. They organize the individual sentences so that all of the information that is relevant to a given point or idea is together. This allows readers to absorb each individual sub-topic on its own and then move on to the next sub-topic when they move on to the next paragraph. By collecting sentences that should work together and packaging them in units, paragraphs create an elegant solution to a fundamental human problem.

This problem might also be explained by a tennis ball analogy. If you throw a single tennis ball at someone and tell him or her to catch it, there is a very good chance that they will succeed. If, however, you throw ten tennis balls at once, the same person could very likely fail to catch any of them. Paragraphs take sentences that work together and stuff them into individual tennis balls, one for each sub-topic. The reader can then catch sub-topics one at a time.

Well structured paragraphs are crucial to successful academic writing because they perform this important organiza-

tional function. Poorly structured paragraphs, however, can have the opposite effect. Paragraphs that lack a guiding idea or cohesive development can confuse the ideas they are supposed to explicate. In order to ensure that paragraphs do what they are designed to do, a basic universal structure has emerged in academic writing. This structure helps to systematize the way paragraphs work and ensure that they are clear, readable, and complete. The purpose of the following section is to elucidate this structure and provide an explanation of its various components. This section is, in its essence, an anatomy of the academic paragraph. It describes each of the features that makes a paragraph a paragraph. It also emphasizes their importance in the production of successful academic writing. These features are not rules in the way in which each of the features of a complete sentence corresponds with a rule. Rather, they outline a structure from which a writer should only deviate with caution, intent, and the knowledge that they might be risking their reader's ability to catch the ball.

Topics and Topic Sentences

Paragraphs can be formatted in a variety of different ways, depending on the discipline in which you are writing. Sometimes the first line of a new paragraph is indented, and sometimes it isn't. A line space is frequently left between paragraphs, but it is just as common in academic writing for there to be no space. These formatting details are largely inconsequential. They are determined by trends, conventions, and institutional norms. All that really matters is that there is a clear typographic representation of the end of one paragraph and the beginning of the next. Whether it is a line space or an indent, these formatting details serve as a kind of shorthand for the organizing principles of the paragraph. Lines and indents, in effect, tell the reader: 'that was all I have to say about that, but now let me tell you about something else.' Formatting signals a specific structure to the reader. It indicates to them that each paragraph is *doing* something on its own. Because this is communicated to the

reader by formatting before they even read the first sentence of a paragraph, things can get confusing if the paragraph doesn't do what you say it is doing.

The Big Idea

Paragraph structure serves to coordinate the content of the paragraph such that the reader is given the sense that everything is working to support a single guiding idea. Formatting is part of how paragraphs are structured, but only a very small part. The most important feature of effective paragraph structure is the topic sentence. Every paragraph must have a topic sentence if it is to satisfy the claim made by the formatting. What the space or indent tells the reader is that you have told them everything you want to say about one big idea and you want to shift their attention to a new big idea, contained in a new paragraph. When your reader finds your topic sentence he or she understands why you've created a paragraph, and not just a loosely affiliated collection of sentences. They see what all the indenting and spacing is about. They then start to figure out that all of your supporting, promoting, defending, and inferring (the rest of the paragraph) is being marshaled and corralled into falling in line with the big idea. The topic sentence is what the paragraph is *about*. Paragraphs without topic sentences can, therefore, be read as being about nothing, and should be avoided in academic writing.

Strong Topic Sentences

Because topic sentences are so important, it is valuable to understand some of the attributes that are common to all good topic sentences. The following list outlines the most important among these attributes. This is not, however, a list of criteria. Strong topic sentences demand at least a little bit of creativity and intuition. They are often the hardest part of a paragraph to write.

1. **Appropriate Scope:** The topic sentence must encompass everything else that is said in the paragraph. This means that it should be broad in scope, but only as broad as it needs to be. If the scope of a topic sentence is too broad,

it will seem vague and unrefined. Finding the appropriate scope for a topic sentence is difficult because writers often intuitively write long complex sentences in order to cover everything they plan to say in their paragraph. This can result in unnecessary, even redundant specificity. It is always preferable to write a short, clear, simple sentence that is neither too general to effectively articulate the topic nor too specific to encompass the whole “big idea.”

2. **Malleability:** Paragraphs will often pull topic sentences in a variety of different directions in order to explore the different facets of the topic idea. The topic sentence must accommodate this, both by using the appropriate scope and by using language that is applicable to everything the writer wants to do with their topic idea. In the interest of preserving this kind of malleability, it can be advantageous to use more flexible language in a topic sentence and then refine your idea by using more specific, sophisticated language where it is warranted.
3. **Simplicity:** The topic sentence should be the least ambiguous part of a paragraph. It is where you state your point or idea as directly as possible. This is particularly important when writing in the natural sciences because the exposition of evidence and support can sometimes get complicated. If the reader is given a clear, simple, and direct statement of what a given paragraph is doing, they are likely to have more patience for the parts they struggle to understand.
4. **Relevance:** The topic sentence is usually the best place to begin explaining the relevance of the information contained in a paragraph to the larger purpose of the essay or report. These connections are made explicit by the inference components of a paragraph, but they should be introduced (or at least alluded to) in the topic sentence. If the topic sentence fails to establish the relevance of the topic idea, the paragraph might be considered unimportant or read as digression.
5. **Emphasis:** Topic sentences are often the most emphatic elements of a paragraph because they are used to grab the

reader's attention and focus it on a specific point or idea. They are a good place to tell the reader how important or interesting the topic idea is. The pitfalls of adding emphasis to a topic sentence include a risk of overstating the claim and eroding the author's credibility. Although emphatic topic sentences can make paragraphs more convincing or engaging, too much emphasis can be self-defeating.

Foregrounding Topic Sentences

Topic sentences can only be successful if they are recognizable. A good topic sentence should, therefore, be easy to identify. If it is the first sentence of the paragraph, this is not much of an issue. Since topic sentences need not always be the first sentence of a paragraph, it is worthwhile briefly discussing the ways in which the reader's attention can be drawn toward the big idea. The most common method of attracting attention to one specific sentence in a sequence of sentences is called **foregrounding**.

Foregrounding is a technique whereby one element in a text is set off from the rest by deviating from a pattern. In a paragraph, most patterns emerge from consistencies in **grammar** and **diction**. These patterns are, on some level, evident in all writing because all writers develop habits in how they construct sentences and which kinds of words they choose to use. Deviating from these patterns is one way to foreground topic sentences. If you tend to write compound or complex sentences, try writing simple sentences to foreground a topic idea. If you tend to favor very formal language, try using slightly more colloquial diction for topic sentences. Ultimately, the goal is to make the topic sentence stand out by somehow bringing it to the 'foreground' of the paragraph. There are a myriad different ways this can be achieved, most of which require some creativity if they are to work well. A little bit of experimentation can help with this; play with different ways to make the topic sentence special. Your reader should be unable to mistake your topic sentence from any other part of the paragraph.

Unity and Coherence

Unity is among the most important features of effective paragraphs. It is the quality that gives the reader the sense that every part of the paragraph is functioning as a part of an organized whole. Having a clearly defined topic idea expressed in a strong topic sentence is part of how unity is achieved, but ‘coherence’ is also a significant consideration. Coherence means that all of the various components of the paragraph are working in concert with each other to produce a unified point or idea. This might seem like a difficult concept to apply in practice, but there are simple methods you can use to make sure your paragraph is coherent. The easiest is to start with a topic sentence in your notes and, while writing, make sure that you are always aware of how each sentence you write relates to the topic sentence. If everything you write is anchored in your topic idea it should all be coherent.

Unity is also achieved through consistency in variables like **tone** and **voice**. Tone is the attitude toward the topic idea that the author projects; it is the quality that communicates the general disposition of the author. Like wine, tone can be described using just about any adjective in the English language, so there isn’t much use in trying to describe the characteristics it can convey. It might best be explained by the analogy of a party where everyone speaks some foreign language you do not understand. They are the only ones talking – how would you describe *their* attitude to what *they* are saying? What you would describe is their tone. Tone is important because if, as an author, your tone is erratic or inconsistent, your reader might get confused as to what you really want them to think about your topic.

Voice is similar, but slightly different. It is the manner, or distinctive style, of the author’s textual persona. Embedded in the voice are things like interpretive authority and analytical perspective. Voice is a difficult thing to control because it is something that many writers don’t even think about. They control their voice subconsciously. It is, however, something that all writers should be aware of. When proof-reading a paragraph, simply ask yourself if every sentence sounds as if it were written by the same person. The answer to this question will tell you whether or not you have achieved consistency in your voice.

Evidence

Inside every good topic sentence there is a central claim. It's like a mini-thesis for every paragraph. This is actually part of the function of the topic sentence. Topic sentences do not simply declare the subject of the paragraph; they also establish an idea. This idea then needs to be substantiated with supporting evidence. This evidence, and a strategic, methodical way of presenting it, is one of the things that characterizes academic writing. Among academics, everyone questions everyone else's claims and works hard to defend their own. It's all about asking 'why?', 'who says so?', and 'why should I believe you?' Evidence answers these questions.

Evidence can take many different shapes, not all of which have to be derived from sources. Figures, tables, and images are evidence; both quantitative and qualitative analyses are evidence; and logical constructions are evidence.¹⁰ Whether your evidence relies on external sources, empiricism, or reasoning, it always plays the same role in the structure of a paragraph. It is the substance. Evidence provides the legs for your paragraph to stand on. This is why it is important to use evidence carefully and present it correctly. If your reader begins to think your evidence is questionable or dubious, your paragraph will fall over, so to speak.

When to Use Sources and Why

Primary and secondary sources are kinds of evidence that some people find peculiar or awkward, but one that is nonetheless very common in academia. Scholarly writing is often so thoroughly steeped in secondary support that every sentence seems to have someone's name and a page number or date after it in parentheses (Giltrow 2002). Sometimes it can even seem as if nothing original is being said because everything is being attributed to someone else's work. This style of writing with sources is actually a central feature of the worldwide culture of academia. It is designed to acknowledge that good scholarship never takes place in a vacuum. There are always contexts and influences. One of

¹⁰ When you explain to your reader that, for example, if $a = b$ and $b = c$, then $a = c$, you are constructing a logical sequence that functions as evidence.

the common misconceptions among writers with limited experience in academia is that this style serves only to identify all of the scholars who are published as agreeing with the author. This method of using other scholars to corroborate an argument is one way to use sources, but it is not, by any stretch of the imagination, the only way to use sources.

The most important reason for using secondary sources is to situate an idea within the greater world of scholarly discourse. Using sources acknowledges an ongoing discussion and orients the author's idea in relation to other relevant work that has been done on the subject. The use of sources in this way gives rise to a very common kind of evidentiary construction. The following is a simplified example of what such a construction might look like:

The world has been proven to be flat (Anarchian 1357). Despite the broad consensus on this issue, recent arguments have emerged contending that the world might, in fact, have a sphere-like shape and could even be part of a heliocentric solar system (Galileo 1616). Fantastical as these arguments might seem, there is considerable evidence that they might have some validity. It is my contention, however, that the world is more likely to be a kind of oblong egg shape.

The first three sentences in this series serve as evidence for the last sentence because they demonstrate recognition of an existing discourse and situate the author's idea within that discourse. This also serves as a poignant demonstration of why secondary sources are used. Even the most ludicrous assertion is rendered more plausible if it is framed within the context of a legitimate scholarly discussion.

There are a lot of good reasons for using primary or secondary sources, ranging from an author's need simply to demonstrate that he or she has read the work of the leading scholars in their field to an effort to substantiate an otherwise spurious idea. The circumstances under which an author should not use secondary sources are, by comparison, slightly more clear-cut. They can be reduced to three simple rules:

1. **Do not** use a secondary source if you do not understand **exactly** what your source is saying. This means you have to

- read your sources very carefully if you intend to use them.
2. **Do not** use a source unless you intend to explain how *their* idea relates to *your* idea.
 3. **Do not** use a source as a substitute for a topic sentence or an inference.

When to Cite and When Not to Cite

The purpose of citation is to credit other scholars for their work and provide recognition for unique ideas. Almost everyone writing in an academic context knows that borrowing another scholar's words necessitates a citation. Some inexperienced writers, however, encounter problems when they neglect to acknowledge a source whose idea they have used, but whose language they have replaced with their own. Whenever a writer uses material, in any form, that is unique to another piece of writing, they **must** cite their source. This is not simply a matter of academic politeness or convention. It is strict protocol that must be observed for a piece of writing to be accepted in academia as legitimate and original.

Daunting as this system might seem to those for whom it is unfamiliar, citation protocol is governed by specific parameters. These are based on the simple criterion that an idea must be unique to a single source for it to warrant citation. Some ideas 'bounce around' between different scholars long enough that no one person can be credited with their genesis. In these cases, phrases like "there has been considerable scholarly debate about..." may suffice. The rule is grounded in the difference between ideas that come from one person or a small group of people working cooperatively and ideas that come from many different people. Consider the following examples:

1. The world is shaped like a sphere.
2. The world is likely to be a kind of oblong egg shape (Godsall 2006).

Of these two assertions, only the second needs to be cited. If you are unsure whether or not it is necessary to cite another author, always err on the side of caution. Failing to cite something that is someone else's unique idea is, after all, plagiarism.

Plagiarism

Plagiarism, the practice of deliberately failing to cite sourced material in written work, is taken very seriously in academic institutions. Instructors go to great lengths to make sure it is discovered when it occurs and rules are in place that mandate strict penalties for offenders. This may seem draconian, but it is the only sensible way to deal with the simple facts of the issue: citing is very easy to do; therefore, failing to cite must be indicative of a deliberate effort to pass sourced material off as one's own ideas. Another reason for the assumption that plagiarized material is always deliberately plagiarized is the fact that using sources honestly, and crediting them where credit is due, always benefits an author. Citing correctly is a way of demonstrating a critical engagement with a scholarly discourse. Writers want to make it as easy as possible for their readers to find their sources because their sources are evidence. A writer who plagiarizes an idea only gains one idea (and maybe a failing grade in the course). A writer who uses someone else's idea as evidence in support of their own ideas and cites it appropriately, gains a link to everything their source wrote on the topic and participation in the scholarly discussion. The bottom line is that it is in every writer's best interest to cite his or her sources.

How to Cite

When you use material that should be credited to a source, there are generally two places where you need to identify your source. The first is at the end of the sentence or group of sentences in which you use the source and the second is at the end of the essay. The in-text citation is always as brief as possible, so as to avoid interrupting the flow of the paragraph. The bibliographic citation provides all of the necessary details for your reader to be able to find your source. One of the confusing things about citation protocol is all of the different formats available to writers. You may have heard of MLA (Modern Languages Association), APA (from the manual of the American Psychological Association), Chicago, Harvard, and Vancouver. These are all established citation

formats that are used in a variety of different academic disciplines. In addition to these, most journals expect contributors to adhere to a specific, often unique, citation format, giving rise to a slew of other styles. In the natural sciences, the most common format is the Harvard system, but there are other common referencing systems used in disciplines where the specific referencing styles of influential journals have been widely adopted. In forestry, for example, the *Canadian Journal of Forest Research* citation format is popular, as is the CBE (Council of Biology Editors) style. In the social sciences, the most common format is the MLA system, but the Chicago system is also popular.

Citation styles have been standardized in order to ensure that bibliographic information is always communicated clearly. Journal articles often have both issue and volume numbers, as well as dates and page numbers. This can mean a lot of numbers to keep track of. Standardized formats are designed to make sure your reader knows exactly which numbers mean what, without your having to spell it out for them. They are supposed to make things easy. Unfortunately, things aren't easy if you don't know what format to use. The best advice there is for dealing with this problem can be summarized in three points:

1. Ask your instructor or supervisor which format he or she prefers.
2. If your instructor or supervisor does not identify a preference, use the Harvard system. Harvard is the most broadly endorsed standard for scientific writing. If you are writing in a discipline that is more closely associated with the social sciences, consider using MLA.
3. Consistency is the most important thing. Whatever format you use, make sure that you use it precisely the same way throughout your work.

In-text

In-text citation, often referred to as 'parenthetical' citation, identifies the author of sourced material immediately after it is used. This method is preferable to footnote citation be-

cause it doesn't interrupt the reader's flow by forcing them to look at the bottom of the page [e.g. (Godsall 2006)]. Here is how it's done:

- In MLA format, the author's name is followed by a page number or numbers indicating where in the source text the material can be found. A date is only provided if the bibliography contains more than one work by the author.
- Harvard format is similar, but there is no page number and the date is always included.
- In both cases all the required information is put in parentheses at the end of the sentence, but before the period.
- If you are sourcing more than one sentence to the same place, the citation belongs at the end of the last sentence that contains material that needs to be cited.
- If you start a new paragraph, but you are still using the same source, you must have citations both at the end of the first paragraph and at the end of the last sentence in the second paragraph that needs to be cited.
- If you are citing more than one source, use one set of parentheses and separate sources with semicolons.

Bibliography

Bibliographies are found at the end of an essay or report and they include all of the available bibliographic information for every source cited in the work. Good bibliographies are complete, completely consistent, and organized alphabetically.

Quoting, Paraphrasing, and Summarizing

Quoting sources can be an effective rhetorical tool, but only when done properly and carefully. Over-quoting is a common problem, as is the misuse of quotations. If a paragraph has too many quotations, or relies too heavily on one central quotation, readers will lose track of what the author has to say. They might even begin to think that nothing interesting is said in the paragraph that hasn't already been said somewhere else. This is likely to be the result of quotations used as substitutes for topic sentences or inferences. Quotations

should only be used as evidence or support and they are only successful as evidence or support if they are used properly. The following rules govern the appropriate use of quotations.

- Short quotations should be integrated into the sentence in which they are introduced, e.g. Galileo advanced the revolutionary argument that “the sun is the centre of the solar system” (Galileo 1616).
- If the quotation cannot be modified to fit in the sentence grammatically, as in the preceding example, it should be introduced with a colon: “as I have for this quotation.”
- If the quotation is longer than a couple of typed lines, it should start on a new line, separated by a line space, and be set off with an indent. These are called ‘blocked’ quotations, and do not require quotation marks because they are already ‘set off’ from the text by the ‘blocked’ format.
- If you modify the quotation, you must identify where and how using ellipses (...) for omissions and square brackets ([]) for insertions.
- Always copy quotations *exactly* as you find them.

Using quotations can be helpful in the production of persuasive writing, but only if it is done judiciously. The best reason to use a quotation is if the source author has managed to articulate an idea in a uniquely compelling or creative way and you find that his or her words are really the best way to communicate that idea. The easiest ways to avoid over-quoting are paraphrasing and summarizing. To paraphrase is to translate your source material into your own words and to summarize is to condense your source material, in your own words, so that it can be more easily accommodated while maintaining the flow of the paragraph. With both of these methods, citation is always warranted.

Evidence and Tense

There is an ongoing debate circulating around the issue of tense in the discussion of evidence. Some academics believe that, when discussing the work of another scholar, it is always preferable to use the past tense (i.e. ‘Smith argued

that...'). Their reasoning is that the past tense provides tacit acknowledgement of the fact that people sometimes change their minds after they write things. Others disagree with this logic because, they argue, the current state of an author's opinions is not relevant to the way their work is read and used by other scholars. These people believe that the present tense should always be used when discussing evidence derived from an outside source. In general, the present tense is the better rhetorical choice because it allows writers to create conversations between their sources without worrying about when things were said. The most significant exception to this advice is the discussion of primary research. When describing an original (primary) study, it is preferable to use the past tense because the conditions under which the study was conducted are liable to have changed.

Tables and Figures

Charts, tables, and images are all types of evidence. As such, they should be introduced and discussed as evidentiary elements in a paragraph. If they are not your own, they should include a parenthetical reference at the end of their caption and a full citation in the bibliography. The caption should also include a figure number. In your discussion of the visual evidence, you should generally refer to the figure number you have assigned. It is also important to pay attention to formatting and text-wrapping. If the formatting of your visual evidence is impeding the readability of your paragraph, it should be situated after the paragraph.

Inferences

If evidence answers the questions: 'why,' 'who says so?' and 'why should I believe you?' then inferences answer the question 'so what?' These kinds of sentences have two functions in paragraphs. The first is to establish the relationships between individual pieces of evidence and the topic idea. The second is to establish the relationship between the topic idea

itself and the larger thesis or purpose of the essay or report. Both kinds of inferences do basically the same thing. They explain to the reader what it all *means*. Despite this important role, inferences are often neglected in poor academic writing. It is often assumed by inexperienced writers that, for example, their evidence is self-explanatory and does not need to be discussed. This is a dangerous fallacy because it invites readers to doubt whether the author really knows what his or her evidence *means*. Even if you are writing for an audience that is familiar with your material, it is always worthwhile to explain things. One reason is that it gives you an opportunity to demonstrate that you understand what you are talking about; another is that it gives you an opportunity to provide an interpretation of your evidence. Inferences are how you get your evidence working for you. They are how you convince your reader that a quote, an image, or a source is on your side.

The second kind of inference that a paragraph needs is similar in that it also has an interpretive function. Some people describe these inferences as 'concluding' sentences. This a misleading title because these sentences should not restate or summarize anything. Instead, they should describe why the topic idea of the paragraph, along with all the evidence, support, and discussion invested in it, is relevant to the broader goals of the piece. These sentences provide an interpretation of the way the paragraph works within the context of the essay or report. Essentially, they tell the reader how to interpret the topic idea. Both types of inferences are essential for integrating individual elements into the fabric of a piece of writing. If you fail to provide inferences for your evidence, you run the risk of isolating it from the rest of the paragraph. If you fail to provide inferences for the paragraph itself, you run the risk of isolating the whole paragraph from the essay or report.

Paragraph Flow and Continuity

Paragraphs work because they unify and coordinate all of the information that is relevant to a given topic idea. This is only possible if the information is drawn together by certain **stylistic** and semantic features. Topic sentences and paragraph cohesion draw the content of paragraphs together, but there must also be unity in the way the content is presented. This is provided by paragraph flow and paragraph continuity. These features ensure that, in addition to being unified in their content, paragraphs are internally unified in terms of their construction and the way their individual elements link together.

Flow

Most style textbooks, in their efforts to explain flow, focus on the use of transitions. Transitions are important devices. They link two or more ideas together by identifying commonalities, thereby allowing the author (and the reader) to ‘transition’ seamlessly from one to the next. Unfortunately, the use of transitions cannot really be taught. Most people use them intuitively. Some textbooks offer lists of transitions with advice on how to use them. For example, “admittedly, although it is true that, granted that, naturally, of course, to be sure” are used “to indicate concession,” according to *A Canadian Writer’s Guide* by Finnbogason and Valteau (2006). These can be helpful, but they give the false impression that the expressions they list comprise everything a writer needs to know about writing transitions. They can also stifle creativity.

Transitions are only part of creating flow within a paragraph. Flow can ultimately only result from a persistent effort to make sure that every time you finish one idea you find a way to provide a ‘bridge’ to the next one. This bridge is anything you can think of to show how each sentence links to the next. Sometimes, as in a case where you have two closely related ideas, a bridge is not necessary because your reader can easily make the

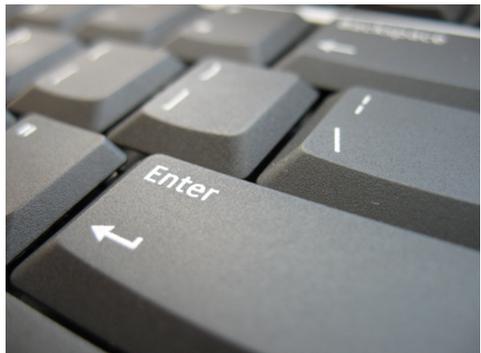
jump. Problems occur, however, when you have two ideas in a sequence that both relate to your topic idea, but do not ‘flow’ together easily. This can result in a paragraph that seems scattered and fragmented to your reader. The good news is that some patience and finesse is usually all that is needed to fix these problems.

Continuity

Continuity is easier to achieve than flow because, although it is a similar concept, it has less to do with the nuance of language and meaning, and more to do with structure and planning. It is primarily a function of the pattern around which the paragraph is constructed. This pattern can be really any arrangement of evidence and inferences, so long as there is a planned, logical, intuitive sequence. If it is a well organized and consciously maintained pattern, the paragraph will have continuity. Continuity fails when the pattern is conspicuously absent and individual sentences or pieces of evidence are isolated. These rogue elements interrupt the paragraph’s readability and can confuse the reader. This problem can be avoided by planning the way your paragraph will work and then following your plan.

Chapter 3:

Academic Genres



Introduction

Once you are able to write clear, concise, and complete sentences that are organized into cohesive paragraphs with all the requisite elements, you should be able to produce successful academic writing. Unfortunately, it's not always that easy. Sentences are the foundation of written language because they are the smallest unit of language that can express a complete thought. Paragraphs, composed of a series of interrelated, complementary sentences, are the next smallest unit of written language. Both sentences and paragraphs are universal. Anything written in prose English must have paragraphs made of sentences. Beyond these two elements, however, nothing is universal. Academics write everything from memos to lab reports to theses. All of these forms of document have sentences and paragraphs, but there are galaxies of variation in the composition of the different academic genres. This creates one of the most difficult challenges for inexperienced academic writers. Even if you can write complete sentences and organized paragraphs, you may not be able to create documents that satisfy the specific criteria of academic forms or follow all the little esoteric conventions of academic writing.

This chapter will help you to satisfy these criteria and learn these conventions by explaining why academics write the way they write. Every document has a purpose and every form has a function. Although the distinction between an expository essay and an exemplification essay may seem arbitrary, these two forms serve different purposes and work in different ways. Both advance an argument about a topic and both are constructed using sentences and paragraphs, but each uses a unique style, structure, and rhetorical strategy, all of which are tailored to the specific purpose of the essay. This chapter describes the unique stylistic, structural, and rhetorical features of the most common genres in the natural sciences with a view toward explaining how each serves a specific purpose. Understanding how these features work will give you a sense of how the conventions that govern academic writing have evolved and how the criteria against which academic writing is judged have emerged. With this understanding you should be able to write like a scholar of the natural sciences.

Essays

One of the common misconceptions about academic essays is that they are written according to a rigid structural formula. This might be explained by the common practice among secondary school English teachers of using the 'five paragraph essay' exercise to teach students how to structure their essays. This is an incredibly pervasive method. It goes by different names – like 'the sandwich essay' for instance – but the same basic concept is taught to school children all over the world. The problem with the five paragraph essay is that it is not an essay. It is an essay-writing drill. It has no place in a university. Still, because it is such a common exercise, university students sometimes have to unlearn some of the things that the five paragraph essay has taught them. Chief among these is the idea that there is only one way to write an essay. There are, in fact, many ways to write an essay – an infinite number of ways, even.

It's important to understand that there is no strict universal formula that makes an essay an essay because great essays are always custom-built for their author's argument. Their structure is usually as unique as their content. That being said, there are a few features that are common to all successful essays. Most writers understand that strong introductions and conclusions are on this list, but a number of other features, including a focused topic and a persuasive argument, also distinguish the successful essays from the less successful ones.

Genre Characteristics

Academics write within their own genres because academic writing is different from any other kind of writing. One significant difference is that scholars write as a means of presenting their research. To do this they must establish its relevance and defend its validity. They must also orient their work within existing scholarly discourses. This gives rise to another significant difference: scholars argue. The simple facts of the nature of research are that everything rests on contested ground, everything gets attacked (with varying degrees of success), and everything is eventually discredited. Some bodies of research, like

Darwin's *The Origin of the Species*, weather the criticism better than others, but eventually every preeminent scholar or seminal work gets dethroned. That's why it's scholarship and not gospel.

These differences distinguish academic writing from other kinds of writing, but they also engender some of the salient features of the essay genres. Academic essays have been shaped to a significant degree by the realities of writing within scholarly discourses. Janet Giltrow, in a book titled *Academic Writing*, points out that, although few undergraduate students write for the purpose of publishing their research in academic journals, "their writing shares features of the research genres." She argues that this is because of the nature of the information with which students work: "as students work with a particular type of research information, the style of that research genre becomes the most appropriate wording for them to adopt" (2002). In the case of the academic essay, 'the style of the research genre' is characterized by two things, both of which some students (and scholars) are reluctant to acknowledge. The first is subjectivity and the second is argument.

Subjective writing is not weak writing. Acknowledging your subjectivity in your writing simply means acknowledging *yourself* in your writing. To feign objectivity, as some writers do with stylistic features like the passive voice, is a detriment to the transparency of your writing, and thus also to the credibility of your research. Acknowledging yourself, by using first person pronouns and explicitly showing how you have engaged with *your* research, demonstrates confidence in your argument, the other dominant characteristic of the essay genre.

Some writers will try to pass off their essays as unbiased elucidation of the facts. This is misleading. Every academic essay is designed to persuade its reader of something. This is your claim. You establish your claim in your introduction and then you methodically support it with the controlled deployment of evidence throughout the body of your essay. Your claim should be clear; otherwise your reader will be left to figure out the relationship between your support and your claim by themselves. This is also important because a clear claim gives you a clear argument. It is better for your mode of persuasion to be overt than for it to be concealed. This doesn't mean academic essays

should flaunt the phrase 'I think.' To do so would be rhetorically crude and patently un-persuasive. Sophisticated arguments rely on artful constructions that persuade with subtlety. They also use diction that is suitable for the essay genre. This means thoughtful, specific diction that is neither too colloquial nor too formal, and is appropriate for the subject.

Planning

Topics and Proposals

Most unsuccessful essays are doomed before the first word is written. They fail because they were poorly planned or poorly researched. The latter results from laziness and the former usually results from ambition. Ambition is a problem because poor planning often starts with a poor choice of topic and bad topics are often ones that are just too big. Diffuse and vague topics fall under this heading, as do topics for which there is insufficient scholarly literature to produce a thoroughly researched argument. Undergraduate students in the natural sciences are often given a subject (or a list of potential subjects) by their instructor and expected to develop a topic. Sometimes they are given a list of specific topics, making things even easier. If you are not given a specific topic, you should be very careful when developing one. If your topic is too broad, you are almost certain to produce a patchy, meandering, and scattered argument. You are also likely to have difficulty maintaining the cohesion and continuity of your essay as you try to manage too much disparate information.

Students writing graduating essays and master's theses are usually expected to produce a proposal that includes a topic, a thesis, a methodological plan, and a preliminary bibliography. Even when they are not formally required, advisors and supervisors often demand proposals as a planning exercise. The reason for this is simple. These projects involve a lot of work and discovering months into a project that you are working with a topic or a plan that isn't feasible is always a very unpleasant experience. Proposals can also be a valuable exercise for less experienced writers. University essays are, after all, a lot of work at any level. If you are developing a topic and you want to be sure

it will be manageable, try working through a mock proposal in your notes. The best way to do this is to ask yourself the following questions:

1. What is the central question of this topic? Every essay presupposes a question that needs answering or a problem that needs solving. This question or problem is the hub of your essay. Anything that is not relevant to your central question is peripheral to your argument. Consider unburdening yourself of these bits.
2. What is my answer to the central question? *Your answer is your thesis.*
3. What is my strongest evidence? You should know what your most robust and persuasive support is going to be before you write your first word. Decide what your three best pieces of evidence are going to be and then think about how you want to present them. You can incorporate more support, but you should establish a hierarchy so that your weaker evidence falls in line behind the really good stuff.
4. What am I *not* going to write about? This is an important question. Your reader should be persuaded that you have engaged with all the relevant scholarly literature and that you have not chosen to ignore any one **discourse**. This must be reconciled with the need to limit the scope of your project. Herein lies the challenge of setting research parameters. You should decide at the planning stage what you need and what you can leave out. If you decide to leave something out, leave it out entirely.

Outlining

Outlines are another useful tool for planning an essay. They can be used in conjunction with a proposal or on their own. The basic premise of outlining is that, if you plan the sequence of your essay, it will be easier to write and ultimately better organized. For most academic writers this premise holds true. This is because preparing an outline forces you to think about the connections between individual pieces of evidence and develop a plan for how everything will work together. There is no single, correct method for creating an outline and most writers have their own

personal style, so don't worry about what it looks like. The only things that distinguish good outlines from poor outlines are detail and care. The more detailed your outline is, the easier your essay will be to write. The more care you invest in your outline the easier it will be to produce a well organized essay.

You should also consider the following two bonus benefits of preparing an outline:

1. If you have a detailed outline that establishes the sequence of your argument before you start writing, you are likely to achieve better flow and continuity between paragraphs and individual pieces of evidence.
2. If you prepare a detailed outline you are less likely to 'ramble' and meander off topic when you are writing.

Notes on Organization

The planning stage is where the 'shape' of the essay should be established. There are a number of things to consider:

Sequence of Evidence

- Successful writers structure their essays such that their evidence is presented in a strategic order.
- Popular strategies include both leading and finishing with strong evidence, while burying the weakest evidence in the middle of the 'body,' and progressing from weakest to strongest evidence, in order to produce a 'crescendo' effect.
- When planning the sequence of evidence, consider how you will link paragraphs together in the interest of preserving 'flow.'

Subheadings

- Subheadings are sometimes appropriate for longer essays, but they are not to be used as a bridge between unrelated elements. They are an organizational tool; they should not violate the flow of the essay. If there is a continuity rift between the last paragraph of one subject and the first paragraph of the next, the problem should be remedied in prose.
- Subheading titles should be relevant and informative, but concise.
- You must maintain consistency in the formatting of sub-

headings. All subheadings that are formatted the same way should be used for similar organizational purposes. If you have more than one 'level' of subheading, each level should be formatted consistently and readily discernable from other levels.

Gaps

- Gaps are the places in your essay where you do not have an adequate link to bridge two paragraphs or pieces of evidence.
- If you do not identify and eliminate gaps, your reader will hesitate and struggle to follow your argument.
- You should find the gaps in your essay at the planning stage because you might find that a major reorganization is required if the gap is to be eliminated.

Introductions and Conclusions

Introductions

Introductions can be challenging. Every 'how-to' book or web site will tell you that you need to 'grab' your reader's attention in the first few lines or risk his or her boredom, ambivalence, and doubt. There is some truth in this. A really good introduction can engage your reader and hold him or her captive for another 3,000 words, waiting to find the answers to the questions you raise and discover the insights you hint at with that solid gold introduction. The temptation to try and clinch the success of your essay with a brilliantly seductive introduction can, however, create some serious problems. The first is an introduction that doesn't actually *do* what introductions are supposed to do. This problem can arise if too much of your introduction is devoted to attention-grabbing and too little serves to actually introduce. Fortunately, this problem is relatively easy to avoid. If you want your introduction to work, make sure it does a few important things:

1. **Identify your subject.** This is the general field of inquiry in which you are working. If you are writing an essay that aims to compare texts by Gifford Pinchot and Aldo Leopold, your subject is early conservation literature and theory. The

parameters of this subject need to be established.

2. **Identify your topic.** The topic needs to be focused and specific. It should be identified explicitly in your introduction. The topic in this example is a comparative analysis of two early conservation texts.
3. **Establish your thesis.** The thesis is the single most important thing for a writer to communicate in an introduction. It is the one sentence that tells your reader exactly what you are going to argue. It is the whole point. An essay can be full of articulate arguments and robust evidence, but if it doesn't have a thesis statement it accomplishes nothing. These sentences don't have to be formulaic and dull, like they are in the five paragraph exercise (e.g. 'In this essay I will argue that...'), but they should leave no doubt in your reader's mind about what your essay is designed to prove.
4. **Indicate the structure of your essay.** Every successful essay has a clear methodology. This is your plan, it is how you are going to prove the validity of your thesis. In the body of your essay this plan should be well organized and methodically executed. All you have to do in your introduction is give your reader a rough sense of how it is going to work.

The second problem that you are liable to encounter when writing an introduction is cliché, and it can be somewhat harder to avoid than the first. In the course of your schooling, you may have been instructed to use rhetorical questions in your introductions, or told to include a tantalizing quote. These techniques can work, but they can also be perceived as trite or banal. Academic essays are not news bulletins. It is important to capture your reader's attention, but more important to tell them what you are writing about. Instead of leading with a Winston Churchill line from *www.quotes.com*, try piquing your reader's curiosity with subtlety, nuance, and suggestion.

Conclusions

Conclusions can present academic writers with some of the same challenges as introductions. Like introductions, they have to perform a specific function and, as a result, there is always a risk that they will be boring and formulaic. Their function is to

summarize the argument, remind the reader of the thesis, and provide an appropriate, but memorable closing. The easiest way to write a functional conclusion is to use sentences like ‘as I have argued...’ These, however, won’t leave much of an impression on your reader. You can avoid these types of constructions by finding new ways to articulate the threads that run through your argument. Despite the old adage that ‘one should never introduce new information in the conclusion,’ your conclusion *can* be a good place to make connections between your inferences that you haven’t made anywhere else. If you then show how these connections support your thesis, your conclusion will work well because you will have indirectly summarized. You will also have avoided the phrase ‘as I have argued,’ and the sudden-onset narcolepsy it can bring with it.

Another thing to think about when writing a conclusion is length. This may seem trivial, but it’s probably more important than you realize. Even if your conclusion does everything it is supposed to do, if it is too short, your essay will seem truncated. Your reader will think you just got bored and stuck three sentences on the end to tie it off. Conversely, if your conclusion is too long, it will lose its poignancy. No one likes an essay that drags on after everything is said. For academic essays, one complete paragraph is usually sufficient. If you are writing a thesis or a long essay, you might want to conclude with multiple paragraphs.

Research Essays

Research essays are the most common type of essay written by undergraduate students. They vary in length and structure, but all research essays are used for the same purpose: to advance a thesis simply by building and demonstrating in-depth knowledge of a topic. Most undergraduate term papers can be categorized as research essays because instructors use these assignments as a tool for compelling their students to engage with scholarly literature. These types of essays rely heavily on secondary sources as evidence and their success often depends on a writer’s ability to read carefully and critically, then find the connections and contradictions within the body of research with which they are working. Arguments should focus on criti-

cal readings of secondary sources. As a result, research essays require meticulous planning and a degree of rigor applied to the information-gathering phases of writing that might not be warranted for other forms. The following three sub-categories of research essays are common, but by they are by no means the only types of research essays university students write.

Literature Review and Analysis

Literature review essays are the most straightforward type of research essay. They are frequently short (fewer than 2,500 words) and narrowly defined. They can focus on one author or on a series of authors within a given discourse or subject. The most important thing to remember when writing a literature review essay is that it is not a book report. Your reader is far less interested in what the book (or article) you are reviewing is *about* than in a critical analysis of how it *works*. Literature review essays sometimes incorporate brief summaries of their subjects, but the purpose of a literature review essay is to evaluate the successes and failures of the subject. When you start a book review, you should read your subject very carefully (more than once), then ask yourself a few questions:

1. Am I convinced of the validity of the author's argument?
2. Is the author's methodology successful?
3. Are there some parts of his or her argument that work less well than others?
4. Is there any reason to cast doubt or suspicion on their research or conclusions?
5. What are the weaknesses of this piece in terms of research, and in terms of methodology? What could they have overlooked or ignored?
6. Do I agree? If I don't, why not?

Definition

Definition essays are another type of short research essay. These are common as small assignments or exam questions, particularly in less senior undergraduate courses. They qualify as research essays because they are designed to answer questions like 'what do you know?' and 'what have you read?' These

questions are usually embedded in an instruction like 'define and explain the significance of...'. The idea is to take a term or concept and use it as a kind of touchstone for a larger body of information or research.

This is a popular trick among instructors because they can either pick something obscure enough that the student is forced to become familiar with a specific body of research in order to answer the question, or they can pick something that sounds generic but has a specific point of reference. In the latter case, students who have engaged with the body of research from which the reference is drawn will produce essays that are very different from those produced by the students who have not. If the concept, for instance, is 'the spirit of capitalism,' those who have not read Max Weber's famous treatise will be able to answer the question, but according to very different parameters than those who have. When writing definition essays, remember to be as concise and specific as possible. Also remember that 'identify the significance of' is usually the more important component of the question. Your essay should focus on the unique relevance of the term or concept to the specific field of inquiry in which you are working.

Expository Essays

The term 'expository' is a relatively broad catch-all for types of essays that are designed to be informative and descriptive in nature. Expository essays usually use a tone and voice that targets a reader who is presumed to be less informed than the author. On some level, all academic writing is expository in nature; however, an essay that is designed to serve an expository purpose will have certain characteristics that other essays do not have.

Where other types of essays are designed to show the relative merits of an argument and counter-argument or two schools of thought within a given discourse, expository essays are written in a style that reflects certainty and conviction. These kinds of essays are concerned with material that can be communicated as fact. They are characterized by the implicit phrase 'this is the way it is, for those of you who don't know.' This doesn't mean that expository essays do not advance and

defend an argument. They do, but they are different from other essays because they are so poorly equipped to deal with complex argument-counter-argument dynamics. They are, by virtue of this limitation, the most basic form of essay.

Comparison Essays

Comparison essays are common in a wide variety of academic disciplines. They are the simplest and most thoroughly distilled manifestation of what academic writing is all about. They are the defense of the position that their author occupies within the context of a given discourse. There are three types of comparison essays: those that compare the author's argument with someone else's work, those that compare the author's argument with two or more other peoples' work, and those that compare two or more other peoples' work. All three of these types of essays do precisely what expository essays usually fail to do: they evaluate the relative merits of an argument and counter-argument or two schools of thought in a (real or hypothetical) scholarly dialogue. Beyond this function, they do one (or both) of two things: they categorize or they pick a side and advocate its superiority.

When it comes down to these last two functions, comparison essays work somewhat like magazine comparisons of consumer goods. If you read a review of three different products in a given market segment – say three different compact cars – the author will either tell you which car is the best and why, or they will tell you why you might want to buy each of the three. It's either 'the Toyota is the best and here's why,' or it's 'buy the Nissan, if you want performance; the Toyota, if you want comfort; or the Honda, if you want economy.' It might also be the latter, followed by 'I'd go for the Toyota.' This is what comparison essays do. This simplicity is part of the reason comparison-style essays are so popular. They are easy to structure and establishing a clear, cohesive argument can be relatively straightforward.

Case Study Essays

Case study essays are common in the natural sciences because very little research is done purely in the realm of the theoretical; most research is conducted with specific reference to a specific situation. Essays that take a real life situation as a subject, then apply research to that situation and develop an argument and an opinion about it, are called case study essays. Almost any kind of essay can use a case study as evidence in support of an argument, but these essays are distinguished by the fact that the argument is about the case study. In some essays, the argument is the case study. When writing these essays, be very careful to ground every part of your argument in the case study itself. The whole point of this type of essay is to apply research, theory, and analytical rigor to the situation in question. Naturally, then, failing to adequately form the connections between your argument and your case study is a terminal problem. Be specific about how your ideas are relevant and how your research applies.

Exemplification

Exemplification essays are essays that use a case study (or more than one) as their primary means of developing an argument. These essays operate in two (usually distinct) ways. The first is to 'test' a theory or hypothesis by applying it to a real life situation and evaluating its success in explaining that situation. These types of essays have titles like 'Canadian Fisheries: A Tragedy of the Commons.' The second is to make a claim and show that your example(s) validate your claim. These types of essays have titles like 'The Failure of Canadian Conservation Policy as Exemplified by the Collapse of the Atlantic Cod Fishery.' Both of these types of essays, like most case study essays, are successful only if they are thoroughly grounded in the situation that serves as the example.

Narrative Essays

Narrative essays are a lot like exemplification essays. They use case studies as their primary means of developing an argument and their success depends mostly on how well they are able to forge the links between their ideas and the example(s)

they use. What makes narrative essays unique is that they form an argument through the telling of a story. It is rare for narrative essays to be assigned in undergraduate classes, but it is, nevertheless, worthwhile for any writer to understand how this format works. A narrative structure can make a dry, boring topic more compelling and an obscure or esoteric topic easier to engage with. This holds true for both the author and the reader.

The idea of the narrative essay is to discuss a given case study, and formulate an argument about it, by telling a story. The story guides the structure of the essay and leads the reader through an exploration of the case study. This provides the basic framework of the essay, but throughout the telling of the story the author also explains the significance of the situation in the broader context and the relevance of the story to his or her argument. An example might be an essay that discusses the collapse of the Atlantic cod fishery through a story about a Grand Banks trawler captain. The story, in this example, would provide the apparatus for a discussion of the complex socio-economic landscape in which the conservation issues associated with over-fishing are situated. This can be an interesting alternative to the more prosaic essay formats, but when writing a narrative essay, be sure that you are developing a clear argument, not just telling a story.

Normative Essays

Every type of essay that academics write can be categorized according to one simple binary: there are **normative** essays and there are **empirical** essays. All of the above types of essays are considered empirical essays because they are concerned primarily with 'the way it is.' Normative essays are different because they are concerned with 'the way it should be.' Empirical essays are essays that rely on observation. Whether it is the author's own observations that form the foundation of his or her argument, or those of another scholar whose work they employ as evidence, empirical essays are all about that which can be observed in the world right now. Normative essays use many of the same structures and strategies as empirical essays, but their purpose is different. Normative writing is used to advocate

a future course of action or a desirable change that should be pursued.

This kind of writing is considered by most instructors in the natural sciences to be more advanced than empirical writing. This is not because normative essays are hard to write; it is because good normative essays are *very* hard to write. Observations about the present are far easier to support than ideas about the future. Normative arguments must, therefore, be more carefully constructed, more tightly woven, and more robust than empirical arguments. Still, many undergraduate students are expected to write normative essays because normative writing is a big part of what professional academics do. Conservation scholars, for instance, devote a great deal of time to the analysis of current conservation policy, but they also advocate change by writing articles that argue the potential benefits of proposed new policy.

When writing a normative essay, it is important to understand that the argument-counter-argument dynamic can be slightly more complicated than that which is found in an empirical essay. Strong normative essays successfully show both that the benefits of the change they advocate outweigh the drawbacks and that the idea they promote is preferable to all the alternative ideas. Weak normative essays make no mention of drawbacks or alternatives. This mistake is akin to that of neglecting to address potential counter-arguments in an empirical essay and engenders the same doubt and skepticism in readers. This issue of addressing alternatives is typical of the kinds of challenges that make normative essays such an exacting undertaking. It's also indicative of the importance of normative writing in both academic and public discourse. Every policy decision a politician makes and every meaningful change in the way people interact with their natural environment is the result of a normative argument that grew out of someone's idea of the way things should be.

Reports

The ability to write effective scientific reports is a very specialized skill. Only certain kinds of academics write scientific reports and only certain kinds of academics read them. The style, structure, and format of this genre reflects this degree of specialization in that all of these features are governed by universal models and strict criteria. While almost anything that makes an argument with sentences and paragraphs can be considered an essay, a scientific report must follow certain guidelines just to qualify as part of the genre. The language of scientific writing is carefully controlled, down to the smallest details. If essays can be compared to free verse poetry, then scientific reports are more like sonnets.

Scientific reports are different from essays for more reasons than the stylistic discipline required to write them. Authors of essays generally try not to assume that their readers are as familiar with their subject as they are. Essays explain things. Scientific reports also explain things, but the target audience is usually people whose scientific credentials are comparable to those of the author. Writing reports is more about describing research to people who do similar research than it is about explaining things. Beyond this difference, there are the parallel issues of simplicity and specificity. As a communication medium, essays are built with relatively loose tolerances. Essay authors are concerned with persuading their reader that their argument is well reasoned and well supported. They do not need every detail of their argument to be received precisely as it was transmitted. It is less important that their words *mean* exactly what they should mean than it is that their words *work*. Scientific writing is different: precision is paramount.

Consider the analogy of vinyl records and compact discs. Essays are like an analog medium and scientific reports are like a digital medium. When you hear music that was recorded on vinyl, what you are hearing is a good representation of what the musician recorded. If it sounds good, it works. Essays are like vinyl records because, while readers might not be able to walk away with exact duplicates of the author's ideas in their heads, if the essay works, they are able to understand the concepts and

the arguments. Scientific reports, by comparison, are like CDs because they are designed to enable precise and efficient transmission of information. When you listen to a CD you hear the music exactly as it was recorded. Scientific reporting is comparable because it demands meticulous control of language in the interest of ensuring that the information contained in a report is received (read) exactly as it was recorded.

Genre Characteristics

The stylistic guidelines that govern scientific report writing are designed to ensure that the tandem goals of simplicity and specificity are met. The basic rules are relatively easy to intuit and hold true for most academic genres. These guidelines can be summarized by the following list:

1. Never write one long, convoluted sentence when you can write two simple, grammatically complete sentences.
2. Use the simplest language that means what you want to say and only use technical language if you are sure it is appropriate.
3. Avoid qualifying statements where possible. This means using absolute constructions (like 'it is') when you can. Qualified statements (like 'it is sometimes considered by some people to be') are both weak and confusing. Although qualifiers like 'might' or 'could be' are often necessary to accommodate complexity or uncertainty, it is important to avoid unnecessary or repeated qualification.
4. Eliminate redundancy wherever possible. Say things as clearly as you can, so that you only have to say them once.
5. Avoid using a non-human agent (Tischler 2006), for example: 'The report concluded that...'

In addition to these guidelines, there are also a few standards that apply specifically to report writing. Many of these concern the integration of statistics, formulae, tables, and figures, all of which are common in scientific reports. The rules are as follows:

1. Formulae should be set off on individual lines.
2. Common formulae (e.g. a standard deviation) do not need

to be explained, but more obscure formulae do.

3. If you include a table or figure, you should make reference to it in the text. All tables and figures should be numbered, accompanied by captions, and referenced (if necessary).
4. Appendices should also be numbered and referred to by number.

Also, concerning abbreviations:

1. Use standard abbreviations when citing scholarly journals.
2. Abbreviations and acronyms should be spelled out (with the abbreviation or acronym in parentheses) the first time they are referred to in the text. For example: 'The North American Free Trade Agreement (NAFTA) is a free trade agreement.'
3. Common scientific notation and units of measurement can be abbreviated without being spelled out.

The last thing to be aware of when writing report-style documents is the use of the passive voice. Passive constructions are, as in every academic genre, generally to be avoided. With respect to scientific reports, this is because passive constructions are both less simple and less specific. Passive sentences (like 'it was discovered that...') have a subject that is acted upon by some unnamed or implied agent and, in scientific reports, nothing should be left unnamed or implied (Tischler 2006). Passive constructions are also usually less direct and easy to read than active constructions (Gustavii 2003).

The reasons for favoring the active voice are many and manifold; however, there are some cases in which the passive voice is appropriate. These are when the actor in a sentence can reasonably be considered less important than the action. You might, for example, find this to be the case when writing the methods section of a laboratory report. As a rule, if there isn't a reason to obscure the actor in a sentence, the active voice is preferable.

Components of a Scientific Report

Reports are usually composed according to a specific formula. This formula has emerged as a result of a tacit consensus among scholars as to how scientific reports should be constructed and

what components they should include. Since this consensus is now many decades old, the formula has become an almost universal standard. Some scientific reports truncate or leave out certain components (either in the interest of brevity or to avoid redundancy) and others include components that are not on this list (usually to accommodate a specific research methodology). Many reports use extended introductions or discussion sections to provide additional information. Others present extensive results sections and provide limited discussion. All of this depends on the purpose of the report. For general purposes, or for reports that are designed to conform to the 'classic' model, the following list details the components of a successful scientific report. If you are at all uncertain as to what components your report should have, you should consult your instructor and examine some of the contemporary work being produced in your field.

Title

- According to Marc Tischler of the University of Arizona, "a title should be the fewest possible words that accurately describe the content of the paper" (2006).
- Also consider that specific, descriptive titles help readers to figure out what you're talking about.

Abstract

- The University of British Columbia Faculty of Graduate Studies web site states that the maximum length of an abstract is 350 words.¹¹ This seems like an arbitrary number, but it isn't. If a report is published, the abstract will be listed as part of the full citation provided by online bibliographies. These services only allow 350 words and cut off abstracts that run longer.
- In 350 words you should be able to describe the problem your report is designed to solve, provide a summary of your research methodology, and briefly explain your conclusions.
- Do not include any *discussion* of your results or any supplementary information. Abstracts should be limited to the absolute bare essentials.

¹¹ UBC Graduate Studies thesis specifications and policies can be found at <http://www.grad.ubc.ca/students/thesis/>

Introduction

- The most important thing to communicate in an introduction is the purpose of the research. Your report has a purpose; there is something you are trying to discover. Your reader should know exactly what this is as early as possible.
- Establish a hypothesis. This doesn't just mean what you think your research should prove (or disprove). It means understanding and explaining some of the norms and assumptions that shape your expectations for your research.
- Explain why the research you are doing is important. What problems are you solving? What questions are you answering?
- Contextualize your research with relevant literature. Provide your reader with an understanding of where your work fits within the existing body of research. This will give you an opportunity to restate the importance of your work as you explain what research has been done and what research still needs to be done.

Methods

- Your introduction should flow smoothly into your discussion of your methodology. In the introduction you explain what problems there are to be solved (or questions to be answered) and in your methods section you explain how you intend to solve (or answer) them.
- The methods section should be as detailed as possible. Your reader should be able to reproduce everything you did *precisely* as you did it and yield the same results (where possible).
- The use of the past tense and the passive voice is usually appropriate in this section.

Results

- Your results section should include all of your significant findings presented clearly and in an organized way.
- Do not present raw data. Present neatly processed and packaged data.
- You should identify trends in your findings that are significant to your conclusions and highlight anomalies or interesting details.

Discussion

- The discussion section of a scientific report answers questions like ‘who cares?’ and ‘so what?’
- This is your chance to persuade your reader that what you have discovered is significant.
- You should return to some of the contextual research you discussed in your introduction and explain how your findings fit within the larger context of established work in your field.
- Revisit your hypothesis and discuss how your findings fit with your earlier assumptions and expectations. Are they confirmed or contradicted?

Conclusions

- When you conclude a report you should reflect on your methodology. What could you have done differently? What errors in the design or execution of your research methodology impacted your findings?
- Provide a brief summary of your research.
- Close with a brief discussion of how your research contributes to the working knowledge of scholars in your field. What have you observed that is new and interesting?

Laboratory Reports

Laboratory (or lab) reports form a genre that requires very careful attention to certain style, structure, and formatting issues. It is rare for any of the above components to be omitted from a lab report. Undergraduate students usually encounter lab reports as assignments designed to present the findings of an experiment. These assignments are characterized by certain properties that are not common to all scientific reports. The experiments for which these reports are prepared generally follow strictly regimented procedures and, as a result, the findings of these experiments should conform to the expectations detailed in the introduction. If the results defy expectations or the hypothesis is not validated, it is important to explain why.

Lab reports generally have more limited introduction and

discussion sections that are less concerned with broader contextual issues than those found in other types of scientific reports. However, they frequently have more extensive and detailed results sections that feature a large amount of data presented with less interpretation. When writing a lab report, take care in preparing your methods and results sections.

Other Types of Assignments

Briefs and Memoranda

Briefs

A brief is a document that condenses a large and detailed body of information into something that can be quickly and easily assimilated by a reader with basic knowledge of the subject. The information can be a presentation, an experiment, a body of research, an issue, or just about anything else. Briefs summarize the information, present the key points, and offer a few interesting details. They can include bulleted points, but they should be written at least partially in prose. They can include diagrams, figures, tables, images, or any other type of visualization that can help to communicate a lot of information quickly and clearly.

Since most briefs are only a few pages long, good briefs are selective with the information they include and economical in the way they are written. Concision is prized over sophistication and detail. When deciding what information to include and what information to leave out, imagine you are preparing the brief for your employer. He or she is a very busy person and expects to be able to learn everything they need to know about your topic in only a few minutes. Maybe they missed a presentation you gave and need to know the important points, or maybe they need a crash course in an issue affecting your business. Either way, they need to be able to extract everything important from your brief as quickly as possible and without being distracted by surplus detail.

Memoranda

Memos are written in the same style as briefs, but they are composed according to a slightly more formal structure. This structure can be summarized by the following guidelines:

1. Memo titles are concise, specific, and informative, just like memos themselves.
2. Every memo should have headings identifying their recipient, author (with title), date, and subject (brief and specific), in that order.
3. Memos begin by identifying their purpose and providing a one or two sentence summary of their content. This section of a memo is sometimes called an abstract.
4. Memos conclude by outlining the specific relevance or significance of their content and briefly restating key points.
5. If you use sources, they must be cited as they would be in any other type of document.
6. Because they are so brief, formatting, spelling, and grammatical errors are obvious in memos. Don't make them.

Annotated Bibliographies

Annotated bibliographies can serve a number of purposes. They are sometimes included with research proposals as a way of showing what each source contributes to the argument. They can also be used as a planning tool for prioritizing and evaluating sources. Undergraduate students encounter annotated bibliographies mostly as short assignments. Instructors use annotated bibliographies to test their students' research skills. When writing an annotated bibliography, focus on how each source is different from the others and what (if anything) makes it valuable. Annotations are usually only a few sentences and should never exceed a paragraph. In those few sentences you should be able to describe where the source fits both within the context of your research and within that of the larger body of research in the field. You should also be able to identify its thesis, its strengths and weaknesses, and the dominant features of its methodology.

Plans

There is a broad spectrum of undergraduate assignments that can be categorized as plans, all of which share a few basic features. Since plan-type assignments focus on future scenarios, they are concerned primarily with anticipating and discussing things like timelines, potential impediments, risks, and alternative plans. They usually begin with contextual information and research pertaining to the social, political, ecological, and commercial environments in which the plan is to be executed. They then proceed through the details of implementation and conclude with a discussion of potential problems or challenges. Successful plans are thorough, detailed, and thoughtful.

Business Plans

One of the most common types of plan assignments is the business plan. Because there are so many variables to consider when developing a plan for a viable business, these assignments have a long list of components, each of which addresses a different series of factors. The basic components of a business plan are as follows:

1. **Executive Summary:** This section should be no more than a few pages long, but be able to effectively communicate the viability of the business concept.
2. **General Description:** This is the introduction to the business. It includes the company's name, legal and financial status, history, location, and management structure. This section should also include a mission statement.
3. **Industry Analysis:** Industry analysis includes anything a potential investor might want to know about the prevailing trends and dynamics, both in your economic sector and within your industry.
4. **Market Analysis:** You should identify the nature of your market in economic, demographic, and geographic terms.
5. **Competition:** Your discussion of your business's potential competition should identify barriers to entry and market share distribution. You should also discuss where, in your industry, you think the greatest opportunity lies.

6. **Strategic Position and Risk Assessment:** What are the potential risks to your investors and to what degree can they be mitigated?
7. **Marketing Plan:** This section defines your marketing strategy in terms of product, place, promotion, price (the four Ps), and target markets.
8. **Operations Plan:** This section provides a thorough and detailed description of the day-to-day operations of your business. This includes things like supply management, inventory control, customer service, and production.
9. **Management and Organization Plan:** Describe the management structure of your business and identify the management style you expect to employ, with consideration given to social responsibility issues.
10. **Timeline:** How long will it take you to get things running? When do you anticipate meeting your goals? At what point do you 'get out' (your exit strategy)?
11. **Financials:** Demonstrate financial viability by providing balance sheets, cash flow projections, income statements, and other important financial details.

Journals

Journal assignments are common in courses that have a large fieldwork component. The purpose of a journal is to aid in compiling field notes, research notes, and observations. They are generally written informally and are rarely structured according to a defined model. When keeping a research journal, the most important thing is to be consistent in the way you compile and present information. Efforts should also be made to be as detailed and thorough as possible, because in many cases you won't have an opportunity to revisit your research site to fill in the blanks.

Bibliography

- Finnabogason J, Valteau A. 2006. *A Canadian Writer's Guide*, 3rd Ed. Nelson.
- Giltrow J. 2002. *Academic Writing: Writing and Reading in the Disciplines*. Broadview Press.
- Gustavii B. 2003. *How to Write and Illustrate a Scientific Paper*. Cambridge University Press.
- Kane TS, Ogden KC. 1993. *The Canadian Oxford Guide to Writing: A Rhetoric and Handbook*. Oxford University Press.
- Tibbetts AM, Tibbetts C. 1987. *Strategies of Rhetoric, With Handbook*, 5th Ed. Scott Foresman.
- Tischler ME. 2006. *Scientific Writing Booklet*. The University of Arizona. Available at: <http://www.biochem.arizona.edu/marc/Sci-Writing.pdf>
- Truss L. 2003. *Eats, Shoots & Leaves: The Zero Tolerance Approach to Punctuation*. Gotham Books.

Glossary

Agency	Influence over an outcome. Having power or controlling action in a given situation.
Clause	Clauses are phrases that contain both a subject and a verb, but are not punctuated as sentences because they lack sufficient information to express a complete thought.
Discourse	A dynamic conversation between scholarly texts taking place over an extended period of time. Discourse is the fabric of intellectual exchange that drives the perpetual critique and revision of research.
Emphatic	Designed to produce emphasis.
Empirical	Derived from observation. Empirical research is concerned with describing the world as it is.
Foregrounding	A technique used by writers to draw attention to specific features of their work or to important elements. Foregrounding is usually achieved through controlled stylistic variation.
Formatting	Formatting is the arrangement of type on a page. It is relevant to organizational features, like subheadings, but is composed mostly of layout details, like indents and spacing.
Grammar	The rules according to which sentences are written and read.
Jargon	Technical language used improperly.
Normative	Normative analyses are concerned with the discussion of the way things ought to be.
Phonetics	The study of the way language sounds.
Phrase	A phrase is two or more words that do not constitute a clause.

Plagiarism	Plagiarism is the use or representation of the original ideas of another author without acknowledging them as such and according to recognized standards.
Readability	The measure of ease with which a text is read and understood. Readable texts are clear and easy to follow.
Register	The unique style and tenor of the language used in a given discourse.
Rhetoric	The art of persuasion. The strategic use of language in the pursuit of an objective.
Semantics	The study of meaning in language.
Stylistics	The study of style in language. Style is the complete set of textual features, including grammar and punctuation, that comprise a given mode of written communication.
Syntax	The patterns in the arrangement of words in written language and the rules that govern them.
Tone	An author's attitude toward his or her subject as it is communicated in the text.
Voice	The stylistic and semantic construction of the author's textual persona in a written work.

Parts of Speech

Adjective	Adjectives are words that describe nouns, like 'descriptive.'
Adverb	Adverbs modify verbs, clauses, and adjectives. They are often identifiable by the suffix 'ly.' For example: 'quickly,' 'gently,' and 'deliberately.'
Antecedent	In grammar, an antecedent is the noun for which a pronoun substitutes.
Article	'The,' 'a,' and 'an' are the only articles in English. These words modify nouns by distinguishing them as either specific or generic.
Conjunction	Conjunctions are words like 'and,' 'however,' and 'but' that join together two or more words, phrases, clauses, or sentences, and describe their relationship.
Noun	Nouns are words that signify people, places, or things.
Pronoun	Pronouns are words like 'he,' 'she,' 'it,' and 'they,' that can substitute for nouns that are named elsewhere.
Receiver	A receiver is a word that completes the meaning of certain types of verbs by naming the person, place, or thing that is acted upon.
Verb	Verbs are words that describe action. All verbs must be formed according to their tense and person.
Version	The state of conjugation or inflection in which a word is found.

Appendix 1

Sample Templates

Sample Letter Template

[Date]

[Your Name]
[Your Address]

[Recipient's Name]
[Recipient's Title]
[Name of Organization]
[Address]

Dear [Recipient's Name]:

Re: [Subject of letter]

First paragraph: Include introductory information as you would in a regular essay. For example, you might want to introduce yourself, why you are writing, and state your main point(s). This paragraph should grab the reader's attention and provide the reader with a good idea about what is coming up.

Body paragraph(s): As in an essay, expand on your points here. Remember that each paragraph should only deal with one central idea.

Last paragraph: Restate your main point(s), summarizing your letter. You might want to close the letter by requesting some form of action.

Sincerely,
[Your Name]
[Title]

Thesis Title Page Template¹²

A NEW SYNTHETIC DYE

by

SANDRA MARIE SMITH

B.Sc., The University of British Columbia, 1997

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

in

THE FACULTY OF GRADUATE STUDIES

(Sociology)

**[The above must be the name of the graduate program in
which you are registered.**

**Please do not put Faculty, Department, Institute, School,
Centre, or Program]**

¹² Sample title pages are available from the UBC Graduate Studies website at www.grad.ubc.ca/students/thesis/

Appendix 2

Sample Rubrics

Sample Essay Rubric

Topic and Thesis

- The scope and parameters of the topic are appropriate for the nature of the essay and clearly delineated.
- The thesis of the essay is strong, explicit, and readily identifiable.

Structure and Format

- The essay is well organized, with a logical and intuitive sequence of information.
- The essay displays evidence of thorough strategic planning.

Strength of Argument

- A position is clearly established in the introductory paragraph and reinforced throughout the essay.
- A persuasive, methodical, linear argument is established early in the essay and developed consistently throughout the essay.
- The argument succeeds in validating and defending the thesis.
- Counter-arguments are acknowledged and addressed where appropriate.

Research, Evidence, and References

- Thorough comprehension of the topic and relevant issues is demonstrated by the depth and breadth of research.
- Referencing is correct and complete.
- Evidence is used appropriately and integrated with the flow of the argument.

Tone

- Tone is controlled and appropriate for the academic discourse.
- Colloquialisms are avoided.
- Diction is precise and effective; there are no misused words.

Clarity, Flow, and Continuity

- Flow is preserved both within paragraphs and between paragraphs.
- There are no lapses in continuity and no isolated elements.
- The essay is composed with consideration for readability and clarity.

Language Control

- Basic sentence mechanics are sound.
- Punctuation is used correctly and effectively.
- The essay is free of awkward constructions, unnecessarily long or convoluted sentences, and ambiguous modifiers.
- The essay exhibits no tense or agreement issues.

Sample Report Rubric

Structure and Completeness

Title

- The title is specific, descriptive, and brief.

Abstract

- The abstract provides a thorough summary of the research problem, the methodology used, and the report's conclusions without exceeding 350 words.

Introduction

- The research question or problem is introduced.
- The purpose of the research is clearly communicated.
- An hypothesis is established.

Methods

- The methods are described clearly and in sufficient detail to ensure the reproducibility of the report's findings.

Results

- The results are presented in an organized fashion.
- The results are interpreted sufficiently and correctly.
- All tables and figures are laid out and labeled correctly.

Discussion

- Relevant contextual research is deployed appropriately and effectively.

- Hypotheses are revisited and discussed.

Conclusions

- A brief summary of the report's findings is provided.
- The relevance and significance of the report's findings are discussed.

Research, Evidence, and References

- Thorough comprehension of the topic and relevant issues is demonstrated by the depth and breadth of research.
- Referencing is correct and complete.

Tone

- Tone is controlled and appropriate for scientific writing.
- Colloquialisms are avoided.
- Diction is precise and effective; there are no misused words.

Language Control

- Basic sentence mechanics are sound.
- Punctuation is used correctly and effectively.
- The report is free of awkward constructions, unnecessarily long or convoluted sentences, and ambiguous modifiers.
- The report exhibits no tense or agreement issues.