

Guest Editorial

Cognitive Load theory: Gaps between theory and practice

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Cognitive Load theory (CLT) described by John Sweller represent an innovative and practical cognitive learning theory about how brain works when students learns new things.¹ This theory suggests that learning takes place best under conditions that are aligned with human cognitive design. It incorporates three key components of cognitive architecture: memory system (sensory, working and long-term memory), learning processes and type of cognitive load imposed on working memory during learning.² In memory system, bottleneck for learning is created by working memory as it can only process limited number (from 5-9) of information elements (chunks) at any given time. The working memory is squeezed by three type of cognitive loads during any instructions or teaching: intrinsic load (mental efforts related to learning task complexity), extraneous load (how a task is taught, every method has its own cognitive load and it should be as minimum as possible) and germane load (learner use of cognitive strategies to facilitate learning).³ According to the theory, when the cognitive load exceeds learners working memory, learning is compromised.

CLT is very relevant and important to medical education as learning tasks are multifaceted and mostly impose increased cognitive load on working memory of learners.² Although it's an excellent concept with huge potential for educators to improve the practice, we are not utilizing and practicing this concept in its true sense. We routinely observe in our curriculum, teaching techniques, and modalities that basic principles of CLT were violated.

Instructional techniques developed on CLT principles

make sure that learner working memory should not be overloaded. It is built on the foundation that since the brain can only do a few things at a time, we should be mindful about what we ask it to do while learning. Let's imagine student enters in class room and two sessions are planned (either lecture or small group discussion), each of one-hour duration and in every session, the teacher tries to teach them a whole chapter of the book. Students had not yet recovered from this cognitive load when they were asked for clinical work in hospital. Most of the time instead of involving them in tasks (based on CLT learning principles), faculty finds its easier to take a small lecture there either at the bedside or in their seminar rooms. Subsequently, they asked the students to go to patients beds again without proper guidance and supervision. We expect them to come back to college after that for another session of skills learning. Most of the time, there exists a lack of relationship among sessions of each day for the students. Do you think this routine is very optimizing for student learning on sound educational principles? We need to shift ourselves from teaching mode (what we want to teach) to learning mode (focus on what student have learned after any learning encounter).

Instructional techniques developed by CLT aims to improve learning by optimizing intrinsic load, especially for complex tasks, minimizing extraneous load as much as possible so that all mental energies should be available towards the intrinsic load, and promoting germane load. For example, there is a large amount of research done on how to make PowerPoint slides so that students learning should be improved.⁴ These slide design principles are very easy to practice

only if we plan to do some extra efforts. We have developed special workshop about how to develop such PowerPoints. Feedback of participants is very encouraging and they appreciated the efforts [<http://www.clinision.com/effective-powerpoint-presentations>]. One excellent paper about modifying instructional techniques on these principles is highly recommended for every person involved in teaching.⁵

Another important aspect of CLT is an expertise-reversal effect. Teaching techniques that improve learning among novice may not help or even interfere learning among experts.⁶ This important aspect should be taken into consideration in the curriculum as well. The same course contents should not be used in the early years of any course as compared to end stages. When PBL came, every institution wanted to join the bandwagon and still many of our institutions are using it among novice too. However, research has shown that PBL method is not a very effective teaching technique of novice as compared to other guided instructional techniques.⁶ It is recommended that in early stages of learning, guided instructions should be used and as one develop expertise at the end of the course and in continuous medical education (CME), PBL should be utilized for best learning outcomes. Not only teaching instructions but curriculum should be designed based on principles of CLT.²

If one looks into different MHPE programs being run by various institutions across the country their design is still far from many of these principles due to many logistic reasons. In a few days of extensive contact

session, very large amount of new information is transferred from expert facilitator to novice student. Although most of the participants are experts in their subject fields but they are novice if we consider them in term of expertise of medical educationist. We need to look into our current practices and there is a great need that all our educational activities should be based on sound educational and research-based principles.

References

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