CRITICAL READING FOR GRADUATE STUDENTS

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Critical reading for graduate students

Self-reflection questions

- How strong are my reading skills? Am I reading fast enough?
- Do I read with a critical eye?
- Do I manage the vast amount of information I need to read?

Introduction

And you thought you had a lot to read in your undergrad program. Welcome to Grad School!

A true story: When I was doing my Master's one of my professors passed me a book which had nothing to do with his course or my field of study. He said gleefully, "I've been reading this interesting book. I thought you might enjoy it, too," and shoved it into my reticent hands. What a position he had put me in. On the one hand, I felt obligated to read this book since he chosen ME to read it. On the other hand, I was so swamped and overwhelmed with my own reading that the thought of having to open the front cover of this book made me feel nauseous.

Unlike undergraduate courses where some students do minimal reading and still succeed, graduate studies require a student read large volumes of information. Reading at graduate school is the way in which students glean new ideas, theories, models, etc. that inform their theses and research papers. Grad students are asked to actively engage with the information they read. For example, a literature review requires a student to read with great breadth and depth within his/her research area and then synthesize the ideas into a unified whole. The number of documents to read, analyze, and synthesize to compile a literature review can be mindboggling. So consider organizing a chunk of time each day to read. Daily reading will help you stay on top of your 'in-tray', thereby reducing stress and helping to maintain motivation.

To succeed in graduate school, you must have strong academic reading skills. Take a minute to assess your reading skills. See our Reading Self-Assessment.

Reading issues

This module covers the following issues related to reading:

I. Speed
II. Comprehension
III. Critical Reading
IV. Retention/Recall
V. Volume of Reading
VI. Focus & Concentration
VII. Reducing Stress

Being aware of yourself as a reader

Issues

It's important to be aware of your style, knowledge, skills, and attitudes to the text you are about to read.

Before you start reading, reflect on the following 4 areas:

1. Learning Style

Your learning style is your preferred way of understanding the world, not your only or best way of learning.

Ask yourself: What is my personal learning style and how can I use my style to help me read better?

You can determine your own learning style by using a free on-line assessment tool such as the Index of Learning Styles, the VAK test, or the Myers-Briggs Inventory.

You can also take our own Learning Styles & Approaches to Reading tool. Visit the Academic Reading module (for undergraduate students) and find our tool entitled Learning Styles & Approaches to Reading in the pdf.

2. Background knowledge/schema

How much background knowledge do I have of the topic?

3. Attitude

What is my attitude to the reading? e.g. Do I feel motivated? Do I feel like putting it off?

4. Concentration and focusing

How well will I be able to concentrate and focus on the reading?

I. Speed

Myths about rapid reading

1. If you increase your reading speed, your comprehension will be reduced. Good readers score high on both speed and comprehension. But, it takes time and practice to get there.

2. Thorough "work" reading has to be slow. On the contrary, slow reading is dull and discouraging and provides few rewards. Slow readers miss the overall meaning of the material.

3. Skimming isn't real reading. Skimming IS reading. It is a vital part of rapid reading. It's the technique to apply when you are looking for something specific and/ or you want an overview of the whole document.

4. If you don't comprehend the first time or lose concentration, immediately reread. Going back to recheck what you have understood is very inefficient. It stops you from reading actively and anticipating what is coming next.

5. Technical documents can't be read rapidly. Technical documents lend themselves to rapid reading as these documents often give background info that the reader doesn't need.

6. Rapid reading of everything is boring. Untrue. You don't read everything at the same rate or intensity: you need to adjust your speed in accordance with the nature and content of the material.

7. When you read, you need to remember everything. Total recall is an impossible task and this attitude can stop you from trying to read at all. You need to set your goals for reading and determine what you need and don't need to remember.

Source: Redway, K. (1992). *How to be a Rapid Reader*. Chicago: National Textbook Co.

The average university student reads at around 250 to 350 words per minute on fiction and non- technical materials. A "good" reading speed is around 500 to 700 words per minute. Some people can read 1000 words per minute or more on these materials. To find out how fast you read, take the Increase Your Speed: Reading Speed Test.
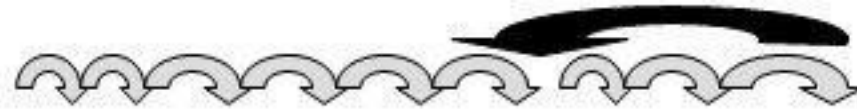
What determines reading rate

1. Purpose e.g. to understand information, for example, skim or scan at a rapid rate; to determine the value of material or to read for enjoyment, read rapidly or slowly according to your feeling; to read analytically, read at a moderate pace that permits you to interrelate ideas.

2. Nature and difficulty - depends on background knowledge and complexity of material

3. Internal structure – rate adjustment according to difficulty

What slows you down?
Fixating and regressing
Experiments with slow readers show that not only do these readers look at every word (called '**fixation'**), their eyes jump back to previously seen words (called '**regression'**).

"I am looking at each word while I read this sentence."

What else slows you down?

- Inability to distinguish important from unimportant information
- Fears e.g. losing comprehension Poor attention and concentration Passive reading
- Habitual slow reading
- Subvocalization – i.e. hearing the words in your head and even saying the words under your breath (but it has its advantages)

What speeds you up?
Training your eyes
Humans have very good peripheral vision. In fact we can see about 180 degrees from a point in front of our eyes. Peripheral vision was necessary in ancient times to protect ourselves from predators. Even though we no longer need to fend off Sabre-toothed tigers, our peripheral vision is just as important today as it was thousands of years ago. This ability allows us to read more words than those you are looking directly at. Once you understand your eyes' patterns and build your reading confidence, you will no longer feel the urge to fixate on each word or regress and your reading speed will increase.

To speed up you'll need to:

- increase the number of words in each block
- reduce fixation time (¼ second per block or chunk of words is adequate)
- reduce regression

"I am looking at large groups of words in this sentence and don't regress."

Speed strategies

Conditioning your eyes

1. Use a pacer or pointer. See [Speed Reading: Using a Pacer](#).

2. Window Slot Technique

   If you struggle with erratic eye movements, (i.e. your eyes jump around on the page and can't follow a left to right, line by line pattern), try using the —window slot technique. Use a postcard or thick cardboard and cut out the centre in the shape and size of one line of print. As you run the window down the page, the eye is limited to horizontal movements only. This technique is useful for all readers and particularly useful for readers who suffer from dyslexia or other reading challenges.

Skimming

Remember: SKIMMING IS READING. Skimming is taking mental notes of the outline/presentation of the material, picking up what stands out, and surveying headings and keywords.

For more information on Skimming, visit the [Reading and Note-taking module](#) (for undergraduate students) and use the Skimming: A Checklist tool in the pdf.

Building your vocabulary

- Play/do word games and puzzles
- Read lots and widely
- Make a personal dictionary of new terms, jargon, phrases
- For second language speakers of English, vocabulary acquisition, both academic and non-academic, is an ongoing and daily process. Strive to learn a few new words each week. Reading to your kids can also be a fun and easy way to pick up useful vocabulary.

Other techniques to improve reading speed

- Improve concentration
- Improve memory and recall
- Reduce subvocalization
- Reduce interruptions, procrastination and stress

II. Comprehension

Good comprehension involves:

- Being able to select and understand what you need
- Retaining and recalling the information
- Linking the new information to existing information

Comprehension is affected by:

- Level of difficulty, complexity, and even interest
- Background knowledge
- Jargon, new vocabulary
- Knowledge of English language structure

Types of reading comprehension

According to Makau (1990) there are 3 types of reading:

1. Content reading — understanding the information
2. Empathic reading — understanding the spirit of the message
3. Critical reading — combines the first two with analysis and evaluation

Source: Makau, J. (1990). *Reasoning and communication: Thinking critically about arguments*. Belmont, CA: Wadsworth Publishing Company.

Comprehension strategies

SQ4R: Survey, Question, Read, React, Recite, Review

The SQ4R assists university students to read more effectively and efficiently. SQ4R is a powerful approach that incorporates a number of reading skills and techniques such as skimming, elaborating, note-making, and reciting.

To see how SQ4R can be applied to textbook reading, visit the Reading and Note-taking module (for undergraduate students) and see the "SQ4R for Textbook Reading" and "Mindmap of SQ4R" tools in the pdf.

SQ4R can also be applied to any written genres such as research papers. See Using SQ4R to Read a Research Paper.

Reading research papers

One of the common sources of information at grad school is the research paper as they are the means by which a student learns new contributions to his/her field. Because a research paper adheres to a strict format (i.e. introduction, methods, results, discussion, conclusion), on the

surface they might appear easy to read. However, their condensed style (due to page limitations and assumed knowledge of audience) requires strong reading comprehension skills. Alongside general comprehension of the information provided, the reader needs to analyze and critique the thesis, determine the reliability and validity of the research data, and judge whether the paper is worthy of further attention. To do so requires critical thinking, which is covered in the next section.

See [Using Guiding Questions to Assist with Reading a Research Paper](#) and [How to Read Research Papers](#).

III. Critical reading

In graduate school you will need to read critically most of the time, so it's important that you understand how to approach a text with a critical eye. Critical reading involves evaluating and judging the accuracy of statements and the soundness of the reasoning that leads to conclusions.

Critical reading raises many questions such as:

- Who/what is the author/source? Is the author/source credible? What are the author's purposes?
- Is the information relevant to the context?
- What are the author's conclusions?
- Does the author provide adequate support for the conclusion? What questions are the author trying to solve/answer?
- What are the author's underlying assumptions and are they warranted? What inferences has the writer made and are they justified?

What to consider when reading critically:

1. Underlying assumptions
2. The argument
3. Evaluating an argument
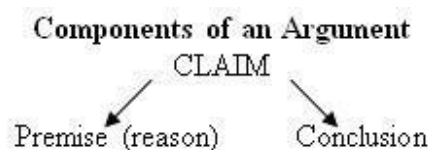
Critical reading strategies
1. Underlying assumptions
Authors rarely explicitly state all that they wish to communicate especially when they assume that their 'audience' has certain background knowledge, attitudes, and values. Therefore, it is the reader's job to be aware of the implicit messages.

For practice in detecting underlying assumptions see Critical Reading - Underlying Assumptions.

2. The argument
What is an "**argument**"? People present arguments to persuade others to accept claims.

Components of an Argument
CLAIM
Premise (reason)   Conclusion

1. **Claim**: a statement representing some event or idea about the way the world is or should be. You distinguish a claim from other statements if you can ask, "Is this statement true or false?"
2. **Premise:** reasons/evidence to support a claim. Arguments can have 1 or more premises.
3. **Conclusion**: the claim being defended by the reasons or evidence. (Do not confuse this with the other usage of 'conclusion' to mean the last part of an essay or presentation).

Therefore, an argument occurs when a **claim** is made and **premises** are put forward to justify a **conclusion** as true.

The arrangement for an argument is often (but not always) Premise 1 + Premise 2 + Premise 3 etc. → THEREFORE + Conclusion

What the difference between an argument and an explanation?

Explanation = claims are offered to make another claim understandable, i.e., to say why or how it is true.

For a practice exercise see The Argument.
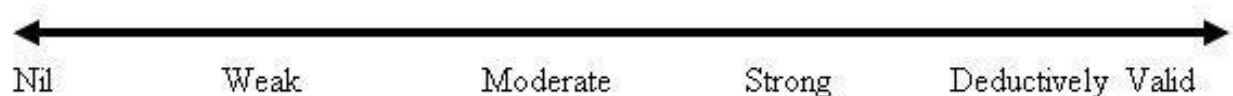
Indicator words
An indicator word indicates the presence of an argument and helps us determine what role the statement plays in the argument, i.e., either premise or conclusion. Some indicator words come before the premise; others come before the conclusion. Indictor words are NOT part of the content, but serve to signal which statements are premises and which are conclusions. They indicate the direction of the reasons in the argument. Learning these words and their meanings will help you spot an argument more quickly.

For practice with indicator words, see The Argument - Indicator Words.

Degrees of Support (or degrees of validity)
Arguments must be valid which means the conclusion follows logically from the reasons given. Depending on the writer's goal, differing degrees of validity are used to persuade the reader to support his/her argument. A critical reader needs to be aware to what extent the author is providing support for his/her argument.

Degrees of support/validity:

Nil   Weak   Moderate   Strong   Deductively Valid

Nil. Even if all the given reasons are true, they would provide no justification whatsoever for the conclusion. (aka a faulty conclusion or non sequitur)

Weak. If the given reasons are true, they would provide a small amount of support for the conclusion, but certainly not enough to justify accepting the conclusion as true. In other words, the reasons are logical, but NOT compelling enough to make it 'a good bet'.

Moderate. Between strong and weak. If the reasons are true, they do not establish the truth of the conclusion, but they make the truth of the conclusion a 'live possibility' worth further consideration and investigation.

Strong. If the reasons are true, then they make the truth of the conclusion extremely likely, but not totally guaranteed. In other words, you would stake something of great value on the truth of the conclusion.

Deductively valid. If the reasons are true, then there is no possible way in which the conclusion can be false.

Source: Allen, M. (1997). *Smart thinking: skills for critical understanding and writing.* Melbourne: Oxford University Press.

For practice in distinguishing degrees of support see The Argument: Degrees of Support.

3. Evaluating the argument

One important aspect of critical reading is our ability to evaluate arguments, i.e., to judge and assess an argument's persuasiveness. If you are persuaded by an argument, you will accept it based on the strengths of the reasons provided.

When is an argument a 'good' one?

Arguing a conclusion based on premises is a natural human activity. In a good argument the 'arguer' puts forward 3 assertions:

1. She asserts the premises.
2. She asserts that IF the premises are true (or acceptable) then the conclusion is true (or acceptable).
3. She asserts the conclusion.

Someone who offers a 'good' argument is giving you REASONS and EVIDENCE to accept their claim. Therefore, if you look only at the conclusion and accept or reject it without looking at the reasons (premises), you are ignoring the argument.

Adapted: Govier, T. (1992). *A practical study of argument*. 3rd ed. Belmont, CA: Wadsworth Publishing Co.

See Good & Bad Arguments for examples.

Three criteria for evaluating arguments

i. Terms are clearly defined. Writers and readers need to agree on what is meant by the key terms. Without agreement on terms, the argument's validity can by questioned.

ii. Information is used fairly. The information used to support the argument is correct and current. It avoids distorting the facts or being one-sided, i.e., both sides of the argument are represented.

iii. The argument is logical. Arguments can be biased but NOT fallacious. To determine if an argument is logical,
   a. consider the 'grounds' on which it was based, i.e., personal knowledge, reliable expert opinion, common knowledge, reliable testimony, common sense
   b. look closely at the claims to make sure they are not fallacious.

Source: Behrens L. & Rosen L. (2005). *Writing and Reading Across the Curriculum*. NY: Pearson/Longman.

Avoiding logical fallacies

A logical fallacy is faulty logic used in writing or speaking. There are many types of fallacies. You need to be able to recognize them when you read and avoid using them in your writing. See Some Common Logical Fallacies.

Practice reading critically

Use the Critical Reading Checklist of guided questions to assist you in reading more critically.

IV. Retention

61% of what you read is lost after the first hour and 100% is lost after 24 hours unless…you revisit the information.

The strategies you choose to assist you in remembering are a matter of preference and learning style. You might find one strategy that works very well for you; however, we recommend using multiple modalities (e.g. many senses) to increase retention and recall.

Retention strategies

Note-making

There are many different types of note-making strategies. See [Note-making Strategies](#).

Cornell System

The Cornell system produces an excellent note from which you can review ideas. It incorporates a section for traditional notes with a 'Cue Column' and a 'Summary' section. The Cue Column, on the left of the page, allows the note-maker to write key terms, concepts, sequences, and/or questions that will cue the brain to remember the detail notes. The bottom section of the page is reserved for a brief summary which is very useful when reviewing notes.

It can be used very effectively with the **SQ4R** system. At the 'Q' step of SQ4R, the note-maker writes down his/her question in the 'Cue Column'. Questions in the Cue Column are then used in the revision and review stages. The Cue Column can be easily folded over to hide the notes thus acting as a natural self-test mechanism.

For more information, including examples, see the [Active Reading and Note-making module](#) (for undergraduate students). Find the Cornell System in the pdf.

Mind Mapping

Why might you choose to make a concept or mind map as your note?

First of all, consider your learning styles: visual, auditory, and tactile. Learners who are visual and/or tactile will benefit from constructing a graphic map of the information read. Visual learners like to see a visual representation of the reading materials while tactile learners like to do something when they read. For visual learners, mind mapping appeals to their love of images, pictures, and colours. For tactile learners, constructing a mind map while reading keeps you active so you don't lose concentration and focus. They are fun to make and can be easily redrawn for review purposes. Irrespective your learning style, all readers can benefit from concept/ mind mapping as this type of note making requires the reader to distinguish main ideas from details. It is, therefore, a particularly useful method to employ if you are a reader who 'gets lost in the detail'.

For more information, including examples, see the [Active Reading and Note-making module](#) (for undergraduate students). Find Note-making with Mindmaps and Combining Cornell and Mindmaps in the pdf.

Visual Techniques

Some visual learners like to highlight text with colour. Colours can aid comprehension and retention if employed effectively. For example, each colour represents a different type of detail: one colour for main ideas/themes, another colour for subordinate ideas, etc. Some readers who use mind maps as a note-making tool connect the coloured text to the same colours on their mind map.

However, use highlighting sparingly. Why? Highlighting can be used as a procrastination tactic so you can avoid really understanding and working with the text. Highlighting is usually about marking what you should learn versus learning it now!

Auditory Techniques

Reading & Reciting Out loud

Auditory learners (note the person who mutters under his/her breath while reading) don't need to be told that reading out loud is a helpful strategy as they do so naturally. If you are not a strong auditory learner, we still recommend trying to recite out loud some of the time as research indicates it has a positive effect on retention. For information on the importance of reading and reciting out loud, see Why You Should Read Out Loud? in our module [on Active Reading and Note-making](#) (for undergraduate students).

Listening to "Memory" Music

Studies have shown that certain high-frequency music accelerates learning and improves memory. In particular, music of the Baroque period and classical Eastern instruments such as the sitar from India and the koto harp from Japan has positive effects on learning and memory.

For more information about memory music, see [Super Memory Music](#).

V. is for Volume: There's SO MUCH to read!

How to deal with all the reading?

Keep on Top of the Pile: On your daily schedule, set aside a block of time called 'Reading', preferably at the same time each day so you become habituated to a reading routine.

Reduce Volume to essential things and then read them in the way appropriate to that specific task

Read for Purpose: e.g. get an overview; read to do an assignment; read for studying (reading to access information), in-depth insight into a theory, argument, process; prepare for a seminar

Don't Panic: Don't let the reading list on the syllabus scare you. Professors don't expect you to read it all. They are simply giving you additional reference, insights into topic, etc.

VI. Focus and concentration

- Minimize distractions e.g. email, kids
- Know your best concentration span for reading and stick to it and then take a break. Try the 50-10-50 technique: 50 minutes reading, 10 minute break, 50 minutes reading.
- Don't try to read when tired
- If you are a kinesthetic /tactile learner, you need to DO something while you read.

For more information and strategies to help with focus and concentration, see Ideas Just Sweep Me Away: How to Stay On-Task While Reading.

You can also see the Improving Your Concentration tool in our Active Reading and Note-making module (for undergraduate students).

VII. Reducing Stress

Many aspects of life at grad school may cause stress. One big stressor is trying to keep on top of the huge workload, which includes a never-ending pile of documents to read. Therefore, improving your reading skills, both speed and comprehension, might be one way to reduce your stress.

RELAX and have guilt-free play

- Read for pleasure
- Work as hard at play as you do at work

- You will always have an 'in-tray' so do what you can today and don't worry about tomorrow

For more information on stress management, see our [Managing Stress at Graduate School](#) module.

An excellent book outlining the importance of guilt-free play is Neil Fiore's 2007 book, *The NOW Habit: A strategic program for overcoming procrastination and enjoying guilt-free play*.

TOOLS FOR READING IN GRADUATE SCHOOL

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Reading self-assessment

- 0 = describes me almost never
- 1 = describes me sometimes
- 2 = describes me often, or to a large degree

Reading speed
__I would describe myself as a slow reader compared to other students.

Comprehension
__I have difficulty finding the main idea when I read.

__I often need to read materials several times before I understand it.

__I have difficulty interpreting the meaning of words I read.

__I have trouble 'reading between the lines' for implied meaning.

Volume of material
__I cannot read all the required readings (not enough time).

__I cannot keep up with supplementary readings.

__I skim before reading for detail.

Concentration
__I often can't keep focused, unless I'm very interested in the material.

__My eyes often see the words, but my mind is somewhere else.

__I am easily distracted by my own thoughts while reading.

__I am easily distracted by things going on around me.

Retention
__I forget much of what I read soon afterwards.

__I make notes while reading.

__I highlight or underline while reading.

Analysis
Numbers 8, 14, 15 represent effective reading strategies. All other questions represent problem areas.

Increase your reading speed: Reading speed test

Take any randomly selected text of 250 words and read from start to finish, noting the elapsed time on your watch.

Then score yourself as follows:

Time	Result
Under 20 seconds	Very fast
21-30 seconds	Fast
31-45 seconds	Average
46-60 seconds	Slow
61+ seconds	Very slow

If you fall in the slow or very slow range, you may need to learn some strategies to help you increase your speed.

The relationship between reading speed and comprehension is paramount. Read too fast and you may comprehend less. Read too slow and you might fall behind in your readings.

You need to find a speed that is comfortable for you and allows you to get through the readings within your given timeframe.

Strategies to increase your speed

- During the first read through, try to grasp overall concepts rather than understanding all the details.
- Don't get hung up on single words, but DO look up key words that you must understand to grasp the entire concept. Create a glossary of key words as you read.
- Use a pacer (e.g. kabob stick, ruler) to stop regression and guide your eyes forward.
- Focus your attention and concentration. Read for shorter periods of time, if that helps.
- Eliminate outside distractions (noise, email, etc)
- Prepare an uncluttered, comfortable environment.

Modified from: Fry, R. (1994). *How to Study*. 3rd edition. Hawthorne, NJ: Career Press.
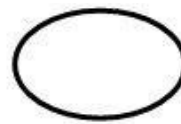
Speed reading: Using a pacer

Your primary school teacher was WRONG! Go ahead: use your finger to help you read faster. Using a pacer to guide the movement of your eyes across the page is recommended by reading experts. At first, not looking at each word might feel uncomfortable, so in the early stages use a guide or pacer to force your eyes to move ahead. Speed readers suggest using a very thinly pointed instrument, such as a kabob stick, as fingers are fatter and can obstruct your vision.

If you're not convinced, try this experiment:

Sit opposite a friend and ask them to draw an imaginary circle in the air with only their eyes. Observe your friend's eye movements; they will probably look like the shape on the left below. Now, guide your friend's eyes with your finger by drawing an imaginary circle in the air. You will notice that the eye movements are smoother, like the shape to the bottom right. These changes suggest that if you use a guide to help your eyes move smoothly across a page, you will avoid wandering, regressing, fixating—all those bad habits that slow you down!

Unguided eye movements

Guided eye movements

You can move the pacer in different patterns depending on your style and the column width, but start by letting the guide take your eyes along each line and down, line by line. When using a pointer, point at 2-3 spots in a sentence for full-length sentences. When you are comfortable with this approach, you may wish to use one of the faster alternatives:

a) Slide down the middle of the page, especially for narrow column layout.
b) Move in a zigzag pattern starting at one margin and moving to the other. This helps you target critical words, phrases and ideas. The zigzag pattern is prized by 'speed readers'.

Erratic eye movements

If you suffer from erratic eye movements, e.g. your eyes jump around on the page and can't seem to stay focused on where you want them to be, try using a window slot. Cut out the centre of thick cardboard in the shape and size of one line of print. As you run the window down the page, the eye is limited to horizontal movements only.

Practice

Practice these techniques daily, even 5-10 minutes, and your speed will increase. Use the pacer until your speed is where you want it. Some find the pacer so helpful, they use it forever.

Using SQ4R to read a research paper

Survey

1. Don't read the paper: Get an OVERVIEW of the paper first.
2. Ask yourself what the paper is about by:
    a. reading the title and abstract.
    b. reading the conclusion.
3. Read the introduction.
4. Read the section headings.
5. Read tables, graphs, and captions.
6. See who wrote the paper, where, and when it was published.
7. Skim the references and bibliography: see if the author includes relevant related work.

Question

Examine the assumptions and ask:

1. Do their results rely on any assumptions in trends in the environment? Are these assumptions reasonable?
2. Examine the methods and ask:
    a. Did they measure what they claim? Did they explain what they observed?
    b. Did they have adequate controls? Were tests carried out in a standard way?
3. Examine the statistics and ask:
    a. Were appropriate statistical tests applied? Was proper error analysis used?
    b. Are the results statistically significant?
4. Examine the conclusions and ask:
    a. Do the conclusions follow logically from the observations? What other explanations are there from the observed effects?
    b. What other conclusions or correlations are there that was not pointed out?

Also see guided questions in How to Read a Research Paper.

Read & react

- Take notes.
- Highlight major points.
- Place this work with your own experience.
- If you disagree with a statement, note your objection. If you find an agreeable statement, write it down.

Recite & review

See ideas suggested in the generic SQ4R model.

Adapted from Professor Gordon J. Pace.

Using guiding questions to assist in reading a research paper

Here are some general questions to ask when analyzing various kinds of research papers:

Introduction

- What is the overall purpose of the research?
- How does the research fit into the context of its field? E.g. Is it attempting to settle a controversy? Show the validity of a new technique? Open up a new field of inquiry?
- Do you agree with the author's rationale for studying the question in this way?

Methods

- Were the measurements appropriate for the questions the researcher was approaching? (Often, researchers need to use 'indicators' because they cannot measure something directly – e.g. using babies' birth weight to indicate nutritional status.)
- Were the measures in this research clearly related to the variables in which the researchers (or you) were interested?
- If human subjects were studied, do they fairly represent the populations under study?

Results

- What is the major finding?
- Were enough of the data presented so that you can judge for yourself how the experiment turned out?
- Did you see patterns or trends in the data that the author did not mention? Were there problems that were not addressed?

Discussion

- Do you agree with the conclusions drawn from the data?
- Are these conclusions over-generalized or appropriately careful?
- Are there other factors that could have influenced, or accounted for, the results?
- What further experiments would you think of, to continue the research or to answer remaining questions?

Source: Hampshire College.

Questions to ask when CRITICALLY reading a research a paper:

1. What is the research paradigm the author is using e.g. psychological experimentation, proving a theorem? If the paper is part of a well-established field, describe the field and its current state.
2. What is the problem area with which the paper is concerned?

3. What is the author's thesis, i.e., of what is s/he trying to persuade you? (Now, summarize the author's thesis).
4. Does the author describe other work in the field? If so, does this research differ from other work in the field?
5. Does the paper succeed at convincing you of the author's argument?
6. Some papers implicitly or explicitly provide new ways of thinking or doing. Does the paper generate new ideas?
7. Does the author indicate how the work should be followed up?

Adapted from [Georgia Tech College of Computing](#).

How to read research papers

It is NOT like reading a textbook.

- Information is too dense for one simple reading
- Special structure allows reader to find desired section more easily
- May only need specific aspect of the article
- Understanding one part often requires forward or backward reference to another part

Therefore…**Be prepared to read 2-4 times!**

Rules for efficient paper reading

1. Read sections in an order which facilitates speed and comprehension.
2. Question yourself as you read to keep the process active and critical.

See Using Guiding Questions to Assist in Reading a Research Paper in [Critical Reading for Graduate Students](#) module.

The following order is recommended for faster and more effectiveness paper reading.

1. **ABSTRACT**--It's very important to read the Abstract closely to determine whether you need to read the whole paper. Ask yourself: What specific results are mentioned? Are the findings relevant to my own research questions?

   Reading strategy: read closely to determine connect to your research questions

2. **DISCUSSION**--The Discussion (also known as 'analysis' or 'conclusions') gives important results and reasons for conclusions. This section gives more DETAIL on the specific results and, therefore, helps you determine whether this paper is relevant to your research, Ask yourself: Are these results useful? Do you agree with the logic of the author's conclusions?

   Reading Strategy: speed read 1st, then read for details, might need to read several times

3. **INTRODUCTION**--The Introduction explains the motivation and importance of the research. It gives prior research and what the accepted understanding in the field is. Ask yourself: Do you understand the background information? Do you need to look up references?

   Reading Strategy: skim

4. **RESULTS**--The Results provides raw data you might need for your own research. Figures and tables provide data in a condensed, easy to view way. Understanding Figures is very important to understand the paper. Ask yourself: Do you know what the axes mean? What units are used? Do the curves make sense?

   Reading Strategy: review Figures closely

5. **METHODS**--The Methods is often the hardest section to read as it contains specialized techniques. A well written Methods section is allow you to understand how you could replicate the experiment, if you wanted to.

   Reading Strategy: skim to pick out the basic method first. If the method is important to your research, then read again for more detail.

Source: Purdue University Libraries tutorials.

Underlying assumptions

Critical reading

Exercise: Analyze the paragraph below for the author's underlying assumptions. There are both explicit and implicit messages.

"AIDS is a serious epidemic. This dreaded disease has moved from drug users and homosexuals to promiscuous heterosexuals. Clearly, God is showing his wrath for those who violate his moral laws."

Explicit assumptions:

1.

2.

Implicit assumptions:

1.

2.

3.

4.

Source: Makau, J. (1990). *Reasoning and communication: Thinking critically about arguments*. Wadsworth Publishing Company, Belmont CA. p. 30-32.

What are some of your underlying assumptions which will colour your reading and writing?

The Argument

Exercise

For each passage below, determine whether it does or does not contain an argument. (Hint: Ask **"What is the writer/speaker trying to justify?"** This will help you see if there is an argument). Give reasons for your judgment. If there is a conclusion, underline it.

Passage 1

I don't care what you say. I really think that Yvette is in love with John. Why? Because she always wants to talk about him. She even blushes when you ask her about him.

Passage 2

Soccer is an active game which is very popular around the world. The game requires terrific eye-foot coordination, speed, and endurance.

Passage 3

Any diet poses some problems. Here's why. If the diet doesn't work, that is a problem. If the diet does work, then the dieter's metabolism is altered. An altered metabolism as a result of dieting means a person will need less food. Needing less food, the person will gain weight more easily. Therefore, after successful dieting a person will gain weight more easily.

ANSWER KEY

Passage 1
Answer: Argument with 2 reasons.

Passage 2
Answer: No argument. Neither sentence is offered as a reason or as evidence for the other. Nor is there any evidence that someone is trying to justify or prove any claim about soccer or anything else.

Passage 3
Answer: Argument is that all diets pose problems. Conclusion is at the beginning and at the end. 'Therefore' is an indicator word.

The argument: Indicator words

Common Premise Indicators

Indicator	Meaning
Since	On the grounds that
Because	For the reason(s) that
For	As indicated by
Follows from	May be inferred by
As shown by	May be derived from
Given that	May be deduced from

Common Conclusion Indicators

Indicator	Meaning
Therefore	For all these reasons we can see that
Thus	On these grounds it is clear that
So	Consequently
Hence	Proves that
Then	Shows that
It follows that	Indicates that
In conclusion	We can conclude that
Accordingly	Demonstrates that

Source: Govier, T. (1992). *A practical study of argument*. 3rd ed. Belmont, CA: Wadsworth Publishing Co. pp. 4-5

Hints about some indicator words

1. 'Hence', 'thus', 'consequently', 'so', 'therefore' as conclusion indictors = some (maybe all) of the reasons for that conclusion **appeared somewhere earlier in the text**.
2. 'Since', 'as', 'because' as premise indicators = the conclusion being supported usually is stated **in another clause of the very same sentence**! e.g. Since nuclear plants have a life expectancy of under 40 years, they themselves may become the hardest waste disposal problem of all.
3. 'And' as Conjunction: preceded by a conclusion indicator word (e.g. **and** therefore) ≠ an indicator word as Premise: e.g. He is fat **and** he has diabetes. Therefore, he should go on a diet. = an indicator word

Exercise

Place each of the following phrases in one of the three columns below, according to whether it is a premise/reason indicator or a conclusion indicator. Assume that the word(s) appear before the statement. If a word has other uses in addition to an indicator, e.g. 'since,' assume for the purpose of this exercise that it's an indicator.

Phrase	Reason (premise)	Conclusion	Neither
1. Implies that			
2. Especially			
3. I think that			
4. Being that			
5. Seeing that			
6. Nevertheless			
7. May be deduced from			
8. Not			
9. Suggests very strongly			
10. In the first place			

Thomas, S. (1981). *Practical reasoning in natural language*. 2nd ed. New Jersey: Prentice-Hall.

The argument: Degrees of Support

EXERCISE: Look at the examples below and analyse their degree to support.

1. All people are mortal. George W. Bush is a person.
   Conclusion: George W. Bush is mortal.

2. Of 18 patients who previously had recurrences of malaria, after treatment with Drug X, only 2 (11%) had a recurrence. In contrast, in 11 control subjects not treated with Drug X (but with a placebo), 83% had recurrences. Numerous earlier studies had shown that Drug X inactivates the malaria virus.
   Conclusion: Treatment of malaria by Drug X should be considered.

3. Some roses are red. Some violets are blue.
   Conclusion: Kang still loves Sue.

4. Saddam Hussein's secret service police tortured Iraqi citizens. It is unlikely that these police would have engaged in torture without his consent or direction. Hussein had a long record of sadistic activities.
   Conclusion: Saddam Hussein was guilty of torturing his own people.

5. Ahmed has two suitcases.
   Conclusion: Ahmed has some luggage.

6. The construction of the new Queen's Centre is now $41 million over the original budget.
   Conclusion: The administrators who are overseeing this facility are incompetent.

Answer key

1. deductively valid.
2. strong
3. nil
4. moderate
5. deductively valid
6. weak

Adapted from: Thomas, S. (1981). *Practical reasoning in natural language*. 2nd ed. New Jersey: Prentice-Hall. 98-111.

Good and bad arguments

Exercise
Read the following 2 dialogues. Compare and contrast them for 'good' and 'bad' arguments.

Dialogue 1
Peter: Mountain climbing is a terrific sport. It gives people a chance to get out in beautiful country; it gives them good exercise; it builds really strong arm and leg muscles, and it requires great teamwork.

Jasmine: A great sport? Isn't it kind of dangerous?

Peter: More than any other sport I know it builds both health and teamwork.

Jasmine: I don't know. I've heard about a lot of accidents mountain climbing.

Peter: Furthermore, you aren't going to find a better sport for aerobic strength and arm and leg muscle development.

Jasmine: Mountain climbing is really risky. I just can't see the point. And besides, why should the public have to pay when these mountain climbers get into trouble? The forest rangers are in there with helicopters and it all costs taxpayers' money.

Peter: We're going out next weekend and I was going to ask you to come. But I guess I won't now. Obviously, you're not the type.

Your analysis:
Analysis of a bad argument

They ignore each other's arguments to the point where they seem about to lapse into a quarrel.

Peter asserts 4 reasons why he thinks mountain climbing is terrific.

Jasmine doesn't agree with Peter's claims. She states another view based on another argument: mountain climbing is not a good sport because it's dangerous. She ignores Peter's argument totally. She reacts as if Peter didn't use any premises (when he uses 4) and she disagrees solely based on his conclusion, i.e., instead of considering his reasons and how they might support her own. Peter then responds in kind and ignores Jasmine's arguments

Dialogue 2
Peter: Mountain climbing is a terrific sport. It gives people a chance to get out in beautiful country; it gives them good exercise; it builds really strong arm and leg muscles, and it requires great teamwork.

Jasmine: I doubt that mountain climbing is better for developing your muscles better than tennis or soccer. Is it better for developing teamwork than baseball or basketball? I can see why mountain climbing attracts people, in a way, but I think it's too risky to be a good sport to take up.

Peter: I'm not saying it's the only way to develop muscles and good teamwork. You could do that through sports, of course. But mountain climbing is such a challenge and it's so much fun and gives you such a sense of achievement. When you put these together with the good exercise and teamwork, you've really got something. As for risk, why do you think mountain climbing is so risky?

Jasmine: It's those stories you see in the paper about how the forest rangers have to go out and use helicopters to rescue these mountain climbers who go out on ledges and so on.

Your analysis:
Analysis of a good argument

Jasmine considers Peter's argument and asks how several of his premises are supposed to support his conclusion. She mentions her own point of view.

Peter responds to her argument by asking her why she thinks it's risky. He is, in effect, questioning her premise (politely) and asking for a sub-argument.

Whether they agree to each other arguments in the end, we can see that much more info was exchanged and the situation is less likely to degenerate into a quarrel, i.e., a fight rather than a reasoned attempt to justify one's point of view.

Source: Govier, T. (1992). *A Practical study of argument*. 3rd ed. Belmont, CA: Wadsworth Publishing Co.

Some common logical fallacies

Hasty generalization

Making assumptions about a whole group or range of cases based on a sample that is inadequate (usually because it is atypical or just too small). Stereotypes about people are a common example of the principle underlying hasty generalization.

Missing the point

The premises of an argument do support a particular conclusion, but not the conclusion that the arguer actually draws.

Weak analogy

Many arguments rely on an analogy between two or more objects, ideas, or situations. If the two things that are being compared aren't really alike in the relevant respects, the analogy is a weak one, and the argument that relies on it commits the fallacy of weak analogy.

Appeal to authority

Often we add strength to our arguments by referring to respected sources or authorities and explaining their positions on the issues we're discussing. If, however, we try to get readers to agree with us simply by impressing them with a famous name or by appealing to a supposed authority who really isn't much of an expert, we commit the fallacy of appeal to authority.

Straw man

One way of making our own arguments stronger is to anticipate and respond in advance to the arguments that an opponent might make. In this fallacy, the arguer sets up a wimpy version of the opponent's position and tries to score points by knocking it down. But just as being able to knock down a straw man, isn't impressive, defeating a watered-down version of your opponents' argument isn't impressive either.

Red herring

Partway through an argument, the arguer raises a side issue that distracts the audience from what's really at stake. Often, the arguer never returns to the original issue.

False dichotomy (either/no)

In false dichotomy, the arguer sets up the situation so it looks like there are only two choices. The arguer then eliminates one of the choices, so it seems that we are left with only one option: the one the arguer wanted us to pick in the first place. But often there are really many different options, not just two—and if we thought about them all, we might not be so quick to pick the one the arguer recommends!

Begging the question (e.g. circular reasoning)

A complicated fallacy; it comes in several forms and can be hard to detect. An argument that begs the question asks the reader to accept the conclusion without providing real evidence; the argument either relies on a premise that says the same thing as the conclusion (i.e. "being circular" or "circular reasoning"), or simply ignores an important (but questionable) assumption that the argument rests on.

For examples and tips to help avoid these fallacies, see the University of North Carolina at Chapel Hill's resources. For practice spotting fallacies, see their sample argument.

Source: "Fallacies" at UNC

Critical reading checklist

Try using the following set of question to guide your critical reading.

1. What is the claim?
2. What are the conclusions?
3. What are the premises or reasons for the claim?
4. What are the underlying assumptions supporting the premises and claim?
5. What are the definitional and descriptive assumptions, the value conflicts and value assumptions?
6. What backup evidence supports those assumptions?
7. How could this claim be refuted? Under what conditions can the claim not be made?
8. What terms or phrases are ambiguous or not well defined?
9. Are the samples representative and the measurements valid?
10. Are there flaws in the statistical reasoning?
11. Are there alternative causal explanations?
12. Are there any logical fallacies or errors in reasoning?
13. What significant information is omitted?
14. What alternative conclusions are consistent with the strong reasons?
15. What are my value preferences in this controversy?

Note-making strategies

Highlighting and summarizing

Another way to focus your attention while reading expository texts is highlighting and summarizing. Highlighting (or underlining with a pen or pencil) helps readers to focus on the details presented in a chapter, so it is effective for "global" learners who see the main ideas of a chapter but have trouble focusing on details like definitions, dates, and people. Highlighting forces you to reread the information you highlight (or underline), aiding in retention of that information. Highlighting also gives you a quick way to review the important details in the chapter days or weeks after you have read it, helping with exam preparation.

But to avoid focusing only on the details while reading a chapter, it helps to write a summary of the main points after you finish reading. Although there may be a chapter summary in the book, writing your own summary forces you to pull the isolated facts and details into a cohesive unit that it understandable to you. Write your own summary and then compare it to the one in the book. Review both summaries in preparation for exams.

Margin notes

The margin notes strategy focuses your attention on important information in readings, including expository texts, journal articles, and theories. Because it involves underlining or circling key words and recording brief notes in the margin as you read, margin notes is a very active strategy that requires you to more deeply process information compared to highlighting alone. While margin notes are faster to record than outlines or reading grids, they are not as complete. The margin notes provide a hard copy of the important information in the reading that may be used to review for exams.

Outlining

Outlines are a good way to record main ideas and supporting details presented in a reading. They are effective for both global and analytical students, but may be more appropriate for sequential learners than for random learners. Reading outlines may be formal or informal. The chapter title is usually used as the title to the outline. The major headings in a chapter will form the Roman numeral titles in the outline. Main ideas with their supporting details are arranged under each Roman numeral. If desired, you can include a summary at the end of your outline.

Outlining has advantages and disadvantages. One the positive side, outlines give a rather complete summary of what is in the readings, so they may be helpful for students with little prior knowledge of the subject or with trouble in reading comprehension or retention. Outlines also give you a shortened version of the reading that may be used for exam preparation. On the down side, outlines can be time consuming to prepare.

Reading grids

A reading grid is a table used to summarize the main ideas and supporting details covered in a chapter. The title of the chapter is used as the title of the reading grid. Each major heading in the chapter forms the heading of one cell of the grid. Terms and definitions, dates, people's names, and other details are recorded in the corresponding grid cell. Like outlines, reading grids provide a rather complete summary of the reading material as well as a shortened version of the reading that is useful in reviewing for exams. Non-sequential learners may prefer reading grids over outlines because the structure of grids is less rigid.

Journal article checklist

Instructors often require that students read articles published in professional journals; this is especially true in upper-level undergraduate courses and in graduate classes. Journal articles often present results of experiments but can also be summaries of current research on a particular subject. Because articles published in professional journals are geared toward a more sophisticated audience and cover quite specific subjects, students must read them differently from the general overviews that characterize expository text books. It is not a bad idea to read journal articles more than once. Margin notes may be an effective reading strategy for journal articles. Journal article checklists are another strategy one might try. Students can make up their own checklist geared toward a particular subfield, or they can use the sample checklist shown below. Self-made checklists should cover things like the purpose of the article, goals of the research, research questions and hypotheses, theoretical background for the study, methods used, results, and implications.

Theory summary sheet

Reading theories also differs considerably from reading expository text books because theories tend to be much more abstract than the concrete material presented in introductory texts. Theory books and articles are geared to a more experienced audience.

Like journal articles, theoretical readings must be approached differently from text books. For one thing, most students need to budget time to read theories two or even three times, especially until they get the hang of it. The theory summary sheet shown below provides another strategy for completing theoretical readings. The summary sheet focuses your attention on the purpose, assumptions, and basic tenets of a theory.

Adapted from [Muskingum University](http://sass.queensu.ca/learningstrategies).

Super memory & music

Which music contains the sounds of smartness & mental activity?

Ultra high-frequency waves; classical music with logic symmetry and aesthetic.

Types of music used for fast, factual learning:

- Baroque 17th & 18th century concertos by masters like Bach, Vivaldi, Corelli.
- Sitar from India and the 'Koto'/Japanese harp
- Soothing, serene music at the all-important 60 beats per minute - the "beat of memory."
- Musical keys sequenced in ascending order for increased health benefits.

The Mozart Effect

Mozart's music is exceptionally rich in brain-energizing sounds. US research showed that listening to Mozart improves spatial cognitive skills e.g. following patters; helps to temporarily organize thinking; improves mood which decreases stress.

Listening for ten minutes before a test boosted IQ scores sharply.

Much earlier another MD, Georgi Lozanov, working in Bulgaria, uncovered the same exciting discovery - high-frequency music like Mozart's enhances mind/memory, vitality and motivation. He incorporated this music into the world's first accelerated learning method.

Sources:

Ostrander, S. & Schroeder, L. (1997). *Superlearning 2000: New Triple Fast Ways You Can Learn, Earn, and Succeed in the 21st Century*. NY: Dell.

Small, G. (2002). *The Memory Bible: An Innovative Strategy for Keeping Your Brain Young*. NY: Hyperion.

Ideas just sweep me away … How to stay on-task while reading

A common problem faced by graduate students, who are naturally curious about information and ideas, is staying focused on the reading task. Going 'off-track' or letting one idea lead you to another, and yet another, can occur when an interesting idea grabs your attention and sweeps your mind off to a different place: e.g. another part of the reading, a totally different article or book, an index list.

Going off-track has its benefits … and drawbacks

It's true that letting your curiosity guide you may uncover new information which might come in handy. However, if you find yourself persistently reading away from your original reading goal (e.g. I have to read X article for tomorrow's seminar), you might feel frustrated and unproductive at the end of the day.

Worry behavior versus goal-setting behaviour

However, going off-track may be symptomatic of worries, anxieties, or fears about needing to 'know everything' and/or a lack of confidence in your knowledge base. In some cases, graduate students come into a program from a very different subject area and truly don't know the required literature so their concerns are real and justified. It is important to be aware of the difference between worry-driven behaviour and behaviours based on real needs and goals.

Strategies

1. Highlight the idea—Note new or interesting ideas by highlighting (colour-coding) them. On a separate piece of paper, jot down a key word or tag related to the idea and its location in the text, for later investigation.
2. Create an 'Interesting Ideas File'—An extension of the above idea is to create a file of all the ideas you've come across when you've been _off-track'. That way even if you didn't complete your assigned reading task, you have something concrete to show progress.
3. Organize Your Time—Set aside daily time for task-oriented reading and also time to allow yourself to surf and/or pick up on new readings you found previously.
4. Self Check In—using a cell phone or laptop calendar, set periodic message or beeps to bring your back to your task or goal
5. Replace Worry Behaviours—If you notice worry thoughts associated with your reading, it's time to stop and set real, attainable goals. It's not possible for you to 'know everything' about your field, especially early on in your program. Set small, time-specific goals, e.g. 'Today I will read one paper.' 'This week I will organize a reading schedule.'
6. Be Gentle to Yourself—If you do find yourself on other track, don't get annoyed with yourself. Instead, just gently bring yourself back to the task.