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Active Learning

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What is Active Learning?

There is high acclaim for the benefits of active learning in higher education (e.g., Bonwell & Eison, 1991; Yoder & Hochevar, 2005). The peer-reviewed journal *Active Learning in Higher Education* and numerous books are dedicated to this pedagogical approach. The "buzz" phrase refers to several models of instructions that emphasize the role and responsibility of student learning (Bonwell & Eison, 1991). Active learning developed from the work of theorists promoting discovery learning (Mayer, 2004). During active learning, students are actively (rather than passively) engaged in their learning by discovering, processing, and applying information. They engage in higher-order thinking tasks such as analysis, synthesis, and evaluation (Bloom, 1956). Active learning derives from the assumptions that learning is an active endeavor and that individuals learn in different ways. However, it is important to note that active learning alone will not increase student learning, in the absence of content, reflection, or objectives.

Why is Active Learning Important?

Why is active learning important? More discovery-oriented and student-active teaching methods ensure higher student motivation, more learning at higher cognitive levels, and longer retention of knowledge (Nilson, 1998). The foundations of any discipline are its definition, knowledge base, terminology, structure, methodology, and epistemology. As we move from basic knowledge to the complex organization and hierarchies of information in the disciplines, we parallel the levels of Bloom's (1956) cognitive taxonomy: knowledge, comprehension, application, analysis, synthesis, and evaluation. Feldman (1989) has shown that there are two essential tasks to foster student achievement: (a) to help students see the relevance and importance of the information, and (b) to make it understandable. In fact, the dimensions of teaching that are the strongest correlates of student achievement are: (1) preparation and organization; (2) clarity of communication; (3) perceived outcome of the instruction; and (4) stimulating student interest in the course content (Feldman, 1989). The first two concern the organization of information and its effective presentation and have traditionally been part of a teacher's preparation. The second two deal with motivation and engaging students in their learning.

Learning does not take place in a vacuum. Knowledge accumulates through complex experiences that learners store in schemata - structured representations that capture information relevant to a situation or event (Barsalou, 1992). Schemata and categories form some of the basic structures that underlie knowledge and memory. We rely on these mental structures to encode and retrieve information. Because active learning encourages students to think more deeply about the material, that is, in a more meaningful way, it is effective in improving students' learning (e.g., Bonwell & Eison, 1991; Cherney, 2008; Yoder & Hochevar, 2005). Cognitive psychologists have shown that more meaningful processing (i.e., levels of processing) of information promotes better recall (e.g., Craik & Lockhart, 1972). Elaboration of the material, which involves interpreting information, connecting it with other information, and mulling it over is an important aspect of deeper encoding of information. Other techniques that strengthen encoding and that promote deeper thinking are conscious retrieval of the information, practice that is distributed in time (Smith & Kosslyn, 2007), and generation of questions about the material (e.g., Carroll, 2001; Dietz-Uhler & Lanter, 2009). In addition, distinctiveness, and information that is self-referenced facilitate memory for course content (e.g., Cherney, 2008; Hartlep & Forsyth, 2000; Roediger, Gallo, & Geraci, 2002; VanderStoep, Fagerlin, & Feenstra, 2000). Because the self is an existing well-developed and well-practiced network of knowledge, it offers potential for both elaborative and organizational processing. For example, VanderStoep and his colleagues (2000) found that, in a free recall task, students tended to remember atypical events better. Cherney (2008) showed that students remembered active learning materials better than material that was not introduced through active learning across introductory and upper-level

psychology courses. Vivid anecdotes and demonstrations improved the memory for course content. In addition, student understanding was significantly enhanced when the material was connected to the self and real-life concrete experiences (Cherney, 2008).

Learner-Centered Teaching

In an active learning paradigm, the instructor strives to optimize learning through multiple aspects of learner-centeredness. Classes become about students' learning, not about instructors' teaching. Instructors become the facilitators of learning. Learner-centeredness shifts the responsibility to the students, who in turn have to actively engage in the learning process with their instructors and peers. Learner-centered instructors assess the process of learning throughout and upon completion of a course. These assessments allow instructors to address any misunderstandings or to tailor their teaching to the students' needs.

In sum, learning is a "meaning-making" process. New learning happens when we make connections between existing concepts, knowledge, and experience. These new links can only be created by the learner. One of the challenges for instructors is to impart knowledge of a discipline to students who have limited attention and limited prior knowledge of the concepts. Many students have not established an elaborate network of structures to build upon and create memory cues that will enhance their knowledge of the material. However, not all activities will create new knowledge. Activities that require the learner to create constructs of important concepts and then connections between these constructs are not enough. Students must also think and reflect about the experience. They need to explain the concepts to themselves, to their peers, and to the instructor. This reflection is the active meaning-making process in action; it gets the students to form concepts and schemata, to improve them, to use them repeatedly, and to create those long-term links that make the subject "make sense." If students understand why information is important and useful, if their curiosity is piqued, if they are appropriately challenged, and if they perceive relevance of the content, they will be willing to exert more effort and will perform better as a result.

What are the Barriers to Active Learning?

To address why some faculty have not embraced recent calls for this educational reform, it is necessary to identify and understand common barriers to instructional change, including the powerful influence of educational tradition, faculty self-perceptions and self-definition of roles, the discomfort and anxiety that change creates, and the limited incentives for faculty to change. According to Michael (2007) the barriers fall into three categories: (a) student characteristics or attributes (e.g., students do not know how to do active learning, they are unprepared or unwilling to engage in active learning), (b) issues directly impacting faculty (e.g., it takes too much preparation, faculty have less control over the class, poorer evaluations, there is no reward structure, or faculty do not know how to do it), and (c) pedagogical issues (e.g., classroom set-up does not lend itself to active learning, it takes too much class time, student assessment is difficult, class size, hard to predict learning outcomes or quality control).

Changing from a teacher-centered to a learner-centered classroom can be difficult for both instructors and students. For instructors, the most difficult part of the transition may be giving up control of the classroom — control over content, how much time is spent on it and what is discussed. In addition, faculty members' efforts to employ active learning involve risk--the risks that students will not participate in the activities, that they will not use higher-order thinking, or will not learn sufficient content, or that faculty members will lack the necessary skills, or be criticized for teaching in unconventional ways (Michael, 2007).

Although many of the faculty perceptions are correct, others are not. Understanding faculty perceptions about the barriers to active learning in their classrooms is the first step in devising strategies for helping faculty change the way they teach. Careful and thoughtful planning will successfully overcome each barrier and type of risk. There are several ways that faculty can learn to incorporate active learning activities in their classrooms. Many institutions offer teaching development programs and opportunities that provide faculty with a peer-review network, feedback from colleagues willing to observe classes, or funding for the scholarship of teaching and learning (Johnson, DiLillo, & Garbin, 2010). Some workshops offer faculty new ideas and insights about techniques that can facilitate active learning in their classrooms. "How-to" books are readily available and some institutions use teaching portfolios to track teaching growth over time. These summaries of reflections and materials on one or more courses can be helpful for the faculty to demonstrate efficacy of student learning. However, for such workshops to be successful there must be institutional resources in place that will push faculty to incorporate these new techniques into their courses. Garet, Porter,

Desimone, Birman, and Yoon (2001) found that exposure to new ideas and the practice of these new ideas is usually too brief to achieve a significant change in faculty's classroom behaviors. In addition, there is a lack of reinforcement and follow-up. As a consequence, faculty tend to continue teaching the way they have always taught.

In sum, instructors perceive many different barriers to building an active learning environment in their classroom. These perceptions shape instructor and student behavior in the classroom. However, creativity, flexibility, institutional resources and support can overcome the perceived barriers. Teaching is like any other scholarly activity. It takes considerable effort and time to acquire the repertoire of materials, abilities, and habits of a competent teacher. Moving teaching into a public enterprise where disciplinary and institutional colleagues can discuss teaching will help change the institutional culture in which ideas and innovations are open to scrutiny and debate (e.g., Michael, 2007).

How Can Active Learning be Incorporated in the Classroom?

Researchers have reported several active learning strategies that favorably influence students' attitudes and achievement. This section will discuss a limited number of techniques that enhance student learning and that are easily incorporated into the classroom.

Class Discussions

In-class discussion and participation are common strategies promoting active learning. If the objectives of a course are to promote long-term retention of information, to motivate students toward further learning, to allow students to apply information in new settings, or to develop students' thinking skills, discussion is preferable to lecture (McKeachie, Pintrich, Lin, & Smith, 1986). Research has suggested, however, that to achieve these objectives faculty must be knowledgeable of alternative techniques and strategies for questioning and discussion and must create a supportive intellectual and emotional environment that encourages students to take risks (Lowman, 1984). Silberman (1996) offered 10 methods to increase class participation: open discussion, response cards, polling, subgroup discussion, learning partners, whips, panels, fishbowl, games, and calling on the next speaker (pp.16-18). These strategies have in common that they break students into subgroups, they spark the energy and involvement of all students, and they provide the instructor with valuable assessment information.

Visual-based instruction

Visual-based instruction can provide a helpful focal point for other interactive techniques. Today, PowerPoint lectures are ubiquitous. A possible drawback of this computer-based method is that students may falsely assume that all the information they need to know is on the slides. In addition, interaction between instructor and students and student attendance may suffer from using slides. However, whether instructors use PowerPoint in class is not necessarily the critical issue here, but rather how the instructor incorporates active learning into the classroom. For instance, Hardin (2007) found that it is the instructor's teaching ability, not the use of PowerPoint slides, which has the greatest effect on students' learning in the classroom. Student learning is likely to benefit when an instructor makes use of the advantages of PowerPoint slides, such as providing illustrations and images, connecting to websites for instructional purposes, and allowing more time for students to listen and engage in class discussion. Providing PowerPoint slides and course-specific websites in advance of classes are also excellent tools to keep students ready to participate in active learning activities during class and have a positive effect on academic achievement (Hove & Corcoran, 2008).

Content-based questions

Another way to enhance a PowerPoint lecture is to use the slides in conjunction with content-based questions (CBQ). Gier and Kreiner (2009) provided students with traditional PowerPoint handouts or handouts with CBQs. The latter included three question sets consisting of ten questions each over the covered material. Discussion of the questions lasted approximately 10 min during class. The results showed that incorporating CBQs into a traditional PowerPoint presentation increased learning in two different courses and with both between-subject and within-subjects comparisons, suggesting that the results can be generalized to other courses.

Personal response systems

In-class questioning can also be done by introducing "clickers" or personal response systems to a PowerPoint presentation. Clickers increase class participation and student learning (e.g., Shaffer & Collura, 2009; Smith & Hill, 2011). Students typically rate lectures using clickers as more interactive, interesting, and entertaining. But not every computer-based or technology-assisted interaction enhances learning. Although technology-assisted instruction tends to be associated with increased student motivation, enjoyment, and

development (Forsyth & Archer, 1997), learning outcomes are not always superior in technologically assisted classes (DeBord, Arguete, & Muhlig, 2004; Pemberton, Borrego, & Cohen, 2006).

Case studies

Another active learning technique that can be effective in class is the use of case studies. Case studies are often used in Abnormal Psychology courses to illustrate different psychopathologies or in Research Methods and Statistics courses to illustrate different problem situations. Others can easily be developed for use in other courses. For example, Miserandino (2007) asked students to apply the five factors of personality to Johnny Carson's personality using his *New York Times* obituary. Students both enjoyed the activity and later scored higher on an essay question and related concepts than those who did not take part of the case study.

Microtheme writing assignments

Other important active learning techniques involve in- and out-of-class writing assignments. Stewart, Myers, and Culley (2010) used in-class microthemes or short in-class writing assignments to enhance psychology students' mastery and retention of course content, stimulate active learning, and improve writing quality. To achieve these goals, they provided 10 graded writing assignments throughout the semester to prompt students to think critically about and apply the course topics. Discussions followed to further stimulate active learning and feedback by instructors. Researchers graded the essays using rubrics assessing accuracy, thoroughness, application of course concepts, and writing quality. Their results showed that students who completed the microthemes retained more of the course material and developed better writing skills than those who did not (Stewart et al., 2010).

Ticket-in technique

A similar active learning technique that is based on reflective writing is the "ticket-in" technique. I have used this technique successfully for an honors introductory psychology course. For each chapter, I provided students with a list of 3-5 applied questions that pertained to a concept discussed in their textbook. They reflected on one of those topics and came up with their own questions. For example, for the chapter on cognition, one of the ticket-in questions was: "*Expertise*. A critical aspect of human cognition is our amazing ability to store and retrieve large amounts of data. What is your expertise? How did you gain expertise in this area? What sort of training did you undertake to become an expert? Are you an expert in some topic that might be considered

semantic (academic) or procedural, such as a craft or a sport? Does expertise in these areas draw on the same or different cognitive processes?" Their short reflections became their tickets to class. The questions that they raised were then used in the classroom to discuss the various concepts in more details. Compared to another honors section (control group) that did not have the ticket-ins, the average grade for the experimental class was significantly higher. On their final comprehensive exam, the experimental students scored an average of 95% (compared to 88% for the control) and I received a perfect score on my teaching evaluation in this particular section ("How would you rate the teaching in this course").

Four-Question Reflective Learning Technique

Out-of-class writing activities and experiences are also powerful learning tools. Dietz-Uhler and Lanter (2009) used a four-question reflective learning technique to enhance student learning. They asked introductory psychology students to complete a web-based interactive activity about either the prisoner's dilemma or the self-enhancement bias. Students responded to four questions that encouraged analysis (i.e., what was learned), reflection (i.e., why is it important), connection (i.e., how does the material relate to their lives), and generation (i.e., what questions about the material remain). A performance quiz showed that students who had responded to the questions prior to the quiz did better than those who did so after the quiz. This process, according to the authors, allowed students time to reflect on the questions, thereby increasing comprehension. Similarly, Johnson and Kiviniemi (2009) found that quizzes administered prior to the beginning of an introductory social psychology course significantly improved students' exam grades on multiple-choice and essay questions. Presumably, the required quizzes encouraged students to study gradually instead of cramming the night before an exam.

Learning by teaching (LdL)

Another efficient instructional strategy that mixes guidance with active learning is "Learning by teaching" (Lernen durch Lehren or LdL) (Martin & Oebel, 2007). This strategy allows students to teach new content to each other. This methodology was introduced in Germany during the early 1980s, and is now well established in all levels of the German school system. This educational model is different from presentations made by students in class, because

with LdL, students choose their own methods and didactic approach to impart the content to their peers.

Students can also present either an assigned or a freely chosen topic to their classmates. With proper guidance, students can give the presentation by using PowerPoint, Photostory, YouTube, or other creative technologies. Students can also be divided into subgroups where each designated speaker reports back the group's findings. Students completing research methods and lab courses frequently have to carry out a full experiment, that includes designing the protocol, getting IRB approval, collecting and analyzing data, writing an APA-style research paper, and presenting a poster to the community or conference audience. These active learning experiences allow students to apply what they have previously learned and link that information to existing knowledge networks.

Cooperative Learning and More

Other effective active learning pedagogies worthy of instructors' use include cooperative learning, debates, drama, role playing and simulations. In short, the published literature on alternatives to traditional classroom presentations provides a rich menu of different approaches faculty can readily add to their repertoire of instructional skills. Some of these active learning strategies can be used both in face-to-face interactions and during online teaching and learning. Faculty are increasingly encouraged to incorporate instructional strategies to support a learner-centered approach through the use of innovative technologies that promote active engagement through Internet applications. The online environments that students are using include tools that support interaction with peers and teachers, and online discussion. For example, collaborative learning software applications such as Wimba and social media (e.g., blogs, Twitter, Facebook) allow instructors to create collaborative peer groups so that students can present their work online, collaborate on case studies, share their experiences and knowledge, and communicate synchronously or asynchronously with one another. Ellis, Goodyear, Prosser, and O'Hara (2006) reported that students adopting a "deep approach" (i.e., learning through online discussion) received higher course grades whereas there was no significant difference between deep and surface approaches to face-to-face discussion and course grade. "Deep approaches" here refers to the intention to understand the concept being studied and "surface approaches" to the intention to reproduce the description of the concept (Prosser & Trigwell, 1999).

Not All Demonstrations Lead to better learning

As previously mentioned, not all active demonstrations lead to better retention of material. For example Copeland, Scott, and Houska (2010) showed that adding computer-based demonstrations to an upper-level cognitive psychology course did not necessarily enhance learning. Although students preferred participating in demonstrations to just doing readings, they did not always benefit from those demonstrations. Similarly, Gurung (2004) and Brothen and Wambach (2001) found that use of pedagogical aids, such as chapter summaries, practice tests, and on-line quizzes was not related to exam performance.

Conclusions

Not only do active learning exercises help students learn (Cherney, 2008; Lawson, 1995), they also increase their confidence with class materials (Townsend, Moore, Tuck, & Wilton, 1998). Teaching at its finest requires that instructors consider every educational tool at their command – an assortment of techniques and technologies – to provide their students the richest educational experience possible. Active learning enhances student retention of concepts (Cherney, 2008), particularly when students are the authors of their own learning (e.g., Hovelynck, 2003; Landrum & Nelson, 2002). Reaching every student in the classroom may be particularly challenging in large introductory classes, but the challenge is not insurmountable. Despite the benefits of active learning, obstacles such as class size, lack of materials and resources, and limited class time may limit the use of active teaching methods. The effectiveness of lecture material may also be limited by a lack of feedback about student learning, students' passive listening, and poor suitability for teaching higher order thinking. Because instructors teach the same concepts regularly, it is important to better recognize how students learn best, and which active learning exercises students remember and which exercises yield the highest achievement. Identifying which activities are particularly memorable allows instructors to incorporate those again in subsequent semesters to assist students in developing the necessary knowledge network.

Overall, students learn best from being actively engaged in the material. As cognitive psychologists suggest, information that is unique and can be integrated into an existing knowledge base is more

memorable (Symons & Johnson, 1997). Information processed at a "deeper" level (Craik & Lockhart, 1972) involves closer attention, focusing on an item's meaning and relating it to something else. In- and out-of-class exercises provide students with more time to encode information as well as more unique ways to consider that information within a different context, perhaps creating an image of the item in relation to another item. They may also provide additional possibilities to make connections with the material using individuals' existing knowledge base which can act as a powerful retrieval cue.

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