SREB Readiness Courses . **v2a**

Transitioning to college and careers

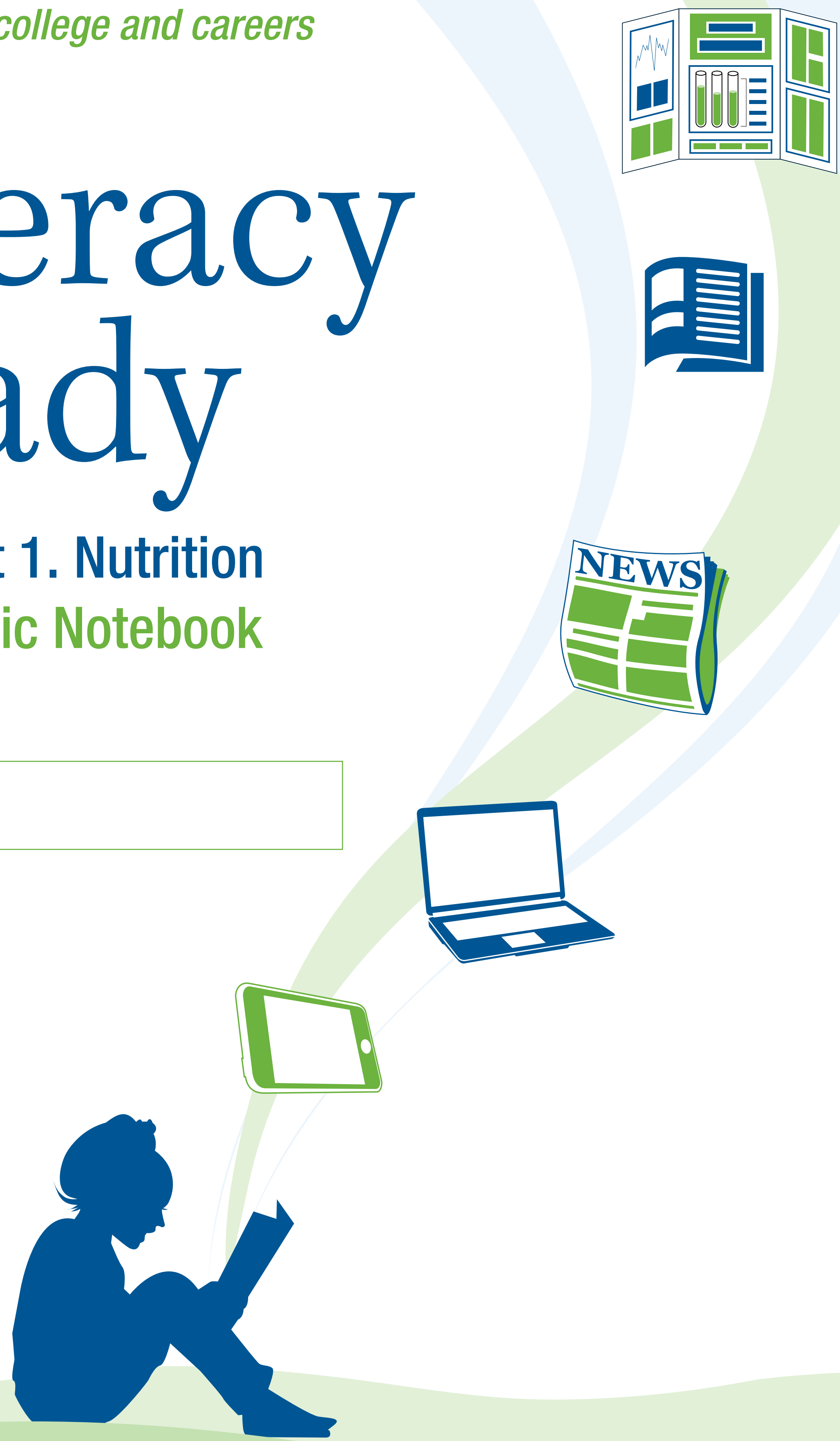
Literacy Ready

Science Unit 1. Nutrition

The Academic Notebook

Version 2a

Name



Unit 1
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Course Overview

Welcome to the first disciplinary literacy science unit of the SREB Readiness Course-Literacy Ready. What does disciplinary literacy in science mean? According to Shanahan & Shanahan (2012), disciplinary literacy refers to the specialized skills and strategies needed to learn at higher levels in each discipline. That means that how people approach reading and writing in the sciences would differ from how they approach it in history, English, mathematics, or other fields. It also means that students need to learn more than the content in any particular discipline—they also need to learn how reading and writing are used within that field. So, disciplinary literacy in science in this unit will introduce you to the knowledge, skills, and tools used by scientists.

You will learn to "make explicit connections among the language of science, how science concepts are rendered in various text forms, and resulting science knowledge" by learning ways to "develop the proficiencies needed to engage in science inquiry, including how to read, write, and reason with the language, texts, and dispositions of science" (Pearson, Moje, Greenleaf, 2010). These ideas are the principal focus of this unit. While certainly the content covered in this course is important, a primary purpose of this unit is to equip you with the tools necessary to be more successful in your college coursework. You will take part in many reading and writing activities aimed at improving your disciplinary literacy in science. To that end, the creators of the course have developed this Academic Notebook.

Purposes of the Academic Notebook

The Academic Notebook has three roles in this course. First, the notebook provides you with a starter kit of tools aimed to prepare you for college science courses. These tools will assist you in learning and comprehending the information from the scientific text, animations, and lectures you receive in the class.

A second role of the notebook is to provide you with a personal space to record your work. The Academic Notebook is where you will take your notes for the class on any materials you are covering. For example, if you are reading an article in class, take notes in this notebook. If you are doing a lab, make your observations and notes here. Likewise, if you are listening to a lecture, take notes here. Use the tools in the resource portion of the notebook to assist you in organizing your notes.

The third and final role of the notebook is that of an assessment tool. Your instructor may periodically collect the notebooks and review your work to ensure that you are remaining on task and to assist you with any material that is causing you difficulty. Your instructor may also assign tasks to be completed in the notebook, such as in-class writing assignments. At the end of this six-week unit, your instructor will review the contents of this notebook as part of your overall grade. Thus, it is important that you work seriously, as this notebook becomes the record of your activity in this course.

Helpful Hints for Science Literacy Success

About Scientists: How do scientists think?

As you will spend much of your time in class learning this on your own, it is best to be brief. In short, scientists learn by careful observation of the world around them to discover general principles. They do this through careful experimentation that results in data. Scientists use this data to draw conclusions. You likely have heard of the scientific method. Scientists use this method as a structured way to investigate the questions they have. An important use of the scientific method is to be able to replicate previous work. Scientists strive to organize, analyze, and explain things clearly. Scientists believe that science is an attempt to build understandings of the world and that science findings are tentative and subject to revision based on new understandings.

About Scientists: What do scientists ask?

Scientists ask lots of questions about nature and the world around them. These are questions that you will hopefully come to ask upon completing this coursework, and the tools in the resource materials section of the Academic Notebook are intended to aid you in asking these questions.

Scientists are systematic when they ask questions. Scientific inquiry helps scientists answer questions through investigation. They begin with observations. They may start with big, broad questions: “Why? What’s going on? How is this explained?” They then may break a larger question into smaller parts to examine. They examine work that has already been done. They use the scientific method to hypothesize, test, analyze and draw conclusions. This inquiry is often cyclical, with experience and observation leading to new hypotheses.

Lesson 1
Evaluating Science Claims

In this lesson, you will . . .

- Be introduced to the two levels of thinking required in this unit: thinking like a scientist and thinking about learning in the sciences.
- Learn about the components of science literacy.
- Develop the skills to critically examine claims made by manufacturers of sports/energy drinks.
- Evaluate claims by using multiple sources of information.
- Apply your knowledge by evaluating claims made by other popular energy drinks and present your findings to your peers.
- Explain the processes involved in evaluating science claims.
- Review and understand the writing project for the unit and, the scoring rubric and a plan to develop your project.

Please work with a partner to circle all of the noun phrases you find in this section.

Carbohydrates as Nutrients. Foods such as bread, cereal, rice and pasta, as well as fruits and vegetables, are rich in sugars called carbohydrates. Carbohydrates are the major source of energy for cells. Energy is stored in the chemical bonds between the carbons, hydrogens and oxygens that comprise carbohydrate molecules. Carbohydrates can exist as single-unit monomers or can be bonded to each other to produce longer-chain polysaccharide polymers.

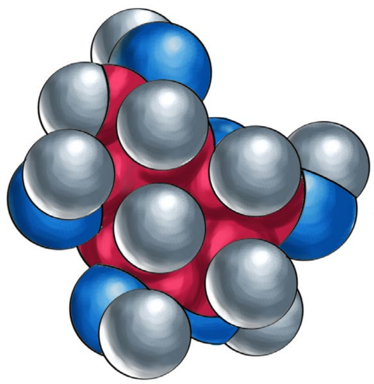
The single-unit simple sugars are digested and enter the bloodstream quickly after ingestion. Sugars found in milk, juice, honey and most refined foods are simple sugars. Fructose, the sugar found in corn syrup, is shown in figure 3.1 a.

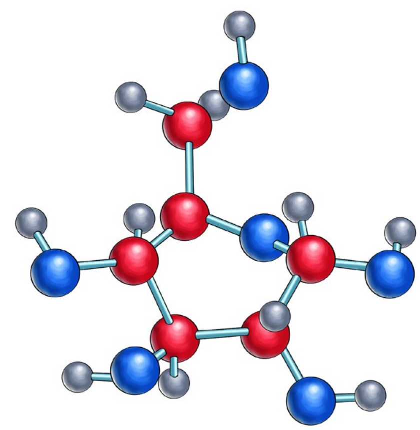
When multisubunit sugars are composed of many different branching chains of sugar monomers, they are called complex carbohydrates. Complex carbohydrates are found in vegetables, breads, legumes and pasta *(Belk and Maier pages 56-57).*

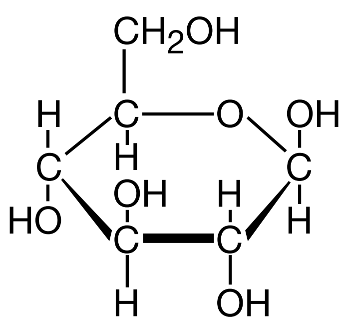
Activity

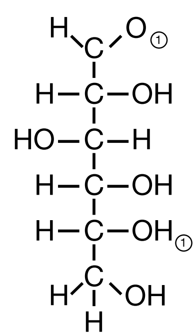
1 Introduction

What do these images have in common?









Read this short article on how scientists think from *Science Daily*

Sep. 22, 2009 — http://www.sciencedaily.com/releases/2009/09/090921162150.htm.

Sep. 22, 2009 — Profound discoveries and insights on the frontiers of science do not burst out of thin air but often arise from incremental processes of weaving together analogies, images, and simulations in a constrained fashion. In cutting-edge science, problems are often ill-defined and experimental data are limited.

To develop an understanding of the system under investigation, scientists build real-world models and make predictions with them. The models are tentative at first, but over time they are revised and refined, and can lead the community to novel problem solutions. Models, thus, play a big role in the creative thinking processes of scientists.

Dr. Nancy J. Nersessian has studied the cognitive processes that underlie scientific creativity by observing scientists at work in their laboratories. She says, "Solving problems at the frontiers of science involves complex cognitive processes. In reasoning with models, part of the process occurs in the mind and part in the real-world manipulation of the model. The problem is not solved by the scientist alone, but by the scientist – model combination. This is a highly creative cognitive process." Her research is published in an upcoming issue of *Topics in Cognitive Science*.

Her study of the working methods of scientists helps in understanding how class and instructional laboratory settings can be improved to foster creativity, and how new teaching methods can be developed based on this understanding. These methods will allow science students to master model-based reasoning approaches to problem solving and open the field to many more who do not think of themselves as traditional "scientists." (http://www.sciencedaily.com/releases/2009/09/090921162150.htm)

REFLECT: Write down the two related words that are the most important in this piece.

Word 1:

Word 2:

Briefly explain your thinking in selecting these two words:

Activity

2 Reading Science Claims

Oxygizer

First read the first Savvy Reader section from Belk and Maier.

Savvy Reader **Detox Drinks**

A CLEAR WINNER IN THE FEEL-GOOD STAKES | *BY CAROLINE STACEY* | *THE INDEPENDENT* (LONDON) | JANUARY 3, 2004

So you thought water was just a drink? Think again. It's a lifestyle choice. We can all safely drink our litre or more a day straight from the tap. But where's the cachet or the profit in that? It's almost as free as air. And wonderful and hydrating though tap water is, the latest bottled waters offer so much more—to make you sportier, healthier, and less hungover.

With Oxygizer you pay for air and water together. It's oxygenated, but not fizzy. Bottled in the Tyrolean mountains by a company based in Innsbruck, Austria, it describes itself as "a sip of fresh air." Already big in the Middle East—where water's a more precious commodity than it is here—it has been launched in Europe and now in the UK.

Oxygizer doesn't just slake a thirst, it provides the body with extra oxygen too. A litre contains 150 mg of oxygen, around 25 times more than what's in a litre of tap water. This apparently helps remove toxins and ensures a stronger immune system, as well as assisting the respiratory system so you recover better from exercise. Some claim detox benefits, it helps hangovers, and even enhances flavours to make food taste better.

1. List the claims made by this article. Is there enough information presented in this article to back up the claims made?
2. Use the appropriate questions in the checklist provided in Chapter 1, Table 1.2, to evaluate this newspaper article. What types of information are missing from this article?
3. Is any data presented to substantiate the claim that oxygenated water improves health?

Abstract

It has been asserted that the consumption of oxygenated water can support physical working capacity. As this has not been accurately investigated yet we analyzed effects of a two-week period of daily O_2-water ingestion on spiroergometric parameters and lactate metabolism in healthy adults. Twenty men (24 ± 2.5 years of age) with comparable aerobic abilities performed four exhaustive bicycle spiroergometric tests. Applying a double-blind crossover study design, 10 subjects drank 1.5 liters of highly oxygenated water every day during the two weeks between the initial two tests whereas the other group consumed 1.5 liters untreated water from the same spring. After a two-week wash-out period subjects underwent a second period consuming the opposite type of water. Spiroergometric parameters and lactate kinetics between both groups at submaximal and maximal levels were analyzed using a MANOVA. Results showed no significant influence on aerobic parameters or lactate metabolism, neither at submaximal nor at maximal levels (all p-values ≥ 0.050). Merely increments of $V{\cdot}EO_2$ at submaximal levels were demonstrable ($p = 0.048$). We conclude that the consumption of oxygenated water does not enhance aerobic performance or lactate kinetics in standardized laboratory testing.

Does Oxygenated Water Support Aerobic Performance and Lactate Kinetics?

V. Leibetseder, G. Strauss-Blasche, W. Marktl, C. Ekmekcioglu. Int J Sports Med 2006; 27(3): 232-235

DOI: 10.1055/s-2005-865633

Please reread the two Savvy Reader articles from Belk and Maier and use the checklist on the next page to evaluate the news report.

Oxygizer

Now read a second Oxygizer article from Belk and Maier. We will examine both the claims and the research abstract from the article that the developers of the drink used to substantiate their claims.

Savvy Reader Oxygizer Improves Performance?

The Savvy Reader feature in Chapter 2 introduced you to the oxygenated water beverage Oxygizer. In addition to making many other claims, the author of the newspaper article wrote that drinking Oxygizer would "assist the respiratory system so you recover better from exercise." The following is an excerpt from the website of the company that produces Oxygizer: "Oxygizer improves performance during periods of high physical stress and the resulting regenerative phase. Univ. Prof. Dr. Wolfgang Marktl (Head of Science at the Institute of Medical Physiology at Vienna University) and his research team have completed their scientific tests. Using a randomised double-blind study, these tests have proven the effective influence and effect of Oxygizer on the body's performance capability."

This is pretty compelling writing and may convince some to purchase this oxygenated water. However, let's also look at an excerpt from the actual scientific study performed by Dr. Marktl and published in the *International Journal of Sports Medicine* in March 2006. "Results showed no significant influence on aerobic parameters or lactate metabolism, neither at submaximal nor at maximal levels. We conclude that the consumption of oxygenated water does not enhance aerobic performance."

1 Does it appear that the author of the newspaper article read the actual study or the promotional material only?

2 How are claims made in the newspaper and on websites different from claims made by authors of articles published in scientific journals?

3 The Oxygizer website also includes some data (http://www.oxygizer.com/default.aspx?lngId=2) that seem to support their claims. Private companies can hire their own scientists to perform studies that often have results that differ from those of government and university-sponsored scientists. Would you be more skeptical of results produced by scientists hired by the company whose product they are testing or scientists who work for the government or a University?

4 Carefully consider the following two sentences from the Oxygizer website: "Univ. Prof. Dr. Wolfgang Marktl (Head of Science at the Institute of Medical Physiology at Vienna University) and his research team have completed their scientific tests. Using a randomised double-blind study, these tests have proven the effective influence and effect of Oxygizer on the body's performance capability." Each of these sentences, read separately, is true. Dr. Marktl and his team did complete their tests, and the Oxygizer scientists did produce data showing increased performance capability. However, placed adjacent to each other, these sentences seem to be indicating that Dr. Marktl's university-sponsored research came up with results that were actually produced by the Oxygizer scientists. Do you think this is a willful attempt to deceive potential customers? Most people don't have time to do such a thorough analysis of every newspaper article they read. This is why it is helpful to develop a general level of skepticism about most product claims.

Savvy Reader (continued)

Table 1.2 **A guide for evaluating science in the news.** *For each question, check the appropriate box.*

Question	Possible answers: Preferred answer		Possible answers: Raises a red flag	
1. What is the basis for the story?	Hypothesis test	◯	Untested assertion *No data to support claims in the article.*	◯
2. What is the affiliation of the scientist?	Independent (university or government agency)	◯	Employed by an industry or advocacy group *Data and conclusions could be biased.*	◯
3. What is the funding source for the study?	Government or nonpartisan foundation (without bias)	◯	Industry group or other partisan source (with bias) *Data and conclusions could be biased.*	◯
4. If the hypothesis test is a correlation: Did the researchers attempt to eliminate reasonable alternative hypotheses?	Yes	◯	No *Correlation does not equal causation. One hypothesis test provides poor support if alternatives are not examined.*	◯
If the hypothesis test is an experiment: Is the experimental treatment the only difference between the control group and the experimental group?	Yes	◯	No *An experiment provides poor support if alternatives are not examined.*	◯
5. Was the sample of individuals in the experiment a good cross section of the population?	Yes	◯	No *Results may not be applicable to the entire population.*	◯
6. Was the data collected from a relatively large number of people?	Yes	◯	No *Study is prone to sampling error.*	◯
7. Were participants blind to the group they belonged to and/or to the "expected outcome" of the study?	Yes	◯	No *Subject expectation can influence results.*	◯
8. Were data collectors and/or analysts blinded to the group membership of participants in the study?	Yes	◯	No *Observer bias can influence results.*	◯
9. Did the news reporter put the study in the context of other research on the same subject?	Yes	◯	No *Cannot determine if these results are unusual or fit into a broader pattern of results.*	◯
10. Did the news story contain commentary from other independent scientists?	Yes	◯	No *Cannot determine if these results are unusual or if the study is considered questionable by others in the field.*	◯
11. Did the reporter list the limitations of the study or studies on which he or she is reporting ?	Yes	◯	No *Reporter may not be reading study critically and could be overstating the applicability of the results.*	◯

Evaluation Chart

Source

5 hour energy ad

Claim	Evaluation	Conclusion

Source

Oxygizer Chapter Two article

Claim	Evaluation	Conclusion

Source

Oxygizer Chapter Three article

Claim	Evaluation	Conclusion

Source

Oxygizer research abstract

Claim	Evaluation	Conclusion

Other notes

Activity

3 Introducing the Task

Nutrition Final Project Directions:

Prompt: How does the scientific community communicate important information to a lay audience? After researching scientific articles, journals and websites on important topics in nutrition, write an informational pamphlet in which you explain the issues, causes, problems and possible solutions to the public. Support your position with evidence from the texts.

Purpose: Your purpose is to create an informational pamphlet or brochure about a topic related to nutrition and diet using science research to support your claims.

A pamphlet is considered to be gray literature, which is literature hard to find using conventional methods. Gray literature is an important type of scientific literature because it provides recent information, information found within the last 12 to 18 months, and includes up-to-date research. Gray literature, like the pamphlet, should be easy to understand for a lay audience. Even though you are communicating the information in a more simplified way, you must understand the science concepts fully to be able to explain them to others. You will need to cite your sources and include them in a works cited page, so that if the reader wishes to read for more detailed information it will be available to them.

In this project, you will select a topic about nutrition or diet that you think the public needs to know more about. It should be a timely issue that would resonate with people interested in finding out more about said topic.

The topics should be debatable. That is, reasonable people may have differing views about the topic. The topic should be narrow and focused enough to investigate for this assignment. For example, nutrition-related diseases is too broad a topic and could be a book instead of a pamphlet. Instead, you might want to focus on one nutrition-related disease in particular.

You will need to bring 10 copies of your pamphlet for class presentations.

You will need to include at least five sources to use in your work. To help you read and organize the material you will take notes on each source in your Academic Notebook.

Finding Articles for the Final Project: Articles can be found in many different places including journals, magazines, newspapers, and websites. Popular journals, such as *Scientific American*, are aimed at the general public. The articles are written by journalists, who have consulted with experts, to be accessible by the public. Peer-reviewed journals contain articles written by experts aimed at experts. The reader is expected to know the basics on the topic covered in the article. For the final project, we are going to focus on popular journals, magazines, newspapers and websites.

Example websites and journals:

- http://www.scientificamerican.com/.
- http://news.sciencemag.org/.
- http://www.mayoclinic.com/.
- http://www.nih.gov.

To format your pamphlet, you will use a four-column layout. This will give you a total of eight panels to use to explain your information. How you organize the information in your pamphlet will depend upon your topic. A sample layout is shown below—be sure to include all of the elements in your pamphlet. Fold the paper so that the title page will be on the front and the works cited will be on the back when the pamphlet is folded and ready to be read. The layout will need to be printed on legal sized paper. The four-column layout will give you more room to include the information from your sources. You can use Microsoft Word or Microsoft Publisher to complete the pamphlet.

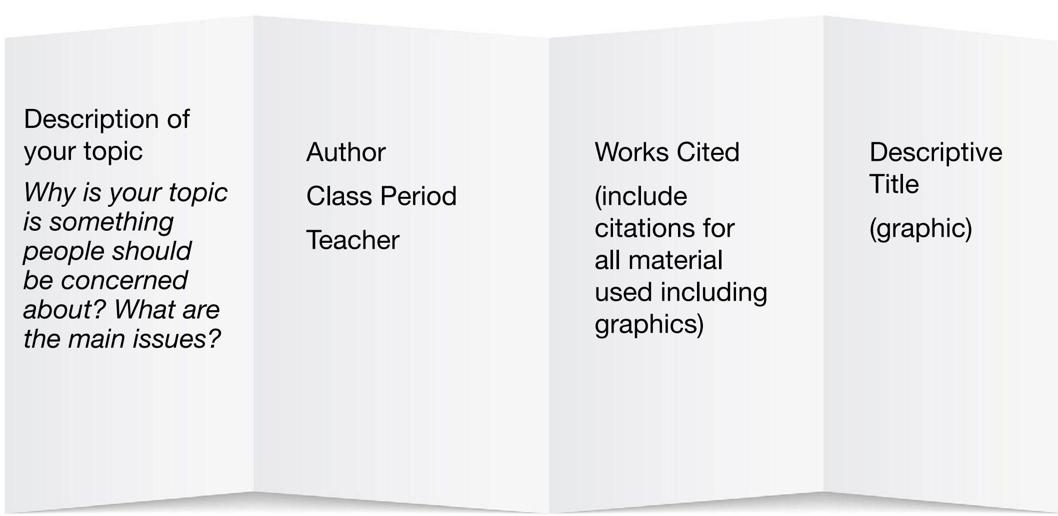
Microsoft Word Directions:

- Open Microsoft Word.
- Go to File, then Page Setup and then choose Landscape (under the Margins Tab).
- While you are there, change the top and bottom margins to one inch. Change the right and left margins to 0.5 inches.
- Click on the Paper Tab while in Page Setup and choose Legal.
- Next choose Format, then click on columns and then choose Four.

Microsoft Publisher Directions

- Open Microsoft Publisher.
- Click on Publications for print.
- Click on Brochures.
- Choose from the Informational Brochures section.
- Once the brochure is chosen, on the left hand side of the screen, click on four-panel.

Side One



Side Two

Grading Rubric

Category	Excellent	Good	Almost	Not Yet
Attractiveness & Organization (Organization)	Exceptionally attractive formatting and well-organized information.	Attractive formatting and well-organized information.	Well-organized information.	Formatting and organization of material are confusing to the reader.
Content - Accuracy (Ideas)	The science is exceptionally well explained including all relevant information.	The science is well explained including all relevant information.	The science is explained including most relevant information.	The pamphlet has little of the required information.
Writing - Mechanics (Conventions)	No errors.	No major errors, one to two minor errors.	Has some major and minor errors.	Has some major and minor errors.
Scientific language and terminology	Used carefully throughout the pamphlet in ways the public can understand.	Used in most of the pamphlet in ways the public can understand.	Is used, but is confusing for readers.	Is not used.
Graphics/ Pictures	The graphics go well with the text and there is a good mix of text and graphics.	The graphics go well with the text, but there are so many that they distract from the text.	The graphics go well with the text, but there are too few.	The graphics do not go with the accompanying text or appear to be randomly chosen.
Sources	Carefully chosen, excellent sources that provide a full picture of the issues involved in the topic.	Carefully chosen sources that provide a good picture of the issues involved in the topic.	Sources do not provide a full picture of the issues involved in the topic.	Incomplete sources.
Citations	No errors in APA style.	Few errors in APA style.	Many errors in APA style.	APA style not used.

ELEMENTS OF AN EFFECTIVE PAMPHLET

1. The pamphlet my group analyzed:

2. What was the purpose of the pamphlet? Who is the writer?

3. Who was the intended audience? How can you tell?

4. How was the information presented? Were there directions? A call to action?

5. What kind of vocabulary was used in the pamphlet? (Technical, scientific, general?) How did the language choice impact the message?

6. How were science concepts explained?

7. Which of the following text features were contained in the pamphlet? Which ones were particularly effective?

Print Features	Organizational Aids	Graphic Aids	Illustrations
• font • italics • bold print • colored print • bullets • titles • headings • subheadings • labels • sidebars • text boxes • captions	• table of contents • index • glossary • preface • pronunciation guide • appendix	• diagrams • sketches • graphs • comparisons • figures • maps • charts • tables • cross-sections • timelines • overlays	• colored photographs • colored drawings • black & white photographs • black & white drawings • labeled drawings • enlarged photo-graphs

My Topic Idea:

This is an important topic because:

What I need to find out:

What I want to let the public know about:

Understanding the final project: In your own words, summarize the task.

Project Planning Timeline

Make a plan for completing the project by the due date. Be sure to include deadlines for finding and reading your sources, and creating a final draft to be discussed in class.

Project Title:

What will be done?	By when?	What resources will I need?	What goals do I have?	Notes

Lesson 2

Close Reading in the Sciences: Nutrition

In this lesson, you will . . .

- Explain the processes involved while reading in the sciences.
- Learn about how to approach both general and discipline-specific vocabulary.
- Learn about and practice close reading with a college-level science chapter on nutrition.

Activity 3 Annotational Close Reading

Reading Science Text

(Adapted from Nist-Olejnik & Holschuh, 2013).

In science textbooks, you will find many new terms and definitions. Often, the terms introduced in early chapters will be used later in the text to define other terms. So you need to be sure you understand the new terms as they appear to avoid trouble understanding future reading. Science textbooks also discuss proven principles and theories in terms of their relationship to each other. Therefore, it is important to be aware of and understand how the theories connect and how they explain the science concepts you are learning.

Concepts in science textbooks are usually presented sequentially, which means the concepts build on each other. Your best plan is to test yourself as you read to make sure you fully understand each concept. It is also helpful to create reading goals to monitor what you are learning. This means that rather than focusing on getting through a chapter, focus on learning concepts every time you read. Adopt a scientific approach and ask yourself questions such as:

- What data supports this concept or theory?
- What other theories is this concept related to?
- How does this phenomenon work? What is the scientific process involved?
- Why does this phenomenon occur?
- What does it show us?

It is also important to pay attention to the diagrams in each chapter. They are there to help you picture the science process so that you can see what is happening. Understanding diagrams is crucial to doing well in most science courses.

Gearing Up for Reading

To gear up for reading, start by reading the chapter title and thinking about what you already know about that concept. Focus on primary and secondary headings to understand how the chapter is organized and how the ideas are related together. If your text has an outline of topics at the beginning of each chapter, use it to help you think about the key points. If not, skim through the chapter for key terms and think about how they are related to the appropriate heading or subheading. Pay special attention to diagrams and figures, and think about how they relate to the overall focus of the chapter. Finally, read the chapter objectives and guiding questions if your textbook has these features.

What and How to Annotate During Reading

Because of the large amount of new terminology involved in learning science, it is important for you to read your science textbooks before class. In this way, you will be familiar with the terms and concepts discussed in the text and you will be able to build your understanding of the concepts as you listen in class. It is also a good idea to connect the concepts discussed in class with the concepts described in your text by comparing your lecture notes to your text annotations each time you read. This will help you follow the flow of the concepts and will help you understand how the ideas are connected.

When you annotate your science text, you need to match your annotations to the course expectations. For example, if you are expected to think at higher levels, be sure your annotations include more than just the bold-faced terms. If you are expected to be able to explain science processes, be sure your annotations help you learn to do just that.

In general, it is a good idea to limit the amount of material you annotate. Annotate big concepts and save the details for your rehearsal strategies. A big mistake that students make when annotating science is that they tend to annotate too much. It is also essential to focus on putting the ideas into your own words. This will help you monitor your understanding of what you have read and will keep you from copying exactly from the text. In addition, look for experiments and results or conclusions drawn from scientific theories, and seek to make connections between the experiments and the concepts they generate.

Science texts often contain diagrams or charts to explain concepts. Because science exams usually contain questions about the concepts described in diagrams or charts, you must be able to read and understand each one. As you read your text, annotate the diagrams and take the time to reflect on what they are depicting. A good self-testing strategy to make sure you fully understand the concept is to cover up the words in the diagram and try to talk through the information. If you can explain how the concept works, you've shown that you understand it. If you find that you cannot explain it, reread your annotations or the diagram text to be sure you understand the key points.

In the annotation example on the next page, notice how the annotations focus on explaining the concepts rather than just memorizing the terms.

Example of Annotations in a Science Textbook

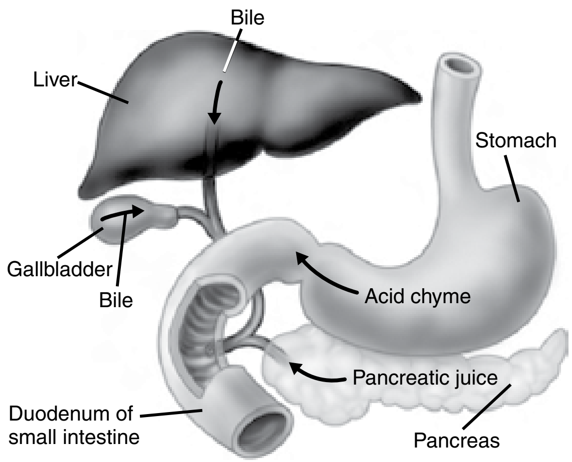


Figure 22.12
The duodenum. Acid chyme squirted from the stomach into the duodenum (the beginning of the small intestine) is mixed with pancreatic juice, bile from the liver and gallbladder, and intestinal juice produced by the duodenal lining itself. As peristalis propels the mix along the small intestine, hydrolases break food molecules down to their monomers.

The duodenum receives digestive juices from the pancreas, liver, and gallbladder (**Figure 22.12**). The **pancreas** is a large gland that secretes pancreatic juice into the duodenum via a duct. Pancreatic juice neutralizes the stomach acids that enter the duodenum and contains hydrolases that participate in the chemical digestion of carbohydrates, fats, proteins, and nucleic acids.

Bile is a juice produced by the **liver**, stored in the **gallbladder**, and secreted through a duct into the duodenum. Bile contains no digestive enzymes but does have substances called bile salts that make fats more accessible to lipase. Fats, including those from the cheese of the pizza we're following, are a special problem for the digestive system because they do not dissolve in water. The fats in chyme start out as relatively large globules. Only those molecules on the surface of the globules are in contact with the lipase dissolved in the surrounding solution. Agitation from the rhythmic contraction of muscles in the intestinal wall breaks the fat globules into small droplets, but without the help of bile salts, those droplets would quickly fuse again into larger globules that would be difficult to digest. Through a process called emulsification, bile salts essentially coat the tiny fat droplets and prevent them from fusing. Similarly, emulsification by a chemical additive helps keep oil permanently mixed with vinegar in some commercial salad dressings.

The intestinal lining itself also aids in enzymatic digestion by producing a variety of hydrolases. The cumulative activities of all these hydrolytic enzymes break the different classes of food molecules completely down into monomers, which are now ready for absorption into the body.

Absorption of Nutrients Wait a minute! The previous sentence said that nutrients "are now ready for absorption by the body." Aren't these nutrients already in the body? Not really. The alimentary canal is a tunnel running through the body, and its cavity is continuous with the great outdoors. The doughnut analogy in **Figure 22.13** should convince you that this is so. Until nutrients actually cross the tissue lining of the alimentary canal to enter the bloodstream, they are still outside the body. If it were not for nutrient absorption, we could eat and digest huge meals but still starve to death, in a sense.

Most digestion is complete by the time our pizza meal reaches the end of the duodenum. The next several meters of small intestine (called the jejunum and the ileum) are specialized for nutrient absorption. The structure of the intestinal lining, or epithelium, fits this function (**Figure 22.14**). The surface area of this epithelium is huge—roughly 300m^2, equal to the floor space of a one bedroom apartment. The intestinal lining not only has large folds, like the stomach, but also fingerlike outgrowths called villi, which makes the epithelium something like the absorptive surface of a fluffy bath towel. Each cell of the epithelium adds even more surface by having microscopic projections called microvilli. Across this expansive surface of intestinal epithelium, nutrients are transported into the network of small blood vessels and lymphatic vessels in the core of each villus.

Digestion Sm Intestine
- when food reaches sm int. it has been thru mech. and chem. digestion
- hydrolisis is initiated

Duodendum
1st ft. of sm int.
- where food is broken into monomers
- gets digest. juice from pancreas (pancreatic juice via duct—neutralizes stomach acid & contains hydrolases for chem digest), liver (bile), gallbladder (where bile is stored and via duct)
- Bile salts—make fats accessible to lipase thru **emulsification**—bile salts coat fat droplets to keep them separated (like oil and water in dressing) Int. lining produces hydrolases to get food ready for absorption

Absorption
Nutrients don't really 'enter' body until entering bloodstream. Nut abs occurs in jejunum and ileum (next parts of sm int.)
Epithelium—int. lining (huge—300m^2, folded, and has villi). Very abosorptive. Each cell has microvilli—all help transport nutrients

The Annotation System of Text Marking

What is Annotation?

- Writing brief summaries in the textbook's margin.
- Enumerating multiple ideas (i.e., causes, effects, reasons characteristics).
- Sketching pictures or charts to explain difficult processes/concepts.
- Writing possible test questions.
- Noting puzzling or confusing ideas that need clarification.
- Underlining key ideas.

Why Should I Annotate?

- It will improve your concentration so you will not become distracted and have to re-read.
- It can provide an immediate self-check for your understanding of the textbook's key ideas.
- It will help you remember more.
- It can assist you in test preparation.
- It will negate the need of time spent in re-reading the chapters.
- It will help you state ideas in your words.

What should I annotate?

- Definitions.
- Lists, features, causes, effects, reasons, characteristics.
- Diagrams and Processes.
- Examples of main idea.
- Good summaries.
- Possible test questions.
- Something you do not understand.

Four Types of Vocabulary Encountered in Science Texts

1. **Discipline specific vocabulary:**

   These are content area words like *polymer* or *macromolecule* that help students understand the content they are reading—these are often the boldface words in science texts.

2. **Words that help you discuss the discipline:**

   These are words that discipline experts use when they practice the discipline such as *hypothesis*, *theory*, *model*, *process* and *evidence*.

3. **General academic vocabulary:**

   These are difficult words that can be used in any discipline, like *expediency*, *plethora* and *enumerate*.

4. **General vocabulary used in a discipline-specific way:**

   These are words that have general meanings and specific meanings in a discipline. “Class” in history means something different than “class” in science.

SCIENTIFIC ROOT WORDS, PREFIXES AND SUFFIXES

(http://www.succeedinscience.com/apbio/assignments/generalinfo/rootwords.pdf)

a-; an- ab- -able	not; without; lacking; deficient away from; out from capable of	cente- centi- centr-	pierce; hundredth; center	-err- erythro- -escent	wander; go astray red; becoming
ac-	to; toward	cephal-	head	eso-	inward; within; inner
-aceous	of or pertaining to	cerat-	horn	eu-	well; good; true; normal
acou-; acous -	hear	cerebr-	brain	eury-	widen
ad-	to; toward	cervic-	neck	ex-	out of; away from
aden-	gland	chel-	claw	extra-	beyond; outside
adip-	fat	chem-	dealing with chemicals	-fer-	bear; carry; produce
aero-	air	chir-	hand	ferro-	iron
agri-	field; soil	chlor-	green	fibr-	fiber; thread
-al	having the character of	chondr-	cartilage	-fid; fiss-	split; divided into
alb-	white	chrom-; -chrome	color	-flect; -flex	bend
alg-; -algia	pain	chron-	time	flor-	flower
alto-	high	-chym-	juice	flu-; fluct-; flux	flow
ambi-	both	-cid-; -cis -	cut; kill; fall	foli-	leaf
ameb-	change; alternation	circa-; circum-	around; about	fract-	break
amni-	fetal membrane	cirru-	hairlike curls	-gam-	marriage
amphi-; am-pho-	both	co-	with; together	gastr-	stomach
amyl-	starch	cocc-	seed; berry	geo-	land; earth
ana-	up; back; again	coel-	hollow	-gen; -gine	producer; former
andro-	man; masculine	coll-	glue	-gene-	origin; birth
anemo-	wind	coni-	cone	-gest-	carry; produce; bear
ang-	choke; feel pain	contra-	against	-glen-	eyeball
angi-	blood vessel; duct	corp-	body	-glob-	ball; round
ante-	before; ahead of time	cort-; cortic-	outer layer	gloss-	tongue
anter-	front	cosmo-	world; order; form	gluc-; glyc-	sweet; sugar
antho-	flower	cotyl-	cup	glut-	buttock
anti-	against; opposite	counter-	against	gnath-	jaw
anthropo-	man; human	crani-	skull	-gon	angle; corner
-ap-; -aph-	touch	cresc-; cret-	begin to grow	-grad-	step
apo-; ap-	away from	crypt-	hidden; covered	-gram; graph	record; writing
aqu-	water	-cul-; -cule	small; diminutive	grav-	heavy
archaeo-	primitive; ancient	cumul-	heaped	-gross-	thick
-ary; -arium	place for something	cuti-	skin	gymno-	naked; bare
arteri-	artery	cyan-	blue	gyn-	female
arthr-	joint; articulation	-cycle; cycl-	ring; circle	gyr-	ring; circle; spiral
-ase	forms names of enzymes	-cyst-	sac; pouch; bladder	-hal-; -hale	breathe; breath
aster-; astr-	star	cyt-; -cyte	cell; hollow container	halo-	salt
-ate	verb form - the act of...	dactyl-	finger	hapl-	simple
ather-	fatty deposit	de-	away from; down	hecto-	hundred
-ation	noun form - the act of...	deca-	ten	-helminth-	worm
atmo-	vapor	deci-	tenth	hem-	blood
audi-	hear	deliquesc-	become fluid	hemi-	half
aur-	ear	demi-	half	hepar-; hepat-	liver
auto-	self	dendr-	tree	herb-	grass; plants
bacter-; bactr-	bacterium; stick; club	dent-	tooth	hetero-	different; other
barb-	beard	derm-	skin	hex-	six
baro-	weight	di-; dipl- (Latin)	two; double	hibern-	winter
bath-	depth; height	di-; dia- (Greek)	through; across; apart	hidr-	sweat
bene-	well; good	dia- (Latin)	day	hipp-	horse
bi- (Latin)	two; twic e	digit-	finger; toe	hist-	tissue
bi-; bio- (Greek)	life; living	din-	terrible	holo-	entire; whole
-blast-	sprout; germ; bud	dis-	apart; out	homo- (Latin)	man; human

brachi-	arm	dorm-	sleep	homo- (Greek)	same; alike
brachy -	short	dors-	back	hort-	garden
brady-	slow	du-; duo-	two	hydr-	water
branchi-	fin	-duct	lead	hygr-	moist; wet
brev-	short	dynam-	power	hyper-	above; beyond; over
bronch-	windpipe	dys-	bad; abnormal; difficult	hyph-	weaving; web
cac-	bad	ec-	out of; away from	hypno-	sleep
calor-	heat	echin-	spiny; prickly	hypo-	below; under; less
capill-	hair	eco-	house	hyster-	womb; uterus
capit-	head	ecto-	outside of	-iac	person afflicted with disease
carcin-	cancer	-elle	small	-iasis	disease; abnormal condition
cardi-	heart	-emia	blood	-ic	(adjective former)
carn-	meat; flesh	en-; endo-; ent-	in; into; within	ichthy-	fish
carp-	fruit	-en	made of	ign-	fire
carpal-	wrist	encephal-	brain	in-; il-; im-; ir-	not
cata-	breakdown; downward	enter-	intestine; gut	in-; il-; im-; ir-	to; toward; into
caud-	tail	entom-	insects	in-	very; thoroughly
-cell-	chamber; small room	-eous	nature of; like	-ine	of or pertaining to
cen-; -cene	now; recent	epi-	upon; above; over	infra-	below; beneath
inter- intra-	between within; inside	-oma omni-	abnormal condition; tumor; all	sacchar- sapr-	sugar rotten
-ism	a state or condition	onc-	mass; tumor	sarc-	flesh
iso-	equal; same	oo-	egg	saur-	lizard
-ist	person who deals with...	opthalm-	eye	schis -; schiz-	split; divide
-itis	inflammation; disease	opt-	eye	sci-	know
-ium	refers to a part of the body	orb-	circle; round; ring	scler-	hard
-kary-	cell nucleus	-orium; -ory	place for something	-scop-	look; device for seeing
kel-	tumor; swelling	ornith-	bird	-scribe; -script	write
kerat-	horn	orth-	straight; correct; right	semi-	half; partly
kilo-	thousand	oscu-	mouth	sept-	partition; seven
kine-	move	-osis	abnormal condition	-septic	infection; putrefac-tion
lachry-	tear	oste-	bone	sess-	sit
lact-	milk	oto-	ear	sex-	six
lat-	side	-ous	full of	-sis	condition; state
leio-	smooth	ov-	egg	sol-	sun
-less	without	oxy-	sharp; acid; oxygen	solv-	loosen; free
leuc-; leuk-	white; bright; light	pachy -	thick	som-; somat-; -	body
lign-	wood	paleo-	old; ancient	somn-	sleep
lin-	line	palm-	broad; flat	son-	sound
lingu-	tongue	pan-	all	spec-; spic-	look at
lip-	fat	par-; para-	beside; near; equal	-sperm-	seed
lith-; -lite	stone; petrifying	path-; -pathy	disease; suffering	-spher-	ball; round
loc-	place	-ped-	foot	spir-; -spire	breathe
-log-	word; speech	-ped-	child	-spor-	seed
-logist	one who studies...	pent-	five	stat-; -stasis	standing; placed; staying
-logy	study of...	per-	through	stell-	stars
lumin-	light	peri-	around	sten-	narrow
-lys-; -lyt-; -lyst	decompose; split; dis-solve	permea-	pass; go	stern-	chest; breast

macr-	large	phag-	eat	stom-; -stome	mouth
malac-	soft	pheno-	show	strat-	layer
malle-	hammer	-phil-	loving; fond of	stereo-	solid; 3-dimensional
mamm-	breast	phon-; -phone	sound	strict-	drawn tight
marg-	border; edge	-phore; pher-	bear; carry	styl-	pillar
mast-	breast	photo-	light	sub-	under; below
med-	middle	phren-	mind; diaphragm	super-; sur-	over; above; on top
meg-	million; great	phyc-	seaweed; algae	sym-; syn-	together
mela-; melan-	black; dark	phyl-	related group	tachy-	quick; swift
-mer	part	-phyll	leaf	tarso-	ankle
mes-	middle; half; intermediate	physi-	nature; natural qualities	tax-	arrange; put in order
met-; meta-	between; along; after	phyt-; -phyte	plant	tele-	far off; distant
-meter; -metry	measurement	pino-	drink	telo-	end
micro-	small; millionth	pinni-	feather	terr-	earth; land
milli-	thousandth	plan-	roaming; wandering	tetr-	four
mis-	wrong; incorrect	plasm-; -plast-	form; formed into	thall-	young shoot
mito-	thread	platy-	flat	-the-; -thes-	put
mole-	mass	pleur-	lung; rib; side	-thel-	cover a surface
mono-	one; single	pneumo-	lungs; air	-therm-	heat
mort-	death	-pod	foot	-tom-	cut; slice
-mot-	move	poly-	many; several	toxico-	poison
morph-	shape; form	por-	opening	top-	place
multi-	many	port-	carry	trache-	windpipe
mut-	change	post-	after; behind	trans-	across
my-	muscle	pom-	fruit	tri-	three
myc-	fungus	pre-	before; ahead of time	trich-	hair
mycel-	threadlike	prim-	first	-trop-	turn; change
myria-	many	pro-	forward; favoring; before	-troph-	nourishment; one who feeds
moll-	soft	proto-	first; primary	turb-	whirl
nas-	nose	pseudo-	false; deceptive	-ul-; -ule	diminutive; small
necr-	corpse; dead	psych-	mind	ultra-	beyond
nemat-	thread	pter-	having wings or fins	uni-	one
neo-	new; recent	pulmo-	lung	ur-	urine
nephro-	kidney	puls-	drive; push	-ura	tail
-ner-	moist; liquid	pyr-	heat; fire	vas-	vessel
neur-	nerve	quadr-	four	vect-	carry
noct-; nox-	night	quin-	five	ven-; vent-	come
-node	knot	radi-	ray	ventr-	belly; underside
-nom-; -nomy	ordered knowledge; law	re-	again; back	-verge	turn; slant
non-	not	rect-	right; correct	vig-	strong
not-	back	ren-	kidney	vit-; viv-	life
nuc-	center	ret-	net; made like a net	volv-	roll; wander
ob-	against	rhag-; -rrhage	burst forth	-vor-	devour; eat
ocul-	eye	rhe-; -rrhea	flow	xanth-	yellow
oct-	eight	rhin-	nose	xero-	dry
odont-	tooth	rhiz-	root	xyl-	wood
-oid	form; appearance	rhodo-	rose	zo-; -zoa	animal
olf-	smell	roto-	wheel	zyg-	joined together
oligo-	few; little	rubr-	red	zym-	yeast

Activity
4

Week 1
Weekly Reflection

Reflect on your experience:

1. Think about the science. What would scientists pay attention to if they were looking at a new energy drink on the market?

2. Think about your learning. How will this experience change the way you approach reading in the sciences?

3. Think about how using annotation impacted the way you read in science? What do you like about the strategy? What do you dislike about it?

Lesson 3
Analogies in Science

In this lesson, you will . . .

- Read, understand and apply science concepts to a health-related case.
- Read across texts in multiple representations and make connections between text, diagram and animation information.
- Present case study results in a short presentation to peers indicating an understanding of how to make science knowledge public.

Activity

1 Chemical Reaction Simulation

Now that you have learned about the nutrients your body needs to maintain itself and how the body attempts to obtain those nutrients, please respond to the following questions:

What has to happen to the food we eat in order to supply our cells with the nutrients they need?

How does this happen?

Chemical Reaction Simulation

Round 1:

Total Time to complete all chemical reactions:

In this simulation, each person represented a reactant. How did they find the other reactant that they were meant to undergo a chemical reaction with?

How does this serve as an analogy for chemical reactions?

How would you describe the rate of this reaction?

Chemical Reaction Simulation

Round 2:

Total Time to complete all chemical reactions:

How were the parameters of the “chemical reaction” changed in this round?

Based on this information, how do you think enzymes speed up chemical reactions?

Chemical Reaction Simulation

Round 3:

Total time to complete all chemical reactions:

How were the parameters of the “chemical reaction” changed in this round?

Based on this information, how do you think enzymes speed up chemical reactions?

Form a hypothesis to predict what might happen if the enzyme were absent in one of the enzyme/substrate systems.

Activity

2 Annotation of Text and Model Analysis

Connecting the Digestive Process

1. In your reading, what is the energy source for all the functions of cells?

   Why do you think it is important for your body to store excess glucose?

2. Think of a process that could serve as an analogy for the digestive process. Describe your analogy, and explain how your analogy compares to digestion.

3. Re-examine the “Art Connection” diagram of digestion on page 1000 of your text. Answer the multiple choice question posed in Figure 34.19. Explain your answer and identify the evidence in the text that supports your answer.

4. What does “Hydrophopbic” mean? Why are lipids called hydrophobic substances?

5. What is the role of hormones in the digestive process?

Activity

3 Synthesis and Application

Lactose Intolerance Case Study

Visit the Mayo Clinic Website to answer the following questions:

1. Define lactose intolerance

2. What are the symptoms of lactose intolerance?

3. What are the causes of lactose intolerance?

Hannah, a 21 year-old female, used to enjoy eating out with friends. Over the past year, she has noticed that within an hour after she eats, she experiences bloating, abdominal cramping, gas, and diarrhea. These symptoms do not occur after every meal. For example, eating in her favorite sushi restaurant is fine as are the meals at the BBQ restaurant. Other foods always seem to bother her such as pizza or burgers. Because Hannah does not know when she will experience the symptoms, she always makes sure she eats somewhere close to home.

Why might one suspect lactose deficiency in this case?

What information helped you solve this?

Draw and label two diagrams: (1) showing the digestion of lactose when lactase is present and (2) showing the process for someone with lactose deficiency.

Week 2
Weekly Reflection

1. Think about the science. What did you learn about enzymes and calories?

2. Think about your learning. How will this experience change the way you approach reading in the sciences?

Lesson 4

Transforming Science Information

In this lesson, you will . . .

- Transform knowledge from visual to text and vice versa.
- Compare and integrate representations of science processes.
- Understand the role of models, animations and multiple representations of information in science.
- Explain science processes through discussion, writing and diagramming.

Activity

1 Reading Across Text

Notes on *Feel the Burn*. *Talk through*.

1. How did the scientists measure calories from restaurants?

    a. Explain the procedure used to prepare the food.

    b. Explain the procedure used to measure the food.

2. What is the difference between metabolizable energy and gross energy?

3. Based on what you read in this article, why do you think the researchers found differences between the calories reported by restaurants and their own results? Identify the location in the text that supports your explanation.

Activity

3 Understanding Animations

Visualization represents any technique for creating images to represent abstract data. One specific area of visualization is scientific visualization. In general the term "scientific visualization" is used to refer to any technique involving the transformation of data into visual information, using a well-understood, reproducible process. Scientific visualization is important because scientists understand the utility of being able to transform information from text to visual and back to text as ways to convey meaning and explain difficult or abstract processes.

Write a summary paragraph explaining the Enzyme Animation.

Write a paragraph explaining the Diffusion Animation.

Draw a labeled diagram of the process of diffusion.

Draw a diagram of Facilitated Transport based on your partner's summary.

Draw a diagram of Osmosis based on a partner's summary.

Lesson 5

Synthesizing Knowledge Gained From Text

In this lesson, you will . . .

- Clearly explain science concepts to peers.
- Learn the Cornell Method of note-taking.
- Pull concepts together from multiple sources and representations to discuss the complexity of calories.
- Develop arguments based on evidence from multiple sources.

Activity

1 Gathering Information on Health Disorders

Research your assigned health disorder and take notes below.

Health Disorder information notes:

(include information on the definition of the disorder, causes, associated risks, and treatments)

Website used for your information:

Juicy sentence to share with the class:

Notes on the reports from other groups:

Summary of BMI article:

Activity
2 3 Cornell Note Taking

Cornell Notes page

Cornell Notes page

Activity

3 Insulin Lecture

Lecture Note Checklist:
Please check the appropriate number.

	5 *Always*	4	3 *Sometimes*	2	1 *Never*
The lecture notes are titled and dated.	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
The notes are easy to read.	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
The notes are organized.	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
You underline or star key ideas.	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
You utilize abbreviations of longer words.	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
You skip spaces between ideas/concepts.	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
You indent minor points.	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
You note all the important concepts	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
You paraphrase what the instructor says.	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
Your notes incorporate examples.	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
Your notes are accurate.	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
Your notes are complete.	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
Your notes include self-test questions.	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
Your self-test questions: a. Are complete.	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
b. Will prepare you for the instructor's tests.	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
c. Cover all the material from that day's lecture.	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
d. Use short-answer format.	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
e. Are appropriate for the type of tests in the class.	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
f. Combine material from multiple lecture topics into a single question.	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1

Activity

4 Synthesizing Knowledge

Prompt:

Is counting calories enough for a person to maintain health? After viewing animations and lectures and reading informational articles, compare the interpretations of the role of calories and argue for the other factors that need to be considered. Be sure to support your position with evidence from the texts and videos.

Use the prompt above to show your understanding of the complexity of calories. You may use your notes from the text, articles and videos to support your stance. Think about the following:

- How could a person be overweight, but calculate a lower-than-recommended daily caloric intake? Discuss the role of metabolism, nutrients, fat and calories.

- Explain the science behind the saying, “you are what you eat,” in terms of a person’s overall health. What role does transport play?

- What factors do we need to consider when looking at someone's overall health (nutrients, enzymes, health disorders)?

- Make a recommendation for someone trying to lose weight about what they need to think about in addition to calories. What if that person had an obesity-related disease? What additional recommendations would you have?

List the text, lecture, lab or animation information that supports your stance.

Source (text, lecture, etc.)	Quote/Facts	Summary of how this information supports your stance

Lesson 6
Taking Science Quizzes

In this lesson, you will . . .

- Utilize strategies to generate your own quiz reviews.
- Learn to ask and answer higher-level questions.
- Use group-testing as a way to increase your ability to explain and understand science concepts.
- Evaluate your own quiz performance.

In this class, you will take a short quiz (15 questions). However, this quiz may work a little differently than you are used to. First, you will take the quiz individually and turn it in. Your individual quiz will count for two-thirds of your total quiz score.

Then, you will retake the same quiz with your group.

In your group, you need to discuss each question and come to a consensus regarding the appropriate answer in order to fill out a single answer sheet that you will submit as a group. The group quiz scores will count as up to one-third of your total quiz score.

To encourage everyone to participate and to prevent “free-loading” during the group quiz, you will be asked to evaluate the other members of your group on how well they contributed to group functioning. This evaluation will be used to determine how many group quiz points each student will receive. For example if a student receives an average score of 80 percent from their peers, that student would receive 80 percent of their group’s test points. (Of course, the instructor reserves the right to overrule any peer evaluation score if it appears to be inaccurate or inappropriate such as when evaluations have been biased because of personality conflicts.)

Activity

2 Preparing for Science Tests

The talk-through:

A "talk-through" is a method of preparing and reviewing for an quiz that involves you in practicing and rehearsing aloud the key ideas of a text or science process. A talk-through is very similar to a lecture that you would give someone. In fact, when giving a talk-through, you should imagine yourself as an instructor giving a lecture to students who know very little about the topic you are teaching. For example, if you know a lot about the ozone layer or how to use the IBM computer and taught your roommate or friend to understand the concept of the ozone layer or how to use the IBM computer, you have probably given a talk-through.

To create an effective talk-through:

1. Select a difficult concept from Belk and Maier Chapter Three or Four, the animations you viewed, the lectures or the articles you read thus far. Think about the important ideas involved in the concept you selected.
2. Organize the key ideas and details on an index card, but be brief—don't write everything as the card is meant only to prompt your memory.
3. Find a quiet place, close the material you are using and use your talk-through card to deliver aloud your talk-through.
4. After practicing your first talk-through, refer back to the material to be sure you included all of the key ideas and that your talk-through was accurate and complete.

Question and Answer Strategy

In this strategy, you will use the science concepts you learned so far to create 10 questions. You will use these questions to quiz your classmates over the material as a way to prepare for the quiz. Remember to include questions from the textbook, articles, videos, animations, etc.

Use the following guidelines as you create your questions:

- Avoid "what" questions. Ask higher-level questions using words such as *why*, *how*, *explain* or *compare*. For example, it is much better to ask a question such as, *"Explain the role of the enzymes in lactose intolerance."* than it is to ask, *"What is an enzyme?"*
- Predict short answer items (even if you are taking multiple-choice tests) because it will help you check your knowledge of an entire concept, rather than one small part.
- Ask questions that require application, analysis or interpretation of ideas. These are the types of questions you will be asked on the quiz.
- Get at the "big picture."
- Ask questions that make people really think about the concepts.
- (General hint: if it takes more words to ask the question than to answer it, ask a tougher question.)

Activity

2 Quiz Review

QUESTION	ANSWER *(note: you can write this as a bulleted list)*	Source(s) *(please specifically note where the material came from—text, article, lecture, etc.)*	Page number
1.			
2.			
3.			
4.			
5.			

6.			
7.			
8.			
9.			
10.			

Activity

5 Evaluating the Quiz

GROUP QUIZ Evaluation:

The purpose of this evaluation is to help you learn from your experience preparing for and the quiz. Think about how you felt about your level of preparation before the quiz, where you focused your effort, and how you felt taking both the individual and group portions of the quiz. What were the results of your experiments? What was surprising in these results?

1. What went right? Analyze the quiz to discuss what you did well and what helped your thinking about these concepts.

2. What went wrong? Analyze the quiz to discuss areas you might want to work on. In this analysis:

   Think about the errors you made and diagnose the nature of your difficulties as they relate to the nutrition concepts learned, problem solving expected, or your beliefs about science and/or science learning. Note: don't just describe a difficulty; you need to analyze your thinking. (Example: A poor diagnosis would be, "I was confused" or "I picked the wrong answer." A good diagnosis would provide a reason for the errors "I thought that a person's basal metabolic rate was the same as their overall metabolic rate.")

3. What will I do differently next time? Conduct an overall assessment of your quiz performance.

   This is where you will look for patterns to your errors, think about particular aspects of the quiz that may have been difficult for you, types of questions you missed, general concepts that were difficult, etc. In your assessment, write about how understanding these issues will impact your science quiz taking in the future.

PEER EVALUATIONS

Name: Group Name:

This is an opportunity to evaluate the contributions of your teammates to group quizzes. Please write the names of your teammates in the spaces below and give them the scores that you believe they earned. You will have 10 points available to distribute for each member or your group, not counting yourself (e.g., if you are in a group of six people, you each will have 50 points to distribute. A group of five would have 40 points, etc.). If you believe everyone contributed equally, then you should give everyone 10 points. If everyone in the group feels the same way, you will all have an average of 10 points and receive 100 percent of the group score. An average of nine would receive 90 percent of the group quiz score, etc. Be fair and accurate in your assessments. If someone in your group didn't contribute adequately (i.e., had not studied, didn't communicate with the rest of the group, frequently missed class, etc.), give them fewer points. If someone worked harder than the rest, give that person more than 10 points.

There are some rules that you must observe in assigning points:

- This is not a popularity contest. Don't give anyone a grade that they don't deserve (high or low) for personal reasons or otherwise.
- Contributing to the group does not simply mean who gave the most correct answers. Asking good questions, challenging the group, etc., showing up reliably are also ways to contribute.
- You cannot give anyone in your group more than 15 points.
- You do not have to assign all of your group points, but you cannot assign more than the total number of points allowed for each group (i.e., (number of people in group – 1) x 10 points).

Group Member:	**Score:**
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

Indicate why you gave someone more than 10 points.

Indicate why you gave someone less than 10 points.

If you were to give yourself a score, what would it be? Why?

Week 4

Weekly Reflection

1. Think about the science. What did you learn about transforming information and taking science tests?

2. Think about your learning. How will this experience change the way you approach reading in the sciences?

Lesson 7
Introduction to Science Research

In this lesson, you will . . .

- Plan your project.
- Learn to identify appropriate sources.

Activity

1 Nutrition Final Project Directions

Purpose: Your purpose is to create an informational pamphlet or brochure about a topic related to nutrition and diet using science research to support your claims.

A pamphlet is considered to be gray literature, which is literature hard to find using conventional methods. Gray literature is an important type of scientific literature because it provides recent information, information found within the last 12 to 18 months, and includes up-to-date research. Gray literature, like the pamphlet, should be easy to understand for a lay audience. Even though you are communicating the information in a more simplified way, you must understand the science concepts fully to be able to explain them to others. You will need to cite your sources and include them in a works cited page, so that if the reader wishes to read for more detailed information it will be available to them.

In this project, you will select a topic about nutrition or diet that you think the public needs to know more about. It should be a timely issue that would resonate with people interested in finding out more about said topic.

The topics should be debatable. That is, reasonable people may have differing views about the topic. The topic should be narrow and focused enough to investigate for this assignment. For example, nutrition-related diseases is too broad a topic and could be a book instead of a pamphlet. Instead, you might want to focus on one nutrition-related disease in particular.

You will need to bring 10 copies of your pamphlet for class presentations.

You will need to include at least five sources to use in your work. To help you read and organize the material you will take notes on each source in your Academic Notebook.

Finding Articles for the Final Project: Articles can be found in many different places including journals, magazines, newspapers, and websites. Popular journals, such as *Scientific American*, are aimed at the general public. The articles are written by journalists, who have consulted with experts, to be accessible by the public. Peer-reviewed journals contain articles written by experts aimed at experts. The reader is expected to know the basics on the topic covered in the article. For the final project, we are going to focus on popular journals, magazines, newspapers and websites.

Activity
2 Reading Scientific Articles

Taking Notes: React to what you read

Taking notes will help you to understand what you read and will save you effort in the future. When you have just read a paper, you may understand it well. The definitions are clear, the charts show correlations at a glance. But next week, when you are writing a report on this subject, or next year, when you need to refer to the paper again, it may not be so clear.

Highlight major points

On papers you plan to keep, underline main points or mark them with a line in the margin; make notes so that new ideas will stand out. When you find a definition of a new term, abbreviation or acronym, write "def" in the margin. When you find an example that clarifies a point, note that in the margin.

When you see a chart or table, examine it. Figure out what its significance is. What trends does it show? What correlations? Write a note explaining it in your own way.

React to the points in the paper

If you see a correlation to other work, note it in the margin. If you doubt a statement, note your objection. If you find a pleasing quotation, write it down.

Construct your own example

This can tell you if you understand the definitions and terminology, give you insight on why a theorem or result holds, and expose aspects not covered by the examples in the paper.

Summarize what you read

When you have digested an article, write a short summary. In your own words, state what you learned from the paper. What were the main points for you? Keep the summary with the article for future reference.

Reacting to what you are reading gets you emotionally involved in the argument. Emotion emphasizes what is said, making it easier to remember. Writing a summary helps to relate the paper to what you already know, again aiding memory by tying into your framework for the subject. The summary also serves as a reference when you need to return to the paper.

Summary: How to read a paper

Preparation
- Quiet place.
- Pencil, paper, photocopy of article.

Deciding what to read
- Read title, abstract.
- Read it, file it or skip it?

Read for breadth
- What did they do?
- Skim introduction, headings, graphics, definitions, conclusions and bibliography.
- Consider the credibility.
- How useful is it?
- Decide whether to go on.

Read in depth
- How did they do it?
- Challenge their arguments.
- Examine assumptions.
- Examine methods.
- Examine statistics.
- Examine reasoning and conclusions.
- How can I apply their approach to my work?

Take notes
- Make notes as you read.
- Highlight major points.
- Note new terms and definitions.
- Summarize tables and graphs.
- Write a summary.

An online version of this document can be found here:
http://www.cse.ogi.edu/~dylan/efficientReading.html

Thanks to Dave Maier for additional suggestions.

Efficient Reading of Papers in Science and Technology

This brochure provides an approach to help you read scientific papers efficiently and effectively.

Prepared by:
Michael J. Hanson
Updated by:
Dylan J. McNamee

version of January 6, 2000

Introduction: Why Read?

Before beginning to read a paper, consider why you are doing it. What do you want to get out of it? Your needs control how you read. If you only need an overview, a brief skim may suffice. If you will present the paper to others, you will need to dig deeply, to challenge the paper's arguments until you understand it fully. If you will use the information later, taking notes will help you remember it. If you don't know what you hope to gain from the paper, you can not tell whether reading it will be beneficial or a waste of time.

In order to get the most from your reading, you should be properly prepared. Find a quiet place to work where you will not be disturbed or distracted, have a pencil and note pad at hand, and bear in mind exactly what you expect to get from this paper.

The following method for reading a scientific paper offers you ideas about the process of reading a paper, how to decide what to read, how to build a broad framework by skimming, and how to challenge the paper to get depth of understanding. Finally, it will show you how to take notes so that the key points won't be lost as soon as you set the paper down. Since reading is the process of getting ideas from the author, you must focus on the author's thoughts, not just read the words on the paper.

Deciding what to read

When you first approach a paper, ask yourself "What did the author do?" Reading the title and the abstract should tell you this. Then decide if the paper is useful to you now. If so, read it. If not, might the paper be useful to you later? If so, file it. If it is not relevant to you, skip it.

Reading for Breadth: Build a framework

If you decide to read the paper, first skim it.

- Read the introduction.
- Read the section headings.
- Look at the tables and graphs to see what they say and read the captions.
- Read the definitions and theorems.
- Read the conclusions.
- Consider the credibility of the article:
  - Who wrote it? Are they well-known?
  - Where do they work? What biases might they have as a result of their employer?
  - Where was the article published? What is the reputation of the journal? Was the journal refereed?
  - When was it written? Might it be outdated or superceded?
- Skim the bibliography:
  - How extensive is it?
  - Are the authors aware of current work?
  - Does it reference classic papers in this field?
  - Have you read any of the papers that are referred to?
  - Do you know relevant research that isn't cited?

By skimming the paper first you can learn what the authors did, and develop a framework to understand the parts of the paper. Developing a framework adds to your general understanding of the field, and gives you a basis to understand the paper. If you know what conclusions they draw, you can follow their arguments more easily. Knowing where they are going can help you to follow their path and give you a chance to find shortcuts or places where they missed a turn.

Once you have skimmed a paper you have a broad idea of what they did. Then you can decide if you want to know more. If you are interested in how they did it, then read the body of the paper for details. If not, file away what you have learned and congratulate yourself

Reading in Depth: Challenge what you read

There is a lot of junk published, so you should be selective in what you read and what you believe. When you read a paper in detail, approach it with scientific skepticism. You can do this by trying to tear the arguments apart.

Examine the assumptions

- Do their results rely on any assumptions about trends or environments?
- Are these assumptions reasonable?

Examine the methods

- Did they measure what they claim?
- Can they explain what they observed?
- Did they have adequate controls?
- Were tests carried out in a standard way?

Examine the statistics

- Were appropriate statistical tests applied properly?
- Did they do proper error analysis?
- Are the results statistically significant?

Examine the conclusions

- Do the conclusions follow logically from the observations?
- What other explanations are there for the observed effects?
- What other conclusions or correlations are there in the data that they did not point out?

By challenging what you read, you will understand better what the author is saying and why they say it. You will also be able to decide whether the evidence supports their conclusions, and to draw your own conclusions from their data. Once you understand the paper, ask yourself how you can apply their approach to your own work.

Activity

3 Finding Articles for the Final Project

Articles can be found in many different places including journals, magazines, newspapers, and websites. Popular journals, such as *Scientific American*, are aimed at the general public. The articles are written by journalists, who have consulted with experts, to be accessible by the public. Peer-reviewed journals contain articles written by experts aimed at experts. The reader is expected to know the basics on the topic covered in the article. For the final project, popular journals, magazines, newspapers and websites are acceptable.

Example websites and journals:

- http://www.scientificamerican.com/.
- http://news.sciencemag.org/.
- http://www.mayoclinic.com/.
- http://www.nih.gov.

Lesson 8
Research and Writing in Science

In this lesson, you will . . .

- Use science research to explain science to the public.
- Identify important concepts from science articles and use the information to support your ideas.
- Explain the science topic you are researching by citing specific evidence from your sources.
- Engage in scientific inquiry by forming hypotheses, researching evidence and providing support across multiple sources to support your claims.

Taking Notes on Reading

We will be using APA style to cite sources. Please see the following website for examples of APA style: http://owl.english.purdue.edu/owl/resource/560/07/.

APA Basic Form

Articles

Author, A. A., Author, B. B., & Author, C. C. (Year). Title of article. *Title of Periodical, volume number* (issue number), pages. doi:http://dx.doi.org/xx.xxx/yyyyy.

Books

Author, A. A. (Year of publication). *Title of work: Capital letter also for subtitle.* Location: Publisher. (this type also uses a hanging indention)

Online periodical

Author, A. A., & Author, B. B. (Date of publication). Title of article. *Title of Online Periodical*, volume number (issue number if available). Retrieved from: http://www.someaddress.com/full/url/.

Activity

1 Taking Notes on Scientific Research

Use these charts to help you take notes on your sources:

Source (type – book, journal article, research report, etc.)	
Bibliographic information (full reference using APA style)	
Purpose of the paper	
Description	
Data (include page number)	
Examples (include page number)	
Important figures or tables (include page number)	
Summary	
What the public needs to know	

Source (type – book, journal article, research report, etc.)	
Bibliographic information (full reference using APA style)	
Purpose of the paper	
Description	
Data (include page number)	
Examples (include page number)	
Important figures or tables (include page number)	
Summary	
What the public needs to know	

Source (type – book, journal article, research report, etc.)	
Bibliographic information (full reference using APA style)	
Purpose of the paper	
Description	
Data (include page number)	
Examples (include page number)	
Important figures or tables (include page number)	
Summary	
What the public needs to know	

Source (type – book, journal article, research report, etc.)	
Bibliographic information (full reference using APA style)	
Purpose of the paper	
Description	
Data (include page number)	
Examples (include page number)	
Important figures or tables (include page number)	
Summary	
What the public needs to know	

Source (type – book, journal article, research report, etc.)	
Bibliographic information (full reference using APA style)	
Purpose of the paper	
Description	
Data (include page number)	
Examples (include page number)	
Important figures or tables (include page number)	
Summary	
What the public needs to know	

Activity

2 Outlining

Key Idea/Support Outline

List five to seven key ideas from your findings.

Begin to outline your ideas for the eight panels of the pamphlet.

Title:

Description of your topic (Why is your topic something people should be concerned about? What are the main issues?):

Background information (causes, symptoms, examples, descriptions, effects on the body, etc.):

Latest research on the topic (These are your five to seven key points. Be sure to include relevant statistics/data/charts, etc.):

Solutions/resolutions/actions people can take:

Week 5
Weekly Reflection

1. Think about the science. What did you learn about science research and health disorders?

2. Think about your learning. How will this experience change the way you approach reading in the sciences?

Activity

3 Revising your Work

Read your draft and think about the following questions:

1. Evaluate your main point. What are you trying to say in this pamphlet? Would it be clear to someone reading your pamphlet for the first time?
2. How is the writing appropriate for your intended audience?
3. What is your purpose for informing readers about your topic? Is your purpose clear in your draft?
4. Evaluate your evidence. Do you offer enough scientific evidence to support your points?
5. How are specific statistics/figures/data used to support your points?
6. Is there any information that doesn't seem to fit your purpose or your topic? You either need to add more support for that information or cut the idea.
7. Do the ideas flow from one point to another? Will the reader be able to follow a logical progression of ideas?
8. Can you read through the pamphlet in the way it is currently designed or do ideas need to be reordered?
9. Are you using and defining scientific terms? Are you using precise language to get your ideas across?
10. Are the references cited properly?
11. What specific suggestions/solutions do you provide for readers?
12. How does the information in the pamphlet follow the format outlined in the project directions?
13. Read for grammar and spelling errors.

Activity

4 Peer Editing

Editing & Revision Checklist

Paper's Author

Paper's Editor

Directions for the editor: Answer all questions to the best of your ability. The writer's grade somewhat depends on you. If you have questions or you are not sure about something, ask me. You need to read the paper several times. Do not skip sentences. Do not skim. Read very closely. Even read aloud quietly, so you can hear problems.

Directions for the writer (after the peer editing process): Make any changes necessary to gain a yes answer to all questions.

Headings and Subheadings:

☐ Yes ☐ No 1. Is there effective use of main heading?

☐ Yes ☐ No 2. Are there subheadings used?

☐ Yes ☐ No 3. Does the heading grab the reader's attention?

☐ Yes ☐ No 4. Do the subheadings contain all the proper information?

Introduction to the topic:

☐ Yes ☐ No 1. Is there an attention-getter?

☐ Yes ☐ No 2. Is there background information about the topic?

☐ Yes ☐ No 3. Are the main terms and issues defined?

Background information:

☐ Yes ☐ No 1. Is there a description of the causes of the problem and/or a description of the issue?

☐ Yes ☐ No 2. Is there an effective description of the symptoms, effects on the body, etc.?

☐ Yes ☐ No 3. Does the writer provide citations for the information?

Description of Research

☐ Yes ☐ No 1. Is there an informative presentation of the latest research on the topic?

☐ Yes ☐ No 2. Is there information about how the research impacts the public?

☐ Yes ☐ No 3. Is the science clearly explained?

☐ Yes ☐ No 4. Are diagrams/illustrations used effectively?

Conclusions:

☐ Yes ☐ No 1. Does the writer present solutions or resolutions to the issue?
☐ Yes ☐ No 2. Does the writer present several reasonable actions people can take?
☐ Yes ☐ No 3. Is the author's concluding sentence meaningful and memorable?

Works Cited Page

☐ Yes ☐ No 1. Is the Works Cited information complete?
☐ Yes ☐ No 2. Has the author used at least five different sources?
☐ Yes ☐ No 3. Are all of the author's sources appropriate for this assignment?
☐ Yes ☐ No 4. Are the sources in alphabetical order?
☐ Yes ☐ No 5. As much as you can tell, is each source listed in the correct format (APA style)?

Grammar/mechanics Checklist:

1. Read through the entire pamphlet and look at all of the words that end with –s. Check and make sure that the writer didn't forget to make a possessive –s. On the paper, put 's (apostrophe s) anywhere where it is needed.
2. Read through the entire paper and look for any sentence that begins with the following words: **when, because, since, if, although, after, even though, while, in order that.** First, make sure these sentences are not fragments. Second, **make sure there is a comma after the subordinate clause.**
3. Check for sentences beginning with the word "So." Get rid of the word. It probably isn't needed. Do the same for sentences beginning with **"And"** or **"But."**
4. Circle any use of the words **"you," "your," "me," "I," "we,"** and so on. Suggest how the writer can avoid these words.
5. Mark all uses of the words **"they"** and **"their,"** and make sure that the antecedents are plural. Also check to make sure there is a clear antecedent for these words.
6. Mark all uses of the words **"this," "that," "these,"** or **"those."** Remind the writer to follow these words with specific nouns.
7. Read the entire paper and make sure that all sentences make sense. Mark sentences that don't make sense and suggest how the writer can change them.
8. Read the entire paper again and make sure that all words are **spelled correctly.** Circle words that are questionable. Check for common misspelled words: *then, than, effect, affect, its, it's, their, there, to, too, two.*
9. Make sure that titles are properly designated by *italics,* <u>underlining,</u> or **quotation marks.**

10. Read through the entire paper and check every time the writer uses the word **that.** Make sure it shouldn't be **who.**

11. Check every comma in the paper, and make sure that it is not bringing together two complete sentences.

12. Check all of the following words: **and, but, so, for, or.** Make sure that there isn't a comma needed. Ask me if you are not sure. If these words are bringing together two complete sentences, then use a comma before the conjunction.

13. Anytime you see a **colon** (:) or a **semi-colon** (;), make sure that it is used correctly.

14. Read the paper one last time and make sure that there are no other mistakes that you can identify. Check for transitions, double negatives, verb forms, subject-verb agreement, and so on. Help the writer get an A.

15. Check to make sure that the entire paper is in **consistent tense** (no shifting from past to present, etc.).

16. Check all verbs ending with –ing, and make sure you can't change it. You are looking for passive verbs: some form of the verb *be* + the past participle of the verb.

Example: "Many options were *tried* by the soldiers," can be changed to, "The soldiers *tried* many options." Check to make sure that passive sentences couldn't be better if they were active.

Lesson 9
Final Project Presentations

In this lesson, you will . . .

- Present your final project to your peers.
- Engage in science discourse, explaining and defending your work.
- Use evidence to support your claims.

Activity

1 Sharing Information

Presenter: **Reviewer:**

Topic:

Date:

Understanding of the topic –

Actions I will take –

Questions I have for the author –

	5 Excellent	4	3 Good	2	1 Poor
How effectively did the pamphlet introduce the topic?	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
How clearly and fully was the science evidence presented?	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
Were the recommendations effective, logical, and complete?	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1

What was the strongest part of the pamphlet?

What would you suggest for improvement?

Presenter: **Reviewer:**

Topic:

Date:

Understanding of the topic –

Actions I will take –

Questions I have for the author –

	5 Excellent	**4**	**3 Good**	**2**	**1 Poor**
How effectively did the pamphlet introduce the topic?	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
How clearly and fully was the science evidence presented?	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
Were the recommendations effective, logical, and complete?	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1

What was the strongest part of the pamphlet?

What would you suggest for improvement?

Presenter: **Reviewer:**

Topic:

Date:

Understanding of the topic –

Actions I will take –

Questions I have for the author –

	5 Excellent	4	3 Good	2	1 Poor
How effectively did the pamphlet introduce the topic?	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
How clearly and fully was the science evidence presented?	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
Were the recommendations effective, logical, and complete?	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1

What was the strongest part of the pamphlet?

What would you suggest for improvement?

Presenter: **Reviewer:**

Topic:

Date:

Understanding of the topic –

Actions I will take –

Questions I have for the author –

	5 Excellent	4	3 Good	2	1 Poor
How effectively did the pamphlet introduce the topic?	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
How clearly and fully was the science evidence presented?	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
Were the recommendations effective, logical, and complete?	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1

What was the strongest part of the pamphlet?

What would you suggest for improvement?

Presenter: **Reviewer:**

Topic:

Date:

Understanding of the topic –

Actions I will take –

Questions I have for the author –

	5 Excellent	4	3 Good	2	1 Poor
How effectively did the pamphlet introduce the topic?	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
How clearly and fully was the science evidence presented?	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
Were the recommendations effective, logical, and complete?	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1

What was the strongest part of the pamphlet?

What would you suggest for improvement?

Activity
2

Week 6
Weekly Reflection

1. Think about the science. What did you learn about science research?

2. Think about your learning. How will this experience change the way you approach reading in the sciences?

Reading Notes