Strategies for Studying, Learning, and Researching

By David Alderoty © 2014

Chapter 17) Passive and Active Learning Strategies, With Related Concepts

Over 3,200 words

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A Note for this Chapter

This chapter presents a few very useful concepts and techniques, which relate to the learning process in general. This material will be useful for both instructors and students. Thus, a portion of this text sounds like I am communicating with instructors, but other parts of the text may appear to be for students. **However, all of the material in this chapter should be useful for anyone that is involved with the learning or teaching process.**

Passive Versus Active Learning

What is Passive Learning?

Based on the way I am using the terminology, passive learning, is an attempt to acquire knowledge, **just** by listening, reading, and/or watching. For example, when you are listening to a lecture, reading a textbook, watching a video, without any reinforcing learning activities, you are engaged in passive learning. This is **not** an effective learning strategy for most people, because it does **not** facilitate skill development, and it usually does not aid comprehension and long-term memory retention. Active learning is the alternative to passive learning, which is highly effective, and it is explained below.

What is Active Learning?

Based on the way am using the terminology, **active learning** involves one or more **learning activities** to facilitate **comprehension, skill development,** and **memory retention** of study material. The **learning activities** can involve any of the following, **in relation to the study material**: problem solving, answering questions, creating questions, discussing, explaining, teaching, or working on a project. The above is **not** a complete list; there are **many other** learning activities.

The Simplest Learning Activity: Thinking

Even thinking about the study material may function as a learning activity, but it will be less effective than the learning activities listed above. However, if the thinking is coupled with other learning activities, such as problem solving, answering questions, or any type of practice, it is an effective learning strategy.

For additional information, and alternative points of view, on this subtopic, see the following websites. **1)** Learning By Thinking: How Reflection Improves Performance by Giada Di Stefano, March 25, 2014, **2)** The Relationship Between Thinking and Learning, **3)** Thinking: some deceptively simple questions, **4)** Learning and thinking: what science tells us about teaching, **5)** The Effects of Mental Imagery on Athletic Performance, by Annie Plessinger, **6)** The Biological Basis of Thinking and Learning, by Professor Lawrence F. Lowery.

Examples of Active Learning

Below there are three simplified examples of active learning, which students can apply to their studies.

Example 1) If you are listening to a lecture, and actively taking notes, which you review and rewrite in a Microsoft Word document, after class, you are involved with active learning. This is assuming that you periodically review your notes throughout the semester, to retain the information in long-term memory.

Example 2) If you are reading a textbook, and periodically taking notes, with the goal of answering the questions at the end of the chapter, you are involved with active learning. This assumes that you will reread the necessary material, until you can answer most, if not all of the questions correctly.

Example 3) If you are watching a video, and periodically stopping the video to take notes, you are involved with active learning. This assumes you review and rewrite your notes in a Microsoft Word document, after the video is completed. This also includes periodically reviewing notes to retain the information in long-term memory.

The idea to keep in mind is active learning is a highly effective learning strategy, when it is used with **appropriate** learning activities. This is explained in the following section.

Appropriateness of a Learning Activity, in Relation to the Subject, Evaluation Criteria, and the Student

Appropriate and Inappropriate Learning Activities

Appropriate learning activities can greatly increase the level of comprehension, skill development, and memory retention, of study material. However, inappropriate learning activities can have the opposite effect, and they can waste time and effort.

The difference between appropriate and inappropriate learning activities, relate to the student's skills, abilities, and inclinations, as well as the subject, and how the course grade will be determined. A good learning activity, utilizes the student's inclinations, skills, and abilities. In addition, it facilitates mastery of the subject, especially as reflected and the evaluation criteria, for the course grade.

Ideally, at least one learning activity should be **specifically focused on the evaluation criteria, for the course grade**. For example, if the student will be evaluated with multiple-choice questions, then a good learning activity would be answering multiple-choice questions, which are similar to the test questions. If the course grade is based on, essay questions, math problems, or writing term papers, then at least some of the learning activity should be focused accordingly.

A Simplified Example of a Counterproductive And Productive Learning Activity

A tricky math problem that consumes hours of time is an example of an inappropriate or counterproductive learning activity.

However, the above, would be a productive learning activity, if the trick to solve the problem were revealed, so students can solve it in a few minutes, instead of a few hours.

Learning Activities, Effectiveness, and Problems

It is relatively easy to devise learning activities that can be used with the active learning process. However, if a learning activity does **not** facilitate, **directly or *indirectly**, **comprehension**, **skill development**, and/or **long-term memory retention** of the study material, it is ineffective.

***Certain learning activities can facilitate learning indirectly, by motivating students. This can involve activities that make the study less stressful, pleasant, or provide other motivating rewards. For example, breaking up a mathematics class into small study groups, might make the class pleasant, and it might provide the students the opportunity to socialize, while learning mathematics. However, the above might be counterproductive for some students, who get distracted by others, who are shy, and/or who are weak in social skills.

In general, learning activities that do not relate directly to the study material can be counterproductive, for at least some students. This is especially the case, if the learning activity involves a challenge, an effort, or skill that does **not** relate to the course of study. The example in the previous paragraph is a good illustration of this, because socializing, does not relate to

mathematical achievement.

Levels of Active Learning

There are Various Levels of Active Learning, Ranging from Minimal, Moderate, to High

There are various degrees or levels of active learning. An example of a minimal level of active learning, is listening to a lecture, and casually taking some notes. The higher levels involve either many learning activities, or a few highly effective learning activities. Generally, complex problem solving, creating detailed diagrams, and writing essays are probably more effective learning activities, than casually taking notes in class, or answering multiple-choice questions. Higher levels of active learning will usually be more effective than lower levels. This is assuming that the learning activities are **not** excessively difficult or time-consuming, and they facilitate comprehension, skill development, and memory retention of the study material.

Classification of Learning Activities

Learning Activities can be Divided into Eight Categories

I am dividing learning activities into eight broad categories, which are learning activities based on one of the following: **1) Problem solving**, **2) Questions**, **3) Writing**, **4) Projects**, **5) Social interactions**, **6) Hands-on studies**, **7) Physical activities**, and **8) Miscellaneous activities**. These categories

are explained in the following eight subsections.

Note, **there can be some overlap between the eight categories**. That is a learning activity can be comprised of two or more categories. This is apparent from the following examples. Problem solving can involve writing. Answering essay questions can also involve writing. Sometimes answering a complex essay question, involves problem solving, with critical thinking. Working on a joint project with a number of students, involves social interactions, as well as the production of the project.

1) Learning Activities Based on Problem Solving

Problem solving can be divided into three subcategories. The first subcategory, are problems that involve numbers or symbols. Problems of this nature are presented in math classes, and in studies that involve formal logic.

The second subcategory, are problems that involve words, without any numbers or mathematical symbols. Problems in this category can usually be solved with critical thinking, and explanations, presented in written or spoken language.

A third category, involves problem solving based on diagrams, or three-dimensional structures. This can be encountered in some mathematics and engineering classes.

Problem solving is usually an effective learning activity, if the students can devise solutions without consuming excessive

time and effort. Excessively difficult problems can be counterproductive.

2) Learning Activities Based On Questions

Questions can be placed into three subcategories, which are multiple-choice questions, essay questions, and questions that are presented, and answered, by voice, such as when an instructor asks the class a question.

This learning activity can involve creating questions, asking questions, and answering questions. Learning activities involving questions can be an effective learning strategy, if the students can arrive at correct answers without excessive time and effort. This learning activity can be especially effective, if the questions are similar to the type that will be presented on examinations.

Answering questions based on reading material, can indicate whether the material was successfully mastered. Students can carry out self-evaluations with the material they read, by answering questions at the end of a chapter of a textbook. Alternatively, students can create their own questions based on the material in a textbook. Questions of this nature can be answered and reviewed throughout the semester.

3) Learning Activities Based on Writing

Writing is a learning activity that is used extensively in college and graduate school. This can involve writing essays, term

papers, booklets, or anything else.

Writing can be a highly effective learning activity, especially when it involves essays related to the course material. If the student's creativity, and/or ideas are appropriately interwoven with the course material, the writing will probably be more successful, in terms of facilitating comprehension, and memory retention.

Writing papers with paraphrases is useful for some students, especially when they are **not** familiar with a subject. However, paraphrasing is probably a weaker learning activity, than writing essays with course material, combined with the student's original ideas.

Writing is not a good learning activity for all students. Many students are not skilled in writing. In such a case, writing is likely to be an ineffective learning activity, if the course grade is not based on writing, or answering essay questions. For example, incorporating writing into a conventional mathematics course will probably result in failure, or low grades, for some students who are highly skilled in mathematics, but weak in writing.

4) Learning Activities Based on Projects

Projects involve the creation of an entity, and it can be especially effective if it includes the students own creativity, appropriately coupled with course material. This usually requires more time than other learning activities, especially if the project is complex.

Projects are not used in traditional classes, except for some art classes, where students create original paintings, or sculptures. Projects can also be used in **advanced** computer science studies, where students create their own software.

Projects can be a highly productive learning activity, when it directly relates to the coursework. However, if the project is excessively time-consuming, it might prevent students from completing the coursework successfully. Projects can also be counterproductive if they do not relate directly to the coursework.

5) Learning Activities Based on Social Interactions

Social interactions can be used as a learning activity in almost any class. Four examples are study groups, students giving speeches, students teaching portions of the class, under the instructor's supervision, or students teaching each other, on a one-to-one basis.

Learning activities, based on social interactions can liven up a class, and prevent boredom. Learning activities in this category, usually give students the opportunity to acquire knowledge from other students, which is a major advantage. If a student does not understand the instructor, he or she might understand an explanation from another student.

Most occupations require various types of social skills, especially in relation to communication skills, in written and spoken language. For example, a chemist must know how to

explain ideas to other chemists, to the boss, to funding agencies, and sometimes to laypeople. **Learning activities based on social interactions can facilitate the development of these skills.**

One of the disadvantages of learning activities based on social interactions, was implied earlier. Specifically, some students are shy, relatively weak in social skills, or are distracted from the coursework by socializing. A potential solution to this problem is to make learning activities based on social interactions voluntary.

6) Learning Activities Based on Hands-on Studies

Hands-on studies, usually cannot be used with most academic courses, except for art classes, and courses that involve laboratory work. Vocational classes are usually focused on hands-on studies. However, with a **novel approach**, it might be possible to create learning activities based on hands-on studies for almost any course. For example, a mathematics course can involve manipulating two and three-dimensional geometric forms, to become familiar with their names and properties. A chemistry class can involve creating plastic models of molecular structures.

Devising learning activities based on hands-on studies can be counterproductive, if it is time-consuming, distracts from the primary coursework, or if it is excessively difficult for some students.

7) Learning Activities Based on Physical Activities

Physical activities, are used in physical education, dance classes, and acting classes. Physical activities can sometimes be used in novel ways, with almost any type of course. This might increase alertness of the students, so they can work more effectively. However, this might also distract the students from the study material.

8) Learning Activities Based on Miscellaneous Activities

Miscellaneous activities, involve any learning activity that does not fall into any of the above categories. For example, competitive or noncompetitive games, devised for a specific course, such as mathematics or economics. Learning activities in this category may or may not be productive, and generally have to be evaluated in terms of trial and error, or experimentation.

Active and Passive Learning in the Traditional School, and How Students Can Create Their Own Learning Activities

The Traditional School Environment, and The Level of Active Learning

In the traditional school environment, the learning activities are usually limited to note taking, and writing term papers. Some instructors encourage students to ask or answer questions in class. There is of course some problem solving associated with

some courses, such as mathematics, physics, and chemistry. Some courses involve hands-on laboratory studies, and a few classes involve physical activities. Most classes are primarily based on passive learning, such as listening to lectures, reading assignments, and highly structured term papers, which minimize or eliminate student creativity.

Thus, in the traditional school environment, there is some active learning, but not very much. This might be because of tradition, and the great difficulties associated with creating successful learning activities, that facilitate student achievement.

However, students can create their own personal learning activities, during their out of class study time. This eliminates the problems that are likely to develop, when an instructor attempts to create learning activities for an entire class, which can result in time-consuming, activities that are excessively difficult for some students.

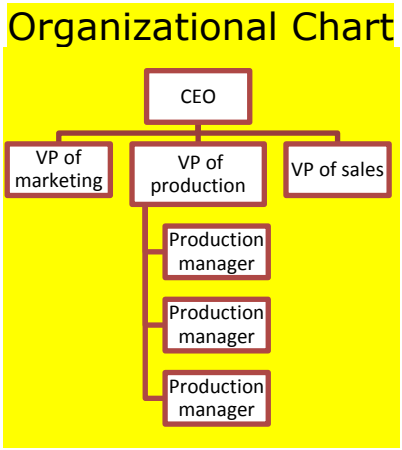
Student Created Learning Activities

Students can create their own learning activities, for traditional college and graduate school classes, focused on their specific learning style. The simplest learning activity is thinking about the course material. This can involve thinking with pencil and paper, or on a computer screen, which is more effective. This can involve words, sentences and paragraphs, as well as mathematics, and diagrams.

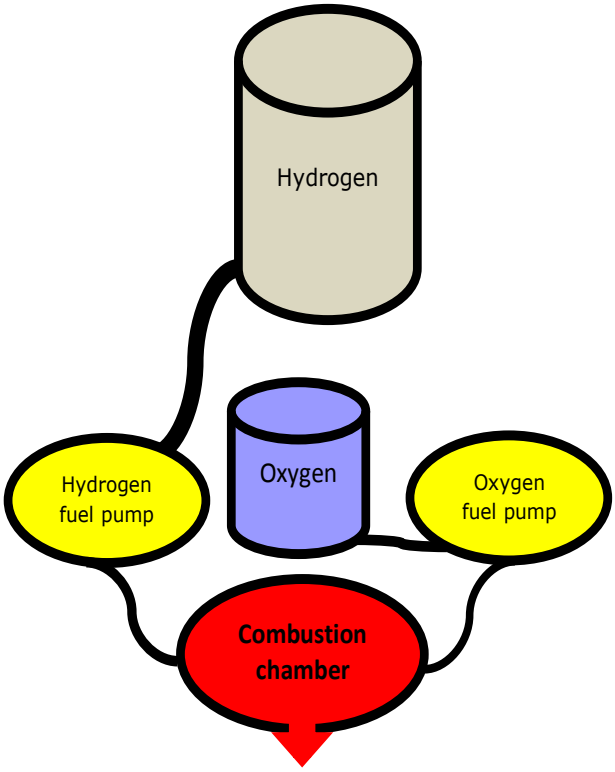
For some students, diagrams are very useful, especially when they create the diagrams themselves. This can involve flowcharts, diagrams outlining a series of cause-and-effect sequences, Venn diagrams, organizational charts, etc.

Student Based Learning Activities with Graphics and Mathematics, and Microsoft Word

Microsoft Word 2010, or later, is a very good program for graphics in mathematics, because you can create almost any type of diagram, with this software. With this software, you can also write mathematical expressions, and create graphs. With a free add-in from Microsoft, you can solve complex mathematical problems electronically directly in a Word document. Below there are examples of graphics and mathematics created with Microsoft Word 2010.



The following is a simplified diagram of a liquid fuel rocket engine, using liquid hydrogen and oxygen as a fuel.



The following was manually solved

$$\int_5^{10} x dx = \frac{x^2}{2} = \frac{10^2 - 5^2}{2} = \frac{100 - 25}{2} = \frac{75}{2} = 37.5$$

$$3x - 6 = 22$$

$$3x = 28$$

$$x = \frac{28}{3} = 9.3333$$

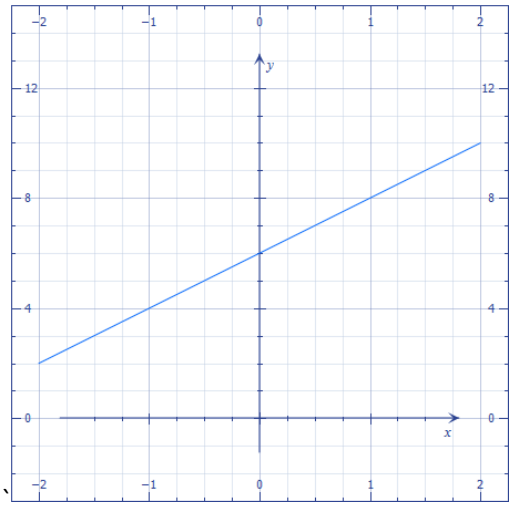
The following was electronically solved, with Microsoft Word 2010

$$\int_5^{10} x dx = \frac{75}{2}$$

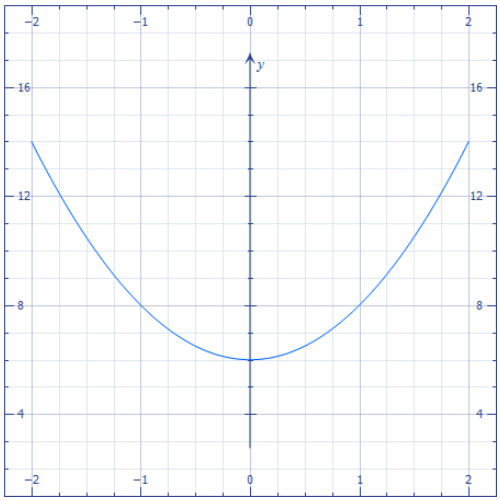
$$3x - 6 = 22$$

$$x = \frac{28}{3}$$

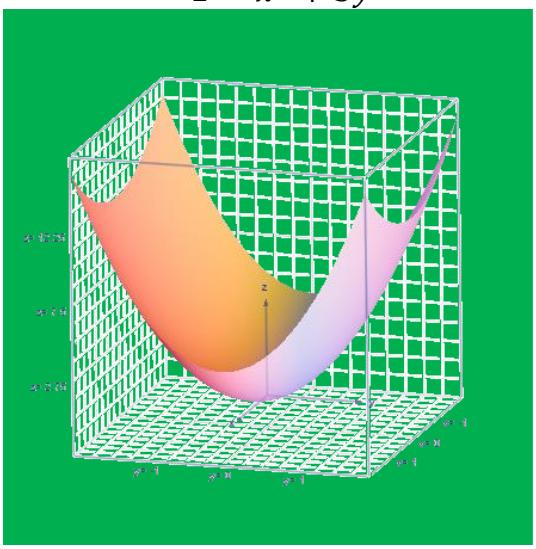
$$y = 2x + 6$$



$$y = 2x^2 + 6$$



$$z = x^2 + 3y^2$$



See the Following Websites from other Authors for Additional Information, and for Alternative Perspectives on Graphics and Mathematics

1) Line diagrams and system maps, **2)** The Advantages Of Venn Diagrams, **3)** Power-up your research with diagrams and

models, 2014 by Helen Kara, **4)** Using A Venn Diagram to Write Your Comparison Essay, **5)** Video: Writing Math Equations in Word 2010, **6)** Video: Microsoft Mathematics Add-In For Word, **7)** Video: Resource: Microsoft Mathematics Add-in for Word 2010, **8)** Video: Microsoft Mathematics 4.0

The Ideas to Keep in Mind

You should convert your homework and study efforts into active learning. The learning activities you use ideally should relate to the way your course grade will be evaluated. For example, if your course grade is going to be based on multiple-choice questions, you should practice answering the type of multiple-choice questions that are likely to be on examinations. If the evaluation is going to involve essay questions, practice answering the type of essay questions that may be on the examinations. Similarly, if the exams will involve math problems, you should practice solving the type of mathematics problems that will probably be on the examinations. The more you practice, the better. This type of practice may reveal your weak areas, which will require more study from textbooks and other sources.

Ultimately, you have to device active learning strategies that work well for you. This can involve a trial and error process, coupled with various learning activities.

The Following Chapters, in this E-Book, And Active Learning Strategies

The following chapters are focused on student based **active learning strategies** for lectures and note taking, reading and studying, writing, and mathematics.

See the Following Websites From Other Authors for Additional Information, and for Alternative Perspectives on Passive and Active Learning

1) Active Vs Passive Learning, **2)** Passive vs. Active Learning, **3)** Active learning, **4)** A blended approach to active learning in a physiology laboratory-based subject facilitated by an e-learning component, by Arianne M. Dantas , Robert E. Kemm, **5)** Active Reward Learning, **6)** Recommendations for Making Active Learning Work , **7)** Dysfunctional problem-based learning curricula: resolving the problem, by William K Lim, **8)** Creating a Learning Activity, **9)** 20 Study Hacks to Improve Your Memory, **10)** Active learning, **11)** How to Design Effective and Engaging Interactive e-Learning Exercises, **12)** Beyond student-centered and teacher-centered pedagogy: Teaching and learning as guided participation, by Michael F. Mascolo, **13)** A COMPARISON OF LEARNING ACTIVITY IN A TRADITIONAL CLASSROOM AND A FLIP CLASSROOM, DISSERTATION, Jeremy F. Strayer, **14)** What drives a successful e-Learning?, **15)** Active learning increases student performance in science, engineering, and mathematics, **16)** Educational Psychology: 20 Things Educators Need To Know

About How Students Learn, **17)** Increasing Student Interaction in Learning Activities: Using a Simulation to Learn About Project Failure and Escalation, **18)** Discovery Learning for the 21st Century, by Joyce A. Castronova, **19)** Video: Race To The Top: Passive or Active Learning?, **20)** Video: Active Versus Passive Learning and Teaching with S. L. Young, **21)** Are You An Active or a Passive Learner? - Jason Everett, **22)** Video: What is Active Learning?, **23)** Evidence Based Education: Active vs. Passive Learning May 14, 2014 by John Greenwood, **24)** Active Vs Passive Learning

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