**CETL 8713 Short Paper**

So far in the course, we have explored how memory building and recalling works, learned about misconceptions about learning, and various learning principles. The first few weeks of the course were focused on the psychology of learning and the learning myths. Both the short video we have watched [1], and the paper titled “What Will Improve A Student’s Memory?” [2] discuss learning myths. A few of the myths mentioned are that “we only use 10% of our brain,” “There are different learning styles, such as auditory, visual, etc.” and so on [1, 2]. Similarly, authors examine claims about learning styles in [3]. The authors state that the evidence on the existence of learning styles is not conclusive and there exists no experimental data supporting that matching the mode of teaching with the learning style of students improves students’ performance. Authors suggest that instead of focusing on different learning styles, paying attention to how students learn and different factors contributing to their learning would be more helpful [3].

In [2], Daniel Willingham shares three principles of learning and creating memories for students. The first principle he introduces is that memory is “the residue of thought” and the more a person thinks about something, the more likely that they will remember it later. However, he also states that remembering the information committed to memory depends more on the quality of the cues associated with that memory. Willingham further explains that the quality of the cues depends on certain factors, such as whether there are enough details about the memory, whether the cue leads to only one memory or multiple memories, etc. As the second principle, we need to make sure that the cues used for our memories are detailed and distinctive to avoid forgetting the things we have committed to memory. The last learning principle in [2] is that people tend to be overconfident about what they learn or commit to memory, which causes them to not study enough, at least on average. Thus, to ensure that students are studying effectively, Willingham suggests that instructors need to find ways to have students assess their knowledge more realistically.

Following the learning principles about memory shared in [2] and the information processing model discussed in the mini-lecture, we then moved on to exploring other learning principles and their effects on students’ performance while experiencing the jig-saw classroom. The first topic discussed during our jig-saw classroom was the effect of prior knowledge on students’ learning and performance [4]. According to expert presenters on this topic, for students’ prior knowledge to be helpful for learning, it needs to be accurate, sufficient, and activated. The expert presenters also shared ways for instructors to highlight the prior knowledge that would be helpful for students’ learning, such as explicitly stating the pre-requirements of the course in the syllabus, connecting the newly learned material to students’ prior knowledge, etc. The second learning principle presented was the effect of students’ knowledge organizations on their learning and performance. As one of the presenters, I talked about the difference between how experts organize their knowledge and how students organize theirs [5]. Generally, the number or density of the connections between different concepts, facts, and skills they know differ significantly between experts and novices. To facilitate learning and enhance students’ performance, instructors are encouraged to create and assign tasks fitting to the students’ knowledge organizations. Lastly, the expert presenters talked about developing mastery and the three necessary steps in the process [6]. According to the presenters, students must acquire component skills, practice integrating these skills, and know when to apply what they have learned. Presenters then stated that experts need to become more self-aware to avoid expert blindspot and teach students the skills to develop mastery in the subject.

From what we have so far in the course about human learning, the main takeaway is to develop self-awareness in terms of our own knowledge organizations and what we know as experts and how students learn so that we can then structure our courses accordingly and create a fitting learning environment. The first application of what we have learned so far could be explicitly stating the pre-requirements and prior knowledge necessary for our course so that students come prepared. Another important point is to create a clear syllabus with the breakdown of the material to be taught and related assignments to provide students with a framework for the course. In addition, depending on the course material and subject, providing students with skeletal notes or lecture slides in advance would be beneficial for students to take notes while the instructor is giving the lecture without having to struggle to keep up and to organize the information they are about to learn.

Going off of [2], I think sharing the application of the material and explicitly stating its relation to prior knowledge students have would also help students make deeper connections between concepts which would then enhance their learning. For example, if the course is about “Introduction to Control Systems”, providing examples of where control systems are used (such as robotics, thermal management of devices, power plants, etc.) could give more motivation to students as well as enable them to make better connections between information.

Lastly, I believe adaptability in the teaching style is an important quality an instructor should have, and it is important for instructors to evaluate how the students are learning and to examine whether that fits the knowledge organizations required by the tasks given out to students. For example, after a homework assignment or a project, if most of the students were struggling, it might be a good idea to evaluate what type of problems students had difficulty solving and addressing those types of problems or issues in class to help students learn better.

**References**

[1] McKinsey Learning and Development. Neuroscience and Learning (March 12, 2015). Accessed: Jan. 27, 2021. [Online Video]. Available: <https://www.youtube.com/watch?v=vp60MMtJ_30&ab_channel=McKinseyLD>

[2] D. Willingham, “What Will Improve A Student’s Memory?” *American Educator*, pp. 17-25, 2010.

[3] C. Riener, D. Willingham, “The Myth of Learning Styles,” *Change: The Magazine of Higher Learning*, vol. 42, issue 5, pp. 32-35, 2010.

[4] S. A. Ambrose, M. W. Bridges, M. DiPietro, M. C. Lovett, and M. K. Norman, “How Does Students’ Prior Knowledge Affect Their Learning?” in *How Learning Works: Seven Research-Based Principles for Smart Teaching*, 1st edition, San Francisco: Jossey-Bass, 2010, ch. 1, pp. 10-39.

[5] S. A. Ambrose, M. W. Bridges, M. DiPietro, M. C. Lovett, and M. K. Norman, “How Does the Way Students Organize Knowledge Affect Their Learning?” in *How Learning Works: Seven Research-Based Principles for Smart Teaching*, 1st edition, San Francisco: Jossey-Bass, 2010, ch. 2, pp. 40-65.

[6] S. A. Ambrose, M. W. Bridges, M. DiPietro, M. C. Lovett, and M. K. Norman, “How Do Students Develop Mastery?” in *How Learning Works: Seven Research-Based Principles for Smart Teaching*, 1st edition, San Francisco: Jossey-Bass, 2010, ch. 4, pp. 91-120.