GENERATIVE TEACHING ACADEMIC COURSES

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Effective teaching of science to all students involves the construction of a comprehensive model of the cognitive processes involved in learning science from instruction. These processes include the learner's background knowledge and alternative conceptions, but also the sometimes neglected processes of attention, motivation and attribution, generation and metacognition.

For many years science teaching has focused on ways to engage learners' generative thought processes in the learning of scientific and mathematical concepts and principles that will transfer to facilitate related learning in science and to enhance problem-solving in everyday situations. One of the more intriguing parts of research and thought about science teaching has been its ambition since antiquity to train intelligence by engaging the learners' generative thought processes in the construction of meaning for concepts and principles that will transfer and will solve problems. For example, Plato taught a slave boy the Pythagorean theorem as a way to train intelligence, or virtue as it was then called. Charles Judd, in the first decade of this century, taught boys the principle of refraction of light as a way to increased transfer of ability to solve a practical problem of hitting a target submerged under different depths of water.

Modern day research on cognition in science teaching focuses upon these same generative thought processes of learners that have intrigued science teachers since antiquity. These thought processes include the learners' knowledge and experience, comprehension strategies, and metacognitive strategies.

The more advanced science learners also have better developed self-regulatory and self-monitoring metacognitive skills (Glaser, 1990), that facilitate planning and use of procedural knowledge as well as declarative knowledge. These more competent science learners also better transfer their science learning than do their less competent counterparts. Lehman, Lempert and Nisbett (1988) studied the transfer effects of graduate training in psychology, law, medicine, and chemistry. Training in psychology and medicine increased ability to transfer and use scientific reasoning in the solution of everyday clinical problems. Training in law increased ability to reason logically about everyday, complex legal cases and that emphasized transfer of scientific or logical methods to practical contexts, did not facilitate ability to solve everyday problems in chemistry. In addition to domain or content-specific learning at the graduate school level, it is important to engage learners' generative thought processes in the representation, transfer, application and self-control of knowledge and action [1].

References:

1. Mayer, Richard E. "Merlin C. Wittrock's enduring contributions to the science of learning." Educational Psychologist 45.1 (2010): 46-50.