

Learning, Understanding, and Conceptual Change

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A learner's ability to process new learning is determined by the strategies that are used to connect their prior knowledge to new information. Expert learners and Novice learners process new learning using different strategies. Expert learners are able to visualize their learning in a way that enables them to determine what they already know and what they need to know to solve problems.

In their book, Bransford, Brown, and Cocking (2000) describe learning as being a "new science . . . One of the hallmarks of the new science of learning is its emphasis on learning with understanding" (Bransford et al., 2000, p. 8). One does not learn by simply having new experiences or by being introduced to new topics. One must be connected to the new information by the preconceptions of the world that they already hold. Learning with understanding takes place when the learner combines what they already know with the new information that is being presented. In the book *Fish Is Fish*, a great depiction of learning with understanding takes place. It is a story of a tadpole and a menow who are inseparable friends. One day they get in an argument when the tadpole wakes up and notices that it has developed back legs. He wakes up and tells the menow that it is finally a frog. The menow doesn't understand how it could be a frog, if just yesterday they were both fish. The tadpole uses the new knowledge of having back legs and its prior knowledge to obtain understanding that it is now a frog.

Learners can be separated into two categories: Novice learners and Expert learners. Novice learners are able to connect prior knowledge to new information to create a level of understanding just like Expert learners, however, they lack the ability to organize their information. Novice learners organize new learning in a series of disconnected data points. A Novice learner may see a math problem and quickly apply any known formula to solve it rather

than looking at the problem and determining what formula fits best. Their knowledge is inflexible and segmented, which does not allow for transferring across different concepts and makes solving new problems harder. For learners to progress into new levels of learning and understanding, they need a way to organize prior knowledge that is easy to recall and use.

Learners become experts when they have the ability to organize information that is easily retrieved and applied to solve problems. Teachers can instruct students on how to better recognize what information or understanding they hold. Learners can increase their level of expertise when they develop strategies that enable them to use prior knowledge in conjunction with new learning. A strategy that can help learners increase in their level of expertise is metacognition. “Metacognition is having the ability to monitor one’s current level of understanding and decided when it’s not adequate . . . The ability to recognize the limits of one’s current knowledge, then take steps to remedy that situation, is extremely important for learners of all ages” (Bransford et al., 2000, p. 42). Expert learners can have different levels of flexibility within their understanding. There are experts that Bransford et al. (2000) calls, “relatively routinized and one that is flexible and more adaptable to external demands” (p. 45). When these more flexible experts are introduced to new information they use their prior understanding along with the skill of metacognition. They measure their level of expertise and then they try to improve on it.

Helping students develop into better learners is the goal for any teacher. Teaching them how to think about their learning and organize it in a way that will help them learn more efficiently is part of the “new science” of learning that Bransford, Brown, and Cocking describe in their book. Having students use educational technology can help visualize the knowledge that

they hold. Sharing these visualizations with other students and their teacher will promote discussions of what background knowledge they hold, along with what learning needs to take place to solve particular problems. One method of teaching with a main problem in mind is Project Based Learning. In this method of teaching the problem is the driver of the students' learning. Teachers act as guides rather than keepers of information. Students often decide to create media productions to share their learning with an authentic audience. Bransford et al, (2000) shares that, "media production is continuous with and a direct outgrowth of the learning that is embodied in the media production" (p.13). The goal here is to have students reflect on their learning as a way to further their understanding.

Incorporating educational technology into the learning process effectively is not just a way for students to share their learning, but it is a way for the learning process to continue. Novice and expert learners can develop in their level of expertise by incorporating the strategy of metacognition with technology. Technology can help learners transition in their level of expertise by providing a way for them visualize their learning and determine what they already know and what they need to know to solve problems.

## References

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