Learning, Understanding And Conceptual Change

Traditional teaching practices have focused on a variety of well-worn and frequently practiced pedagogies. Anecdotal evidence suggests that may of these teaching techniques have been largely successful for generations of learners. “In the early part of the twentieth century, education focused on the acquisition of literacy skills: simple reading, writing, and calculating. It was not the general rule for educational systems to train people to think and read critically, to express themselves clearly and persuasively, to solve complex problems in science and mathematics (Bransford, Brown, Cocking, 2000, pg.4). Traditional school settings today employ seasoned professional educators who continue to embrace these icons of practice. “Students often have limited opportunities to understand or make sense of topics because many curricula have emphasized memory rather than understanding. Textbooks are filled with facts that students are expected to memorize, and most tests assess students’ abilities to remember the facts” (Bransford, Brown, Cocking, 2000, pp. 8-9).

A more recent focus in methodology for instruction promotes a more nuanced approach that considers cultural experience of students as well as previous knowledge or potential misconceptions. Students employ metacognition and multiple models or representations to display understanding. New pedagogical practices in Physics instruction require teachers to encourage students to share and explain models in cyclical patterns that provide evidence of developing understanding. The name Modeling Instruction expresses an emphasis on the construction and application of conceptual models of physical phenomena as a central aspect of learning and doing science (Hestenes, 1987; Wells et al, 1995; Hestenes, 1997, pg.1).

While a level of understanding is common to both novices and experts, the expert has the advantage of time and experience to deepen expression. The novice does not enjoy the advantage of the ability to chunk information, organizing information in a manner that allows for quick and effortless response. The novice must concentrate on form and repetitive practice, striving as an artisan, merely to apply specific rules or processes. On the other hand, a virtuoso has far surpassed the artisan, understanding intuitively and effortlessly how to integrate and manage complexities of relationships. An example in practice might be described as a proficient novice musician who strives to technically produce all of the selected tones in the correct sequence and rhythm to perform a set of notes inked on a musical score. The virtuoso no longer considers only the correct pitches and rhythms, but extends the performance into a new realm that includes phrasing and dynamic contrast with fluidity of expression and diverse tonal color. The virtuoso does not have to consider each component of a performance, but moves into a lithe performance that accesses skill and expertise effortlessly. The novice focus is rudimentary and limited by lack of experience, striving to emulate the performance of a virtuoso through mimicry or parroting. “The enterprise of education can be viewed as moving students in the direction of more formal understanding (or greater expertise). This will require both a deepening of the information base and the development of a conceptual framework for that subject matter” (Bransford, Brown, Cocking, 2000, pg. 17).

Deep understanding of subject matter transforms factual information into usable knowledge." (Bransford, Brown, Cocking, 2000, pg.16). Practitioners in education seek integration of diverse avenues that support student learning. The benefit of employing technological tools in instruction is the cultural trend for students to readily access and process digital information without regard to a school environment or setting. Students employ technical resources adroitly, and may select digital learning as a primary and portable source for attaining information, considering relationships, and for developing performance. **"**As Nobel laureate Herbert Simon wisely stated, the meaning of "knowing" has shifted from being able to remember and repeat information to being able to find and use it" (Bransford, Brown, Cocking, 2000, pg. 5).

Essential training of educators must purposely integrate evolving powerful and available technological tools to support student learning and understanding. Educators must consider and embrace a new paradigm where digital focus has become a primary stimulus for student engagement. If student interest and enthusiasm for learning has evolved to include digital technology as a primary influence or source of "sense making," then teachers must be empowered to utilize this asset in planning and executing a successful learning strategy. Educators must be keenly aware of how students process knowledge. "An emphasis on understanding leads to one of the primary characteristics of the new science of learning: its focus on the processes of knowing" (Bransford, Brown, Cocking, 2000, pg. 10).

References

Bransford, J. D., Brown, A. L., Cocking, R. R. (2000). How people learn: Brain, mind, experience, and school: Expanded edition. Washington D.C.: National Academies Press.

Jackson, J., Dukerich, L, Hesternes, D., (2008), Modeling Instruction: An Effective Model For Science Education, *Science Education*, 17(2). Retrieved from fromhttps://www.researchgate.net/publication/265530286.