Deep Learning: Helping Teachers Assist Students to Take a Deep Approach to Their Learning by Utilizing All Four Major Parts of Their Brain.

Darin Griffith

Introduction

Teachers cherish those special moments when a student tell them how much their lives have changed because of those things they learned and felt in class. But all too often, teachers hear the sound of students who are just trying to get through the class by saying, “Will this be on the test?” Is it possible for teachers to make changes in their teaching to assist students to take a deep approach to their learning rather than a surface approach? The answer needs to be “YES” or what we as teachers do really does not make any difference. And teachers do make a difference! The purpose of this paper is to: firstly, give a brief review of the differences between deep and surface approaches to learning; secondly, show how different parts of the brain can be used to help a student learn deeply; lastly, offer suggestions for how teachers can assist students in using all four major parts of the brain to assist with the deep learning process.

Deep Approach Versus Surface Approach to Learning

The concept of deep learning is called by many names and defined in different ways which has led to some inconsistencies and ambiguity in research (Dinsmore & Alexander, 2012). Tagg (2003) defines deep learning as “learning that takes root in our apparatus of understanding, in the embedded meanings that define us and that we use to define the world” (p. 70). Deep learning emphasizes integration, reflection, and synthesis by the learner and is retained by the learner (Nelson Laird et al., 2008; Roberts, 2011). Surface learning is when students do the minimal amount of work to remember enough information to pass a test or receive an acceptable grade and students reproduce facts to pass tests and please teachers (Dolmans et al., 2016; Ramsden, 2003). Surface learning engages the lowest stages of Bloom’s Taxonomy (Bloom, 1956).

It is important to note the difference between deep learning and approaches to learning. Approaches to learning describe the types of behaviors students use in learning and not the result of learning (Nelson Laird et al., 2008). A deep approach to learning is when a student has intentions to understand what is being taught (Asikainen & Gijbels, 2017). When a student takes a deep approach to learning, they experience higher levels of learning. They move from the knowledge stage of Bloom’s Taxonomy up to and including the analyze, synthesis, and evaluation stages and begin to experience deep learning (Razzouk & Razzouk, 2008). In contrast, a surface approach to learning “has nothing to do with wisdom and everything to do with aimless accumulation” (Ramsden, 2003, p. 59). Surface approaches to learning focus on memorization and rote learning and students’ academic goals focus on passing tests and avoid failing classes (Nelson Laird et al., 2008).

Students approach learning in a number of ways. For example, some students walk into a class with great excitement and anticipation, while others may enter the same class with hopes of producing minimal effort to pass the class. Martin and Säljö (1976) introduced the terms surface level and deep level processing in their ground-breaking study and later amended the terms to surface and deep approaches to learning (Entwistle, 1991). Their study took a group of university
students and assigned them to read an article and asked how they approached learning the information in the article. Students who focused on remembering facts did poorly on retention tests, while students who looked for ideas and principles and made connections with the readings did well. Thus, the approach students took played an important part in what they learned and whether or not they retained that knowledge. The process of learning appears to be directly correlated to the outcome of learning (Marton & Säljö, 1976). One’s approach to learning may impact what is learned and how much. “A deep approach to learning emphasizes learning for the purpose of grasping a meaningful understanding and mastery of concepts” (Campbell & Cabrera, 2014, p. 497).

There are many factors to why students choose which approach they will take to learning. Biggs (1978) claims personality is a major factor and Zhang (2003) found that out of the five major personality types, conscientiousness and openness traits contributed to deep learning approaches, while neuroticism predicted surface level approaches while extraversion did not show a relationship to any of the learning approaches. Thus, students approach learning in varying degrees and which approach they take directly affects their level of learning.

Neuroscience and Deep Learning

Figure 1

Insights about how the brain functions can enhance learning and teaching and understanding how the brain learns can help teachers effectively teach and help students more effectively learn (Shearer, 2018). One insight is how neuroscience reveals how people learn and psychologists theorize that deep learning comes through a cycle “of experience, reflection, abstraction, and testing—which then creates a new experience to continue the cycle of learning” (Roberts, 2011, p. 2). Those four cycles use different parts of the brain and thus deep learning does not take place unless all four parts of the brain are used (Zull, 2002). The human brain first processes new information in the back of the brain called the cerebral cortex. Stories, images, actions, and lectures are first processed in this part of the brain. Information is processed with existing knowledge in the temporal cortex, which is the bottom of the brain. Consequently, if students hear a lecture and then take a test, they are using only half their brain. The third area is
the frontal integrative cortex which, as it sounds, is in the front of the brain. This part of the brain is where formal operational thinking, judgment, ownership of ideas, and new creation of ideas, takes place. The final area in this cycle is located in the frontal cortex near the top of the brain. This area is where learners test ideas for accuracy and relevance. The process results in new experiences and the cycle begins again (Roberts, 2011; Zull, 2002). “Deep approaches to learning require students to use a diverse array of cognitive complexity in their learning process” (Campbell & Cabrera, 2014, p. 497). Thus, effective teaching and deep learning would use all four parts of the brain.

Because we know how the brain functions in the learning process, teachers can use that knowledge to structure learning activities to enhance student learning. The more we engage the brain during the learning process, the higher the level of learning in Bloom’s Taxonomy. Zull (2002) argues that if the entire brain is not engaged, then long term learning will not take place. If no two people are alike, then similarly, no two brains would be alike. Different methods and strategies would be needed for different brains to comprehend learning. Pask (1976) labeled two approaches holistic and serialistic styles of learning and Kolb (1971) characterized four learning styles as divergers, accommodators, convergers and assimilators.

The brain is key to memory, and memory plays an important role in learning. There are different types of memory. Episodic memory is the type of memory that helps us remember facts as they are linked to episodes of our lives while semantic memory is an engaging and transforming memory that is long lasting. Episodic memory is linked to surface learning while semantic memory is linked to deep learning (Roberts & Roberts, 2008). Students who use episodic memory are engaged in the lowest level of Bloom’s Taxonomy while students who are using semantic memory are using higher levels of learning.

Teachers’ Role in Deep Learning

What can teachers do to foster deep learning and help students take a deep approach to their learning? Is it possible to make learning more impactful and change the lives of students, even if the classroom is only a part of their lives? Because context plays an important role in learning, teachers play an important role in shaping which approach students take in their learning for a class (Biggs, 1987; Nelson Laird et al., 2008). Umback and Wawrzynsk (2005) find that faculty have a significant influence on students both in and outside of the classroom. Students work at the level required by their teachers. In other words, generally speaking, students do what their teachers ask them to do (Nelson Laird et al., 2008). Teachers must encourage students to search for meaning with the ideas presented in class by giving classwork and assignments that plant seeds that will result in students engaging in deep learning (Roberts & Roberts, 2008; Tagg, 2003). If teachers are involved with their students’ learning, by fostering students’ active participation, students are more inclined to use deep approaches (Baeten et al., 2010; Biggs, 2003b).

Teacher Strategies

There are numerous methods for teachers to incorporate deep learning strategies in their classroom. As teachers shift from lectures to learner-centered activities, they encourage their students to think and analyze from different perspectives which results in the use of deep learning strategies (Mayhew et al., 2012). Teachers can incorporate role-taking activities and
inquiry-based approaches in their classrooms, such as asking and answering questions (Offir et al., 2008; Roberts, 2002). Teachers can structure their lessons with the use of effective questions and discussion. “Effective learning obliges asking questions, and therefore obligates the lecturer to integrate stimuli that evoke the asking of questions” (Offir et al., 2008, p. 1181). In college, students report higher satisfaction with frequent interaction with faculty than with any other type of involvement, thus teachers should be involved with their students in questioning, discussions, and interaction beyond the lecture (Astin, 1999).

Deep learning techniques engage students in the learning process. This does not mean lectures and reading articles and textbooks cannot be used effectively as the use of research articles can still be used as a tool in teaching and achieve deep learning (Bordt, 2005). Teachers can give quizzes to encourage students to read the textbook to promote learning. However, if the purpose is to have the students read the text book, deep learning may not occur as introductory textbooks have been criticized as lacking in intellectual rigor and depth (Howard, 2004). Most comprehensive textbooks represent the kind of reading associated with surface level learning and quizzes on assigned readings often only encourage students to memorize key words and promotes surface level learning and multiple choice and true/false tests encourage superficial memorization and out-of-context facts (Howard, 2004; Roberts & Roberts, 2008; Tagg, 2003). If reading assignments, quizzes and testing are not about memorizing facts but helping enhance understanding concepts, these activities can enhance and encourage learning (Jacoby et al., 2010; Jensen et al., 2014).

Roberts and Roberts (2008) gives six factors that contribute to deep reading. First is the reading must have an intrinsic interest to motivate readers. And the second, related to the first, is the reader must be curious about how the readings will be related to their work and study. Third, the reader must see how the readings are connected to their life. Fourth, deep reading must go beyond the scope of episodic memory and use one’s semantic memory, making it easier to recall information for tests or other tasks. Fifth, the readers must take a deep learning perspective. And finally, readers must know that higher order thinking skills will be required of them. In other words, the test will be more than a mere collection of facts, but synthesis and evaluation will be required. Roberts and Roberts (2008) conclude that “students are motivated to read more carefully when they are provided with a variety of ways to respond to the text—ways that are consistent with their own learning style” (p. 135). When students are encouraged to read and process the readings in different ways, to make meaning out of the readings, then share new ideas, multiple parts of the brain are being used and deep learning is taking place.

Teachers can encourage deep learning approaches to studying even in reading required texts. Howard (2004) has put into practice the idea of Just-in-Time quizzes. He gives a two-question quiz to his students that are thought provoking and can only be answered effectively by completing the required readings prior to class. The quizzes are due two hours prior to class and classroom instruction includes submissions from his students’ submissions. This altering of the lesson meets the needs of the students. If they did poorly on the quizzes, then they obviously struggled with the concepts in the reading, so he reteaches the principles to help them understand. If they answered the questions with a deep understanding of the topic, then he can instigate a higher-level discussion in class from the readings. His findings include students complete the readings and elicit strong emotional responses because of his Just-in-Time quizzes (Howard, 2004). In this situation, students are actively participating in their learning by preparing for class. This is in harmony with Yamane’s (2006) class preparation assignments (CPA’s). He asks each student to read and think about the assigned readings and submit a writing.
assignment prior to each class. Each assignment includes four elements: an introductory statement, the objective, background information on the topic, and then the writing assignment. The CPA’s have led students into a higher level of engagement and involvement into the class discussion. These Just-in-Time quizzes and CPA’s are just two ideas to help students get involved with their own learning on a deeper level prior to class.

Deep learning is more than just student involvement. For example, a student could play a learning game but only understand enough to play the game and not internalize the information. One study shows that students learn more by creating a game than just by playing a game (Vos et al., 2011). Deep learning involves the entire learning process. Teachers must create and organize classes to follow deep learning design principles to effectively help students achieve deep learning. Boyle and Ravenscroft (2012) express: “Deep learning design encourages the creative study of a learning problem or opportunity. It applies substantive insights from the learning disciplines to exploit the affordances of the technology in order to develop contexts that empower learners to achieve educational goals” (p. 1225).

Technology may be used to enhance learning, but technology alone does not promote deep learning and peer discussions and student contracts have been shown to lead to an increase in deep approaches to learning (Entwistle, 1991). Another factor in helping students to learn deeply is to give them time to do so. One study reveals that when students are given time for reflection and contemplating issues, they exhibited higher developmental gains (Mayhew & King, 2008).

Teachers who desire students to learn using higher-order learning processes are encouraged by Biggs (2003a) to do four things. First, define the desired learning outcomes. Second, choose learning and teaching activities that are likely to lead to the learning outcomes. Third, access the students’ actual learning outcomes and see if they match the intended outcomes. And finally, assign grades based on how well students met the learning outcomes. Teachers can encourage students to take a deep approach to their learning by how the class is organized and what is emphasized. The learning environment which students perceive influences how students learn (Entwistle, 1991). Teachers can help control the perception of the learning environment with how they create learning objectives and structure the class. As Roberts (2011) explained, “if we take deep learning seriously, we must also be serious about [the] course design—the entire course must be of the same fabric” (p.11). When creating a course, the objectives, teaching, and assessments can be aligned to enhance the students learning to reach beyond the remembering level of Bloom’s Taxonomy (Alexandra & Moldovan, 2010). Roberts (2011) postulates that the curriculum needs to be scaffolded to expect deep learning to take place in the classroom. Teachers need to plan learning activities that will reach students in the way they want them to understand (Biggs, 1999). Research indicates transferring control of the learning process from the teachers to students is probably the best way to construct, high-quality learning activities (Vermunt, 1998). Learning must have meaning for the students and teachers must make the lessons mean something to engage students (Shearer, 2018).

Conclusion

If there were a quiz on this reading, what should be included? If readers knew there were questions about names, facts, and details, they would read to look for these things and possibly miss the main point. However, if the reader knew the expectations of the quiz were to explain the main point and suggest application of that point, the reader would have a different experience.
while reading, a deep learning experience. If a student asks: “will this reading be on the test?” then a teacher focusing on deep learning might reply: “what concept in the reading do you feel should be incorporated in the test? That will be the question on the test.”

Teachers really do make a difference. They can use teaching techniques that utilize all four major areas of the brain to help stimulate deep learning in the minds and lives if their students. As teachers stimulate the minds of their students, these students will experience more moments in class that will change who they are, how they think, and how they feel. They will experience deep learning.

References


