CETL 8713: Reflection on Learning, Abhilasha Saroj

Students' learning in class depends on their prior knowledge. It is important to activate student's prior knowledge to help them connect to the new content. However, despite having credible prerequisites and activation of prior knowledge, insufficient, inappropriate or inaccurate prior knowledge can hinder student's learning process. Accurate but insufficient prior knowledge is when the students have accurate prior knowledge, however, the depth is not sufficient to follow the level of instruction or to apply as required the new course content. Knowledge can be categorized as: 1) declarative knowledge: factual concepts, terms, or definitions – "*knowing what*", for example, knowing what is simulation, and 2) procedural knowledge: knowledge related to an understanding of how and when – "*knowing how and when"*, for example: to know which components should be used as inputs to a simulation system and how to identify them. As an instructor, it is crucial to identify if the student's prior knowledge is declarative or procedural. If it is procedural then it is important to further identify its depth and competence to follow the level of instruction in alignment with the course learning goals. Based on this understanding the course content/instruction can be preplanned and modified. Another prior knowledge loophole that can obstruct learning is inappropriate prior knowledge. Inappropriate prior knowledge refers to knowledge that is not relevant to the current context. There are many terms that fall in the overlap of daily communication vocabulary and more than one disciplines. Change of subject context for a term in one discipline versus another is another example of inappropriate prior knowledge. It is important to mention the limitations and context of an analogy, as students' can extend the analogies to situations that aren't applicable. According to research, explicitly recognizing the correct and incorrect contexts, repetition of the same, and providing multiple opportunities to catch the misinterpretation in form of assignment questions etc. helps students to steer away from the prior knowledge. There can also be presence of inaccurate prior knowledge – presence of wrong prior knowledge. If students start connecting the new knowledge to the inaccurate prior knowledge, their learning will be hindered to a great extent. Inaccurate prior knowledge also known as misconceptions are difficult to refute as they are theories deeply embedded in student due to repetition over time. Since these misconceptions are mix of accurate and inaccurate knowledge, it's further difficult to identify them as wrong in order to correct. According to research, this type of prior knowledge stays strongly despite direct and deliberate refutation during instruction. However, it is also found that these misconceptions can change with time that is the results won't be quick but the students can gradually absorb the correct concept (Ambrose, Lovett et al. 2010). I think importance of investigating depth and quality of prior knowledge is very crucial for an instructor. In most of my statistics or computing classes, especially with probability, I would think I know these basic concepts but being out of touch with it led me to overestimate my knowledge on it. It would be later that I realized the need to go back and really look into it.

For understanding and gauging prior knowledge, enquiring colleagues/prerequisite course instructor can help. Initial diagnostic assignment/concept inventory quizzes that capture student's knowledge gap in alignment with learning goals can provide assessment of prior knowledge to instructor and to students also. Self-assessment quiz, concept map assignment/quiz/in-class activity and type of errors in turned in assignments can be used to identify the prior knowledge gaps effectively. To activate accurate prior knowledge, conducting activities or prompting questions and answers often related to prior knowledge can help students activate and link prior knowledge to current concept(Ambrose, Lovett et al. 2010). Recently, in a course I took, the instructor applied some of these recommended ideas like summarizing basics in initial lectures and designing first assignment to get in their details. I found this very helpful in setting strong foundations and developing confidence to carry on with the increasing intensity and depth of the

course. Further, providing examples or analogies to connect prior knowledge with current concept can also help**.** To refute inappropriate prior knowledge, deliberate and explicit mention of the current contextual meaning of the overlapping contexts/terms/ideas can be helpful. Stating conditions, rules for applicability of a theory or methodology is also recommended. Lastly, to challenge the deep embedded inaccurate knowledge, asking questions and required justifications that challenge student's related prior knowledge through assignments or in personal meetings can be helpful. However, key thing about the strategies of refuting inaccurate knowledge is it takes time and hence the instructors need to be patient (Ambrose, Lovett et al. 2010).

Students' learning depends on their knowledge organization methodology. To obtain better learning and performance result from the knowledge, dense, inter-connected, and deep knowledge organization structure is vital. The key difference between a novice and an expert is the density of connections between concepts and skills. Experts tend to have more complex knowledge connection, allowing them efficient and easier access to various legs of the knowledge spectrum as required. As an instructor, it is crucial to realize the difference in knowledge connection level of expert and novice. It is in good practice to make students aware of and teach the basics of deeper knowledge organization techniques as opposed to the expected novice tendency of superficial knowledge organization. Instructors can create their own concept map, which will help them the connections made by them clearly and hence, would help them communicate these connections to the students effectively. Design of assignments/tasks can also facilitate in providing students with an outline on knowledge organization strategies. Students' knowledge organization can be monitored by carefully looking into their response to assignments, by assigning them a concept map related activity, or by providing them with a sorting or organizing task. To strengthen multiple networks of the knowledge organization connections, students should be encouraged to think of more than one knowledge organization structure. (Ambrose, Lovett et al. 2010) Thus, creating tasks that enhance intended knowledge organization technique is recommended. I think this is very true. More practice, discussions, and different types of questions can increase the connections and knowledge organizations. However, it is important to consider the time allotted for such assignments. I think some very short, in-depth, in-class activity assignments in combination with the regular long ones can be effective in refreshing, practicing and connecting knowledge areas.

To teach traffic simulation techniques to study traffic performance, I would create my concept map that includes interconnections between the basic traffic concepts, computing concepts, computing tools, modelling basics, traffic performance measure units, pros/cons of using different type of performance measures, data input source types in real-world, etc. I would talk to the traffic engineering course instructor to know the basic traffic operations content covered. I would like to design a diagnostic first assignment with lesser grade weight that has questions to test knowledge gaps, and to get insights on current knowledge organization structure of students. In addition, weekly meetings with TAs will help me to get insight on the type of misconceptions being seen in assignments. To enhance student's knowledge organization structuring, PowerPoint slides/ lecture materials will be structured, labeled with outline, along with verbal reminders of big picture during instruction. During course instruction I would prompt questions or terms to activate student's prior knowledge and to form knowledge connections. I would design assignments that provide brief background that helps students with knowledge organization.

Reference

Ambrose, S. A., M. Lovett, M. W. Bridges, M. DiPietro and M. K. Norman (2010). How learning works : seven research-based principles for smart teaching. San Francisco, CA, Jossey-Bass.