Active Learning

Higher Education Services

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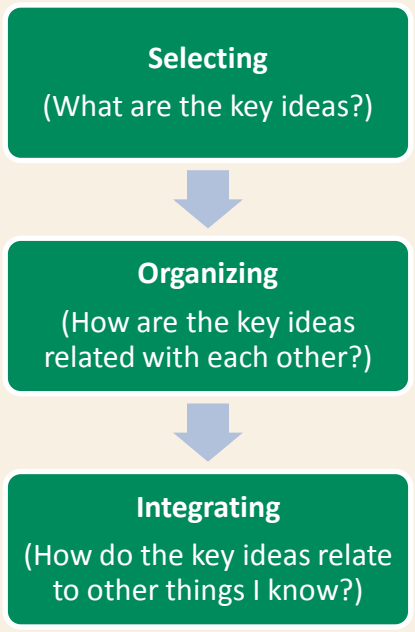
What is Active Learning?

Active learning refers to the robust research finding that learning is more durable and lasting when students are cognitively engaged in the learning process (Bransford, Brown, & Cocking, 2000; Chinn, 2011). Long-term retention, understanding, and transfer have been found to be the result of effortful mental work on the part of learners who are engaged in active sense-making and knowledge construction (Bertsch, Pesta, Wiscott, & McDaniel, 2007; Blerkom, Blerkom, & Bertsch, 2006; Callender & McDaniel, 2009; Dee-Lucas & Vesta, 1980; Halpern & Hakel, 2003). Accordingly, learning environments are most effective when they elicit effortful cognitive processing from learners and guide them in actively constructing meaningful relationships rather than encouraging passive recording and storage of information (Craik & Tulving, 1975; Wittrock, 1992).

Mayer (2011) notes that there are three primary cognitive processes involved in active learning: selecting relevant material to attend to, mentally organizing attended material into meaningful representations, and integrating these representations with prior knowledge. Effective active learning techniques engage learners in one or more of these cognitive activities. The emphasis on appropriate mental processing is critical. There is a common misconception that research on active learning entails that learning through physical activity or personal discovery is preferable to behaviorally passive activities such as quietly listening to a lecture. This is not the case, however, and in many situations these physical activities can actually interfere with the essential mental processing needed to learn successfully (Clark & Mayer, 2008; Kirschner, Sweller, & Clark, 2006). In fact, well-designed lectures can promote active learning if they stimulate appropriate cognitive activity (deWinstanley & Bjork, 2002; Haidet, Morgan, O'Malley, Moran, & Richards, 2004; D. Schwartz & Bransford, 1998).



Why is Active Learning Important in e-Learning?

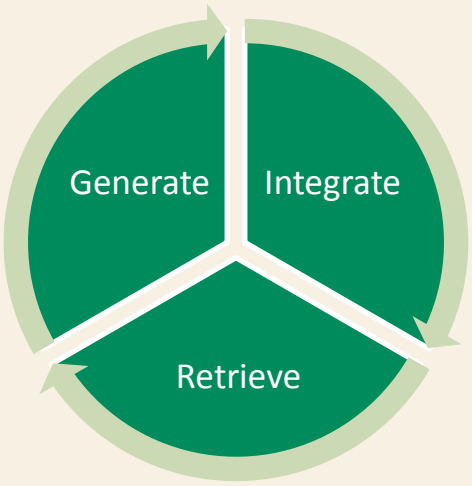
Few educational interventions can match the power of active learning strategies in improving student academic outcomes (Hattie, 2009). Research has consistently found that higher student achievement and engagement are associated with instructional methods involving active learning techniques (Freeman, Eddy, McDonough, Smith, Okoroafor, Jordt, & Wenderoth, 2014; Umbach & Wawrzynski, 2005). Also, students employing active learning strategies in the planning, monitoring, and evaluation of their learning progress have been found to outperform peers lacking these skills (Robbins, Lauver, Le, Davis, Langley, & Carlstrom, 2004).

Although researchers have encouraged educators to incorporate active learning strategies for decades, little has changed in how we teach students in higher education (Chickering & Gamson, 1987). Both traditional face-to-face and online instruction continue to be characterized by passive information transmission models relying almost exclusively on lecturing and textbook reading (McKeachie, 1994). This pedagogical approach often affords little opportunity for students to engage in the types of active processing required to create enduring and transferable knowledge. In addition, surveys of college student behaviors have found an overwhelming reliance on passive learning strategies on the part of learners (Carrier, 2003; Karpicke, Butler, & Roediger, 2009). Common strategies such as rereading, copying, highlighting, and note-taking, involve minimal mental effort on the part of students and are significantly less effective than more active alternatives (Blerkom et al., 2006; Callender & McDaniel, 2009).

Given these observations, efforts to incorporate additional active learning elements in online education, through improved instructional design and student education, are likely to result in substantial improvements to learning outcomes and increased student engagement.

Incorporating Active Learning Into e-Learning

The primary take away from research on active learning is that student learning success depends much less on what instructors do than what they ask their students to do (Halpern & Hakel, 2003). Although there is broad agreement that successful learning requires effortful mental processing on the part of the learner, there is less consensus on which strategies are most powerful and why. However, several active learning techniques have been well researched and their positive effects clearly demonstrated. Below are several well-supported strategies as well as general suggestions for how they might be incorporated into an online learning environment.



Generating Ideas and Connections

Students should be asked to frequently generate connections, questions, and ideas. One of the strongest findings in the learning sciences is that memory and understanding of information is greater if a learner attempts to produce or generate information rather exclusively receiving it from an instructor or textbook (Bertsch et al., 2007; Bertsch & Pesta, 2014). Examples of generative activities that have been found to be particularly powerful include hypothesizing the result of an experiment or answer to a question prior to being provided the solution, incorporating classroom assessment techniques (CATs) such as drawing concept maps or directed paraphrasing, involving students in collaborative or group learning projects, and integrating reciprocal teaching opportunities where students have the

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opportunity to teach content and lead discussions about the material being taught (Garfield, delMas, & Chance, 2007; Rosenshine & Meister, 1994; Schroeder & Scott, 2007; D. L. Schwartz & Martin, 2004).

Integrating Prior Knowledge

Learners need to dedicate time to reflecting on new information and integrating it with preexisting knowledge. Students come to an instructional situation with a robust network of prior beliefs, skills, and experiences that influence and moderate their efforts to construct the personally meaningful relationships required for enduring knowledge (Ambrose & Lovett, 2014). Effective instructional design provides opportunities for learners to take control of their learning by applying personal experiences in journals or reflective writing, through self and peer-evaluation of class assignments, in the creation of learning portfolios, and by participating in discussions that engage students in deep reflection of their beliefs and values (Tanner, 2012; White & Frederiksen, 1998; Zull, 2002). Instructors should also make an effort to link new material to students' prior knowledge and experiences through the frequent use of metaphors, analogies, and real-life examples.

Retrieving From Memory

Perhaps the most well-established active learning strategy is repeated and spaced retrieval of learned information. Effortful recollection of information through recurrent testing, even if such attempts to retrieve information are unsuccessful, is a powerful learning event for improving long-term retention (Karpicke & Blunt, 2011; Kornell, Hays, & Bjork, 2009; Roediger & Butler, 2011) Instructors can increase opportunities for student retrieval by incorporating frequent low-stakes quizzes, providing practice tests with feedback, and prompting students at regular intervals to answer questions while listening to lectures or viewing videos (Agarwal, Bain, & Chamberlain, 2012; Kornell et al., 2009; Lyle & Crawford, 2011; Roediger, Agarwal, McDaniel, & McDermott, 2011).

Active Studying

Knowledge of active learning strategies are necessary for students to maximize their personal studying efforts. These strategies mirror the same generative, reflective, and retrieval activities already discussed. Methods suggested by available research include frequent self-questioning while reading a textbook or listening to lectures (e.g., What does this concept mean? What are the key ideas? How does this relate to earlier ideas?), elaborating on encountered material by considering how it relates to other ideas or knowledge, using flashcards to practice retrieval over extended periods of time, writing potential exam questions for upcoming tests, and creating organizational schemas (e.g., content outlines or concept maps) to connect information in meaningful ways (Blerkom et al., 2006; Dunlosky, Rawson, Marsh, Nathan, & Willingham, 2013; King, 1989; Rawson & Dunlosky, 2011).

Where Can I Learn More About Active Learning?

For a brief introduction to the idea of active learning and some simple suggestions for incorporating active learning into one's teaching, see Hammer and Giordano (2012). A thorough discussion of the powerful effect of retrival practice on learning and the many educational benefits of frequent student testing can be found in Roediger, Putnam, and Smith (2011). For an accessible discussion of much of the research mentioned in this paper, in addition to many examples of instructor and student strategies to make learning more active, see Brown, Roedigger, and McDaniel (2014). Finally, for a comprehensive list of 50 active learning techniques that can be employed in many teaching situations, see Angelo and Cross (1993).

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