A Purposeful Pause:

The Role of Active Reflection in Learning

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Abstract

Given the frequency of standardized testing in our schools, one might question the impact of "teaching to the test" on the overall learning of a student. Whether this might be detrimental to the developing brain and knowledge base of students is troublesome. One concern stems from what is known about information processing and what is neurologically needed to store information in long term memory. It can be said with confidence that for many students the classroom strategies used when "teaching to the test" do not result in information being processed at a deep enough level to remain permanently in memory. The remainder of this article addresses the need for intentional reflection to enhance learning. Students should be provided an opportunity to pause and to consciously recall information, integrate it, and draw analyses and conclusions from it. Learning requires critical thinking that enables the neurologic connections among new bits of information with knowledge that is already in memory, consolidating it into concepts, and retrieving it at a later time. This process depends on the use of reflection as a purposeful learning strategy.

A Reason to Reflect

When included as a part of learning, reflection requires purposeful thinking, integration of information, and the development of concepts. Reflection facilitates the formation of memories, thereby strengthening the integration of learning and experience. The newly connected information is processed, stored, and can then be generalized, transferred, and applied to other settings and situations.

When sensory input, whether in the form of information or experience, is processed by the brain, it is stored in multiple locations. Where it is stored depends in part on which sensory modalities were stimulated and activated. Storage also depends on what information the new input is being connected with, and where those memories are stored. For example, visual experiences are stored primarily in the occipital lobe, but if a student is in a classroom during a

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lecture, listening while observing what is being drawn on the board, then part of the information is also processed in the auditory cortex in the temporal lobe. Taking notes requires even more use of the brain, including the frontal lobe where conscious thought occurs but also in the parietal lobe where integration of sensory input takes place. Contrary to what was once believed, there is no central or specific location for each memory. Memories that are being created are scattered throughout the brain and integrated into the areas with which they are associated. Sensory input is deconstructed, separated, and then stored in multiple locations as it is being processed. Critical thinking and active reflection supplement and strengthen this process.

As Zull (2002) notes, "Learning depends on experience, but it also requires reflection, developing abstractions, and the active testing of those abstractions" (p. 18). During the process of reflection, information is reconstructed and reassembled. When sensory input is processed and connected with what is already stored, biological changes occur in the brain. These increase the size of the neuronal connections, or as J. Valkenburg (2010) noted, the connections become larger and more complex, which results in a strengthening of the neuron communities. To retrieve information from memory and to reflect on it, a learner needs to reconstruct the various pieces of information. Students still need to learn details, facts, and basic information, but this should lead to deeper thinking that requires associations and connections. Reflection helps to develop the associations, solidify them in memory, and thereby increase learning by enhancing the size of the neuronal communities.

Active reflection requires a deeper and more conscious level of thinking than shallow learning, which is often adequate when students are being taught facts or basic information, as when engaged in preparation for standardized testing. Skimming or surface reading require only

shallow thinking; enough to remember general ideas but not enough to effectively analyze the content. Surface reading might require the use of just the first two levels of Bloom's taxonomy; knowledge and comprehension. Deep thinking requires the use of higher order thinking skills in Bloom's upper four levels of cognition; application, analysis, synthesis and evaluation. Learning a new concept or theory results in deeper thinking, as does reading that requires one to actively connect and associate information. To compare and contrast, to make judgments, and to think abstractly all require time to pause, to reflect, and to consolidate what is being stored. The teacher then provides the prompts from which students must retrieve the information.

Memory: Pay Closer Attention!

Before considering the stages of memory, learners must think about their ability to focus and to sustain attention. As noted by Valkenburg (2011), "Attention is primary to getting information into our short-term and, consequently, our long-term memory. Once there, our ability to reflect on associations between and among memories is essential to the development of critical and creative thinking skills" (pg. 4). As independent learners, there is a variety of options available in terms of the strategies one chooses to use to study. Maximizing the preferred mode of sensory input is important, but so too is multisensory learning, whereby the brain has the opportunity to process the input from multiple sensory modalities. Valkenburg (2011) noted that "each individual has to find his or her own way to process and apply the information s/he needs to think critically and creatively" (pg.4). He elaborated, "part of the whole process of thinking is the ability to reflect—to be in the present moment and aware of one's place in time, to make the effort to understand more holistically (to see how ideas fit together), to take the time to revisit

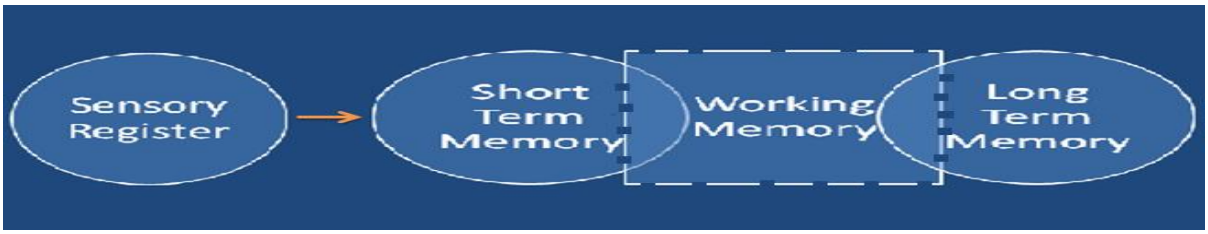
ideas and develop relevant questions and ideas that will enhance one's perspective and cognitive abilities" (Valkenburg, 2011, pg. 6).

Consider how often students find themselves distracted, lacking focus, or multitasking while they study. Using a computer is a good example; while doing so students often engage in multiple activities such as checking Facebook, surfing the internet, listening to music, and sending text messages even while they might be writing a paper. Their focus continually changes, as does how much information they actually process. Dalrymple (2010) cautions that it is not what we remember, but what we *focus* on that is the more critical variable in learning. He observes, "Filtering, not remembering, is the most important skill for those who use the internet….The bottom line is that how well an employee can focus might now be more important than how knowledgeable he is…..with the internet, knowledge can be supplied externally, but focus must be forced internally" (first paragraph).

The memory diagram located below serves as a simplified model of information processing. It illustrates several important points about learning, and especially about working memory, which is represented as a distinct but overlapping stage. The first stage of memory is the **Sensory Register**, dependent on attention, and the selection of which source of sensory stimulation is to be processed. Without selective attention, the sensory input is lost and will not be forwarded to short term memory. As information is received and prepared for storage, it becomes encoded, which is necessary for it to avoid becoming lost. The greatest challenge for many people is simply to focus, which is necessary if information is to move beyond sensory input. Maintaining sustained attention often takes conscious effort, but without it, information

will not be processed. Students need to concentrate and minimize both internal and external distractions to increase the effectiveness of their information processing ability.

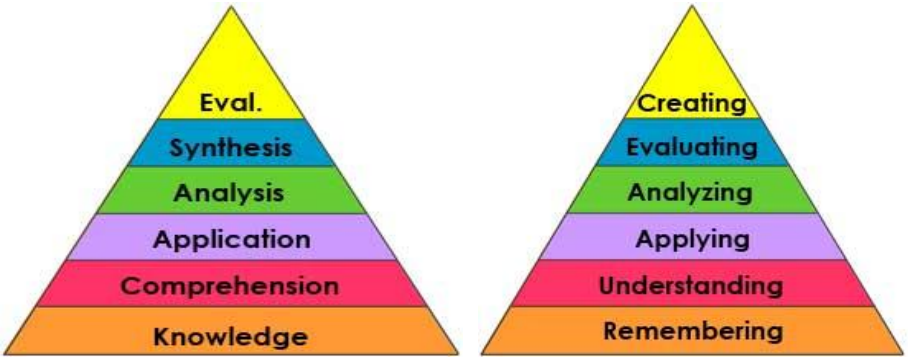
A Four Stage Information Processing Model of Memory



In the second stage**, Short Term Memory** (STM), the selected input has already been effectively forwarded from the sensory register. However, this stage requires continued concentration, and input remains here for approximately 2 – 8 seconds. STM is extremely efficient, but information will be lost if not actively attended to. If one is concentrating and focusing, the information from STM will continue to be processed in **Working Memory**. In Working Memory, there is further selection and manipulation of what information is to be retained and organized. The process of associating and connecting the new information with what is already stored begins here. Consciously thinking about the information is one way to be sure that it will be further processed. The information needs to be used and cognitively manipulated in order to be moved into stage four, **Long Term Memory (LTM).** Once in LTM, the process of integration via meaning and association continues. Each time that information is reviewed and rehearsed, it moves again through Working Memory, thereby increasing the likelihood that it will be connected and stored. The more neural connections, the greater the likelihood information will be remembered and can be retrieved when needed (Wolfe, 2011).

Active Reflection and Bloom's Taxonomy

There is a variety of teaching and learning strategies that can include active reflection and thereby enhance memory. Learning is strengthened when consciously applying this information to Bloom's Cognitive Taxonomy, as depicted below.



Old Version **New Version**

Overbaugh & Schultz. http://www.odu.edu/educ/roverbau/Bloom/blooms_taxonomy.htm

Each time a student pauses to reflect information is retrieved from memory and re-manipulated in Working Memory. This process not only results in a strengthening of what is stored but also supplements it as more connections are formed. There will always be a need for teaching that includes the lower two levels of this taxonomy, *knowledge and comprehension,* which require remembering, recognizing, and comprehending. It is the next two levels of Bloom, *application and analysis*, where students seem to especially struggle, as they need to use what they learn, generalize it, and transfer it during problem solving. *Knowing and comprehending,* the first two levels of in the taxonomy of cognition, are not sufficient skills for students in classes where deeper level thinking is required. Teaching students the importance of reflection

requires that they be able to analyze, synthesize, and apply what they know. Once that has been accomplished, they can use their reflective skills to further evaluate, create, and to predict. The upper two levels of the taxonomy, synthesis and evaluation, require students to organize and assemble information from which they can make informed judgments. The upper level strategies result in the development of independent cognitive skills that include more advanced problem solving, critical thinking, and independent use of creativity.

Teaching Students to Reflect

Educators can assist students in acquiring effective reflective skills by using reflection as they teach, modeling the process and the outcome. Orally expressing one's thoughts while engaged in reflection provides students with an example of how it is effectively used. Teachers can provide students with multiple opportunities to reflect, posing questions such that the student must pause to think, consciously searching her memory as new material is associated and connected with the old. Thoughtful and open ended questions to which there is not a single correct answer requires students to reflect, accessing what is in memory. One can respond to students' questions with a question, expecting and encouraging them to think some more, actively retrieving related information from their memory. As students become more aware of their own thinking, they tend to become more independent and deeper thinkers. Encourage and reinforce their efforts.

An effective metacognitive strategy that can be easily combined with reflection is summarizing the material being learned. This requires a student to pause and to consciously consider what was read or heard. For example, when summarizing a section of a textbook, one

needs to first read, then pause to think, identify the main concept or points, synthesize, and then summarize using one's own words. This requires a deeper level of processing of information; rehearsing or reviewing it again via working memory, synthesizing it, and then summarizing it. This metacognitive strategy involves far deeper thinking than a quick skim of the text or answering close ended questions. In a similar way, a class discussion or a pro vs. con debate will provide students with the opportunity to make associations of new material with what has already been learned and reflect upon it. The goal is to provide multiple opportunities for students to think independently and critically, using reflection as a routine strategy for learning. This helps them to become more aware of their processing of information and experience, organizing it into concepts, and later being able to transfer and adapt it to new situations. In doing so, neuronal communities continue to strengthen and develop, expanding the students knowledge base.

The above examples demonstrate how metacognition can be used in the classroom; ie, encouraging students to be aware of their own thinking. A review of the four stage model of memory, in combination with Bloom's Taxonomy, illustrates how reflection requires the student to access information from long term memory, review and rehearse it, apply it, analyze it, and to draw their own conclusions from it. Every instance of reflection will strengthen the associations one has in memory, increasing the likelihood that it will permanently remain and be retrievable. As noted by Kim (2005), "metacognitive strategies that promote reflective thinking and self-assessment are known to increase the effectiveness of learning" (pg. 1). As educators, we need to teach reflection and provide opportunities for its use.

Recommendations for the use of reflection

Since the implementation of No Child Left Behind in 2001 and the consequent need for schools to be accountable for their test results, there have been increasing concerns that schools are "teaching to the test." This focus on teaching information that will be included on the standardized exams has resulted in not only less time spent on other subjects, but less time provided for students to create, use their imaginations, problem solve, and to reflect on what they are learning. High stakes testing has resulted in increased time in school being spent on test preparation and test taking. One of the results has been concern that students are forgetting much of what is drilled into them for the purpose of taking the standardized test. They are not able to retrieve and apply the information later. It is being abandoned because it appears to have no intrinsic value, as teachers are not requiring that they transfer and apply it.

Primarily because of the Internet, students no longer need to remember a large body of data and information, which in the past was an accumulation of years of education, personal experience, and education. They can simply search the internet and find information. However, *searching* the internet for information is not the same as *thinking* about it and remembering it. We can, and should, return to teaching students *how* to reflect, to analyze information, to connect it with what they already know, evaluate it, and to draw their own conclusions. We need to encourage, and expect, autonomous learners and independent thinkers who recognize the control they have over their own education and their learning.

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