

## Cognitive Psychology Component: Benefits of Metacognitive Strategies

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Today, the field of cognitive psychology is in the midst of a major outpouring of scientific work on the processes of thinking and learning and on the development of improving long-term learning. And today, many cognitive researchers realize that working in collaboration with educators will most benefit the strategies used in the classroom. A crucial development in the science of learning has been to promote the “metacognitive learner”. Metacognitive strategies include procedures where teachers encourage students to take active control of their own learning by being aware of their own strategies, and by using strategies that may *seem*—to both the learner and the teacher—unfavorable during training or for the short term, but are, in actuality, immensely beneficial for long-term learning and in novel situations.

The best way to categorize many of these effective strategies may be to, ironically, set up difficult, somewhat stressful, unstable, and many times unsuccessful, testing environments for the learner, ideas which were first emphasized by Bjork (1984). These strategies can be achieved using a variety of testing methods. For example, cognitive researchers have demonstrated repeatedly that distributing practice sessions far apart in time, as opposed to cramming, produces markedly superior long-term memory performance (see Dempster, 1996, for a review; Melton, 1970). This so-called “*spacing effect*” will occur even though students feel less confident and learn more slowly and with more difficulty *during* those distributed practice sessions (Bahrlick, Bahrlick, Bahrlick, & Bahrlick, 1993; Zechmeister and Shaughnessy, 1980). Another research finding has been to provide contextual variety (Birnbaum & Eichner, 1971). Making the task environment more different on each learning occasion, or more unpredictable, can surely create interference for the learner in the short term, adding to cognitive demands. However, if the learner studies the to-be-learned materials in a large variety of situations, then, in the long term, regardless of the context, performance will stay high. Theoretically, one could think that “contextual variety” itself, has become a retrieval cue for the memory of that learned event.

Another proposal in cognitive psychology has been to reduce feedback during study, even when students make errors (Bjork, 1984). This strategy is used when students are given frequent tests, pop quizzes, and when they are encouraged to generate and present their own ideas. Cognitive data have shown abundant evidence that the act of retrieval induced by a recall test can be considered more potent than a passive study opportunity in facilitating long-term recall (Bjork, 1988; Landauer & Bjork, 1978). It has also been found that when people are told to generate previously learned material, they retain that information better than those people who were told to passively read the material—known as the “*generation effect*” (Slamecka & Graf, 1978). Again, these testing and generation strategies are thought to be difficult, somewhat stressful, unstable, and many times, lead to unsuccessful performance during training, for the short term. For example, such strategies would allow learners to produce large numbers of errors, and to retrieve incorrect information, as they would quite often on pop-quizzes, tests, and generated

ideas (error rates would drop significantly on predicted tests, expected questions, and passive lecture-type learning contexts). However the added variability as a result of exerting a high degree of cognitive effort during learning is thought to better ensure long-term recall of that information (Hirshman & Bjork, 1988). And, researchers have found that still the long-term benefits of testing, generation, and spacing, overwhelms any possible harmful effect of making errors during training.

In short, educators have only recently begun to work with cognitive researchers, attempting to implement optimal strategies in the classroom, and to teach these strategies to their students. And importantly, both teachers and learners need to avoid misperceptions of “fast and easy learning” which only benefits short-term performance, and instead shift to “difficult and somewhat stressful learning” which is optimal for long-term performance. Thus, an important goal of both researchers and educators should be to show that good performance now does not always translate into good performance later—on the contrary, struggle, stress, and spontaneity now, may be the key to long-term maintenance of knowledge.

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