



Have you ever really thought about learning... what it is and how it works?

From a cognitive perspective it is believed that learning is a very active process that leads to changes in mental representations, or knowledge structures, inside the learner's brain. These changes are due to experiences with new information in the world. There are different types of experiences that lead to information being processed in different ways, modifying these knowledge structures. The richer the connections made between new information and existing knowledge structures the deeper the learner's understanding of the subject matter.

Deep learning however suggests that the learner is engaged in critical thinking about new information. In 1987 Scriven & Paul defined critical thinking as the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action. Thus, critically thinking about, and interacting with, new information can lead to the generation of deeper and richer understanding or learning – in other words knowledge.

Designed Resources can provide information that can be used by learners to generate new knowledge. Resources come in various formats, and when designed well, with appropriate characteristics, can be supportive of a learning process that includes critical thinking and results in deep learning.

One dimension in this learning process is when learners interact physically and mentally with new information. Their guided physical activities with new content prompt them to organize and integrate new information into their thinking. This thinking process supports learners in modifying their knowledge structures by identifying new ideas, organizing them, and adding new connections to them, in other words, generating new knowledge in their brain. This is known as a hands-on minds-on generative learning process.

When resources prompt generative learning ... learners are organizing and integrating new information, by physically and cognitively manipulating new content.

Another dimension in the learning process is when learners are exposed to multiple perspectives of content. They experience content in various ways, such as seeing how others perceive or use the content, or experiencing new content in a variety of different formats or contexts, and in prompting them to describe or use the content in flexible ways. This variety of experiences can again lead to the generation of rich knowledge structures with multiple connections based on different views of new content. This is known as cognitive flexibility.

When resources support cognitive flexibility... the resources engage learners in multiple perspectives of content, in taking on multiple roles while viewing the content, and in flexible ways to describe and use the content. Each extends depth of knowledge through new connections.



A third dimension in the learning process is the knowledge domain. Knowledge can be cognitive or related to thinking, affective or related to feelings and attitudes, and/or psychomotor or related to physical movements and their associated thinking strategies. Each of these domains progresses from low level to high level functioning. For example, in the cognitive domain learners proceed from low levels of thinking – like remembering, understanding – to higher order thinking like evaluating and creating. In the psychomotor domain learners proceed from low level performance like imitate and manipulate – to higher level performance like articulation and naturalization. In the affective domain lower levels include receiving and responding while higher levels of affect are valuing and characterizing by value. In all of these domains there is a progression from lower level functioning to higher level functioning.

When resources are based in level of engagement ... they are focused in one or more of the domains and support learners in moving from lower to higher levels of functioning while engaging them at the appropriate levels based on expected learning outcomes.

A fourth dimension in the learning process is reflection. A critical aspect of learning is based on how the learner assesses his or her own learning and abilities to use new knowledge. Reflecting on learning also helps the learner strengthen and modify connections in their knowledge structures. Learners also strengthen and develop new connections as they think about how content can be applied to their immediate situation and then continue to explore application to new contexts.

When resources prompt reflection ... they engage learners in exploring and monitoring their own knowledge. They also prompt learners to apply new knowledge to their current setting, and then prompt them in extending their ideas about application to other contexts. These reflections can lead to strengthening and creating new knowledge structures.

All 4 of these dimension in the learning process can support deep learning by generating multiple and richer connections of new information into existing knowledge structures. We believe that the characteristics of learning resources can be designed to inform each, and all, of these dimensions thus become a critical external part of the deep learning process, prompting the generation of new connections.

The Research in Designing Learning Resources, or RIDLR, team was created to explore where instructional design, development, assessment, and inquiry merge in an effort to understand and solve the riddles between learning resources and learning. Thus, this team will both develop and validate prototype learning resources based on these dimensions and study their effects on learning. A critical aspect of the RIDLR team's work will include developing and validating design and assessment guidelines and protocols that may be helpful to learners and instructors alike in monitoring learning progress when using learning resources.