

Chapter 5

Navigating the Barriers to Adoption and Sustained Use of Active Learning

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What Is “Active Learning?”

Active learning has many names. Active learning may be referred to as evidence-based instructional practices (EBIPs), research-based instructional strategies (RBIS), high impact practices (HIPs), or student-centered instruction. Simply put, we consider active learning as any approach to instruction in which all students are asked to engage in the learning process. This stands in contrast to “traditional” or “classical” modes of instruction in which students are passive recipients of knowledge from an expert. Active learning can take many forms and be executed in any discipline. Commonly, students will engage in small or large activities that include thinking, writing, talking, problem-solving, and reflecting.

We consider active learning to have four major components, which we draw from Bransford et al. (2000). Nearly all forms of active learning have aspects of these four components. The first precept is that students’ prior knowledge, ideas, and interests need to be engaged. Second, learning is social. Students will learn from each other and recognize how to add to their original ideas when talking with others. Third, students need a framework of interrelated big ideas, and it is the duty of the instructor to help guide them using this framework. They need help to know what is important, especially when they are first beginning to build expertise. Lastly, students need to reflect on their thinking in order to set goals, recognize when they do not understand, and adapt as necessary.

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Addressing the Barriers to Doing Active Learning

As we discuss how to navigate common barriers to using active learning, we organize the barriers into one of three categories – personal attitudes and beliefs, social norms and values, and other features of the academic teaching setting that may impact practice. Naturally, some of these categories inform one another. This is merely our conceptualization of the complex system in which college science teachers operate. As we navigate attitudes, norms, and your setting, we occasionally use illustrative quotes to demonstrate our point. Some of these statements are real quotes we have encountered ourselves in the battle to advocate for active learning, and others are dramatizations of the issue at play.

Personal Attitudes and Beliefs About Active Learning

If we as postsecondary faculty and graduate students do not have positive views toward active learning (or even teaching in general), we will likely have little interest in growing and changing our practice. Our views are shaped by a lifetime of experiences as a learner, as a teacher; some instances couched in the lack of importance we place on supporting student learning. We therefore end up instead placing the entire burden to achieve success on the students (Brownell and Tanner 2012; Prosser and Trigwell 2006). If we consider the alternative viewpoint in contrast, a student-centered attitude is linked adoption of strategies focused on student conceptual change (and more active learning; Prosser and Trigwell 2006).

However, adopting more positive attitudes toward teaching can run counter to your professional identity as a scientist and researcher. It may even be in direct conflict. The idea that real scientists should be focused on their research rather than engage with teaching activities can begin enforcing negative attitudes toward a teaching identity as early in graduate school (Brownell and Tanner 2012). However, the conflict between these identities may be less reinforced at comprehensive universities than more research-intensive institutions (Senn 2019). As we continue into this subsection of our chapter, we consider several common attitudes toward active learning and work to consider how to work with these feelings and still adopt active learning.

Skepticism About Active Learning: Is It Really Better Than Lecture?

The short answer is yes. Active learning yields better learning outcomes than lecture. This includes lecture without visual aids, lecture with slides, and lecture with the occasional question only a few students answer.

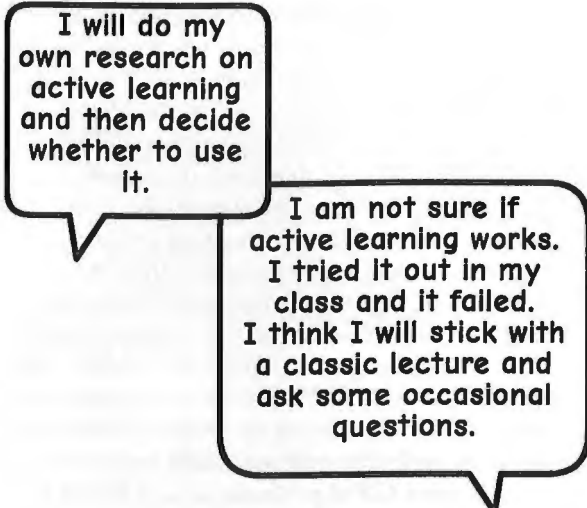
Distrust and skepticism of new ideas are normal in science and in science education. However, the efficacy of active learning is not something we debate in the science education community. In study after study, active learning yields better conceptual understanding and student satisfaction than traditional lecture (Freeman et al. 2014). The National Survey of Student Engagement (NSSE) has examined the engagement experiences of hundreds of thousands of students from over 1600 colleges and universities since 2000. The consistent results of these data show that hands-on, integrative, and collaborative active learning experiences lead to high levels of student achievement and personal development (Kuh et al. 2017).

At this juncture, nearly 100 years after the seminal work of educational psychologist and reformer John Dewey, skepticism about active learning is akin to climate change denial. There is too much evidence to continue along our current trajectory. We cannot continue with 50–75% of us teaching with nearly all lecture-based strategies (Stains et al. 2018). Solving the world's global challenges is on the line, and scientists must be on the front lines to build a more scientifically literate populace and more well-trained STEM professionals and STEM teachers (National Science and Technology Council [NSTC] 2018).

This is not to say that lecture *cannot be effective*. It can be effective for some students and under some circumstances. The point is not to diminish lecture but to recognize that lecture will likely yield worse results than active learning when you look at the group of students as a whole. An “A” student may be an “A” student no matter what experience you give them in the classroom. It's even possible you were that student, and you have past experiences in which lecture helped you learn. But again, when you consider all students, we know that conceptual understanding is better, and fewer students fail when you use active learning (Freeman et al. 2014).

Requiring Your Own Research Prior to Implementation

The desire to do your own research about an active learning strategy is not inherently bad. You need to know what you are doing and how to use that strategy well. However, the desire to test that strategy, after many others have likely already walked that path, is counterproductive. You likely do not need your own data about the effectiveness of a strategy prior to implementation, especially if the strategy clearly meets the four central principles of how people learn and is also a good fit for the goals you have for your course.



I will do my own research on active learning and then decide whether to use it.

I am not sure if active learning works. I tried it out in my class and it failed. I think I will stick with a classic lecture and ask some occasional questions.

If I Learned from Lecture, so Will My Students

We will not reiterate the results that efficacious implementation of active learning can yield, but see this question as something that points to the inequities of training for faculty and graduate students. There is no other profession in which you receive this much education (i.e., a terminal degree), and somehow around half of what you do is something you have had no training in. Furthermore, college students are not who they were in the twentieth century. Lecture may have worked for students from more privileged backgrounds. History has been working against some of our students for quite some time, and we need to be there to meet them wherever they are. This means moving beyond our small sample sizes of our own experiences and listening to the literature on how to best help all learners.

Unreasonable Personal Expectations and the Fear of Failure

Once you are ready to make a change, it may feel like you need to change everything about your teaching – and that you needed to change it for a while. We urge you to go slow when making changes in your teaching and to be patient with yourself as a learner of something new. It is not reasonable to expect that the first time trying something new, the strategy will work out perfectly.

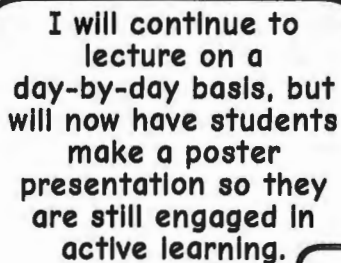
You may find help in unexpected places for learning about how to implement a new strategy. Teaching can be a very isolating profession, and few of us are willing to share materials. Fortunately, teaching is not like academic publishing in this

manner. Beg, borrow, and steal. Cite your source on the materials you use, and then use and modify shamelessly. However, do not assume the materials will meet your needs without appropriate scrutiny first. Set up a Curriculum Exchange with instructors teaching similar topics. Consider reaching out to instructors within your institution and at other institutions that are teaching similar courses. A good method by which to do this may be an online document management system.

As you consider sharing materials, you may feel hesitant for fear of scrutiny. Some of this may be warranted if your relationship is not equal (e.g., if you are not the same academic rank). Should you have these concerns, we encourage you to seek out another individual of similar rank and professional goals between which to share curriculum materials.

Finding Examples of Active Learning While Avoiding “Shiny Object” Syndrome

One of the wonderful things about active learning is that there are many strategies that work. However, not all strategies that are deemed active learning will work for you. It's important to consider your goals if you are looking for a broad, curricular change to your work or a day-to-day strategy. Figure 5.1 documents many strategies we cover in this book, as well as others that are common in the field.



I will continue to lecture on a day-by-day basis, but will now have students make a poster presentation so they are still engaged in active learning.



I will add technology to my course by using a tablet to advance my lecture slides.

When you are selecting an instructional strategy, take your time. Do not jump to selecting a particular strategy simply because you were told to do so by an administrator or because it seems exciting or fun. Sometimes tried and true, day-to-day practices are some of the best ways to begin and stay on your journey of active

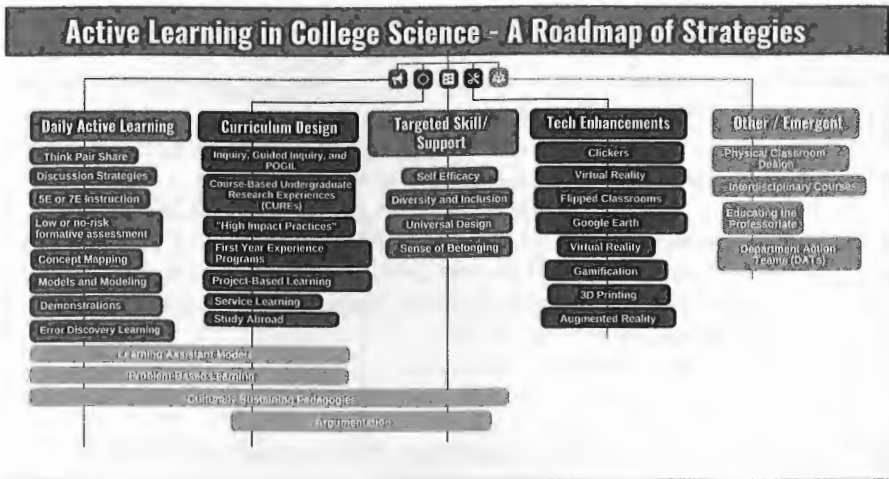


Fig. 5.1 Active learning in college settings – a roadmap of strategies

learning. And most importantly, the strategy must both meet your goals and follow the central principles of how people learn. Lastly, jumping “into the deep end” and selecting a curriculum redesign over a day-to-day change is not always the most helpful for your students. For example, an end-of-semester project may not yield much student success if you are not changing your daily lecturing practices. Similarly, adopting a technology enhancement may not enhance student learning if you still primarily lecture (Stains et al. 2018). Our take-away idea to decision-making here is that if you are new to active learning (or even if you are a veteran), we first encourage you to consider if it is best to adopt an everyday strategy (Fig. 5.1) and then work up to adoption of a broader curriculum redesign and technology enhancement as necessary.

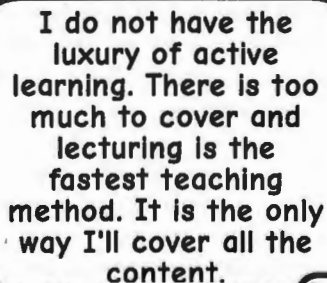
Norms and Values of Higher Education

Social influences can be seen through norms of expected behaviors and the culture regarding teaching practices (Corbo et al. 2016; Kezar et al. 2017). Corbo et al. (2016) found synergistic cultural change across multiple levels of the university is critical for adoptions of educational innovations, as solely institutional perspectives do not give enough credit to the individual’s unique capacity and ultimate level of implementation of such policy-driven initiatives. Kezar et al. (2017) similarly highlights that the strength of many professional learning communities comes from the culture that exists of having people with similar interests united under a shared mission of supporting educational innovation and the relationships that come about through such a culture.

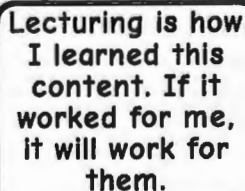
It is here that we note how paradoxical it is, that STEM faculty, people trained to listen to the evidence, would not listen to evidence when it comes to their teaching practices. This issue stems in part from pedagogical reforms designed without consideration of the normative and systems conditions necessary for reform. Instead of reforms designed to encourage single instructors to change their practice, there is also need for a systems-based approach, in which the complex systems in which faculty teach are considered, measured, and ultimately changed (e.g., Austin 2011; Kezar 2011; Trowler 2008; Beach et al. 2012; Henderson et al. 2011).

Content Norms

Autonomy in content and pedagogy (Shadle et al. 2017) is key to your academic freedom. Although it is easy to recognize this autonomy, there are likely some historical and disciplinary norms in play that affect your content decisions. Sometimes, when we have always taught something in a given scientific discipline, we end up with far more content than we can possibly teach. Sometimes, we think we need to teach something to support another course, but that course actually does not use that content. Regardless, we cannot teach everything we know about a discipline. It is in this place of dissonance that we must choose the few, big ideas that are most important for the sub-discipline.



I do not have the luxury of active learning. There is too much to cover and lecturing is the fastest teaching method. It is the only way I'll cover all the content.



Lecturing is how I learned this content. If it worked for me, it will work for them.

Role of University and Departmental Leadership

Leaders have important influence in creating a sense of belonging and job satisfaction of faculty (Campbell and O'Meara 2014), an environment for resource exchange (Van Waes et al. 2015), flexibility in testing new ideas, and valuing teaching quality in tenure and promotion decisions (Shadle et al. 2017). We also know that faculty who experience transformational leadership and work in collaboratively managed environments are more likely to adopt student-centered teaching practices (Ramsden et al. 2007; Trigwell et al. 2005).

Systematic Barriers and Levers

Organizational barriers to active learning are some of the most cited reasons for not carrying out active learning teaching styles. These features include institutional policies, resources such as time and money, leadership, professional development of faculty, and collegiality around teaching (Walter et al. 2016).

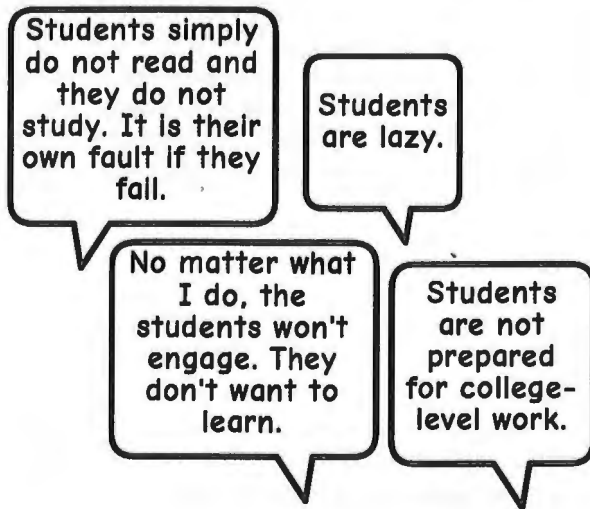
I Have No Time to Make Massive Revisions to My Teaching

We, as postsecondary instructors, have limited time. We are overcommitted. Making the time to find develop meaningful teaching is the most commonly cited challenge to using active learning. Learning a new teaching technique requires time and is labor-intensive; it can take much more time than traditional lecture (Brownell and Tanner 2012).

Our best advice for a lack of time is to start small. There are changes you can make in lecture that will not take away from your content and will not require a lot of preparation time. We have three quick tips for you to help start small. One – follow the five-hand rule. If you ask a question during class, wait for at least five hands before choosing a student to answer. Even better, if you are willing to take 2 min more, ask the students to talk to one another before you ask students to share out to you. Two – follow the 10-min rule. The adult attention span is not long, but some research suggests that the adult attention span of giving deep attrition is only 10 min. If you find yourself talking for much longer than that, find something to vary the pace, format, or interactivity in the lecture. Third – one of our favorite questions to ask in class is “what are your questions.” This helps students to reflect on what their questions are and work to generate them. This is another quick fix that generally yields better student-instructor interaction than alternatively asking “are there any questions?”

Barrier: Students Do Not Like or Want to Do Active Learning

Chapters 56, 57, and 58 discuss the issues surrounding student resistance and possible student evaluations of teaching “fallout” that may come after using active learning. We will only note here that our short recommendation is students will appreciate your honesty and will be grateful that you are not blaming them for being underprepared, lazy, or unwilling to engage. Sometimes the students have their own norms to break, and you may need to remind them why it’s important for you to make a change. Do not expect overnight change. The first few weeks may be a little rough as you work with your students to change established patterns, but if you continue to be patient and professional (and friendly), you will see changes. If you have a couple of uncooperative students who challenge the changes, speak to them after class and explain that you need their cooperation so they can be successful. If your goal is cooperation rather than compliance, you’ll be able to change behaviors without resentment.

***Department Action Teams (DATs) and Professional Learning Communities (PLCs)***

Professional learning communities (PLCs) are individuals with similar interests under a shared mission to promote some form of change can be found as large networks tied to associations or can be smaller scale communities of practice on individual campuses (Lenning et al. 2013). Learning communities are popular conduits of change and have been used successfully to support changes in teaching practices (Lenning et al. 2013). Core components of professional learning communities that

focus on faculty (faculty learning communities – or FLCs – in the literature) with objectives consisting of course redesign and evolving teaching practices heavily utilize peer mentoring and learning community projects (Cox and Richlin 2004; Lenning et al. 2013). A key strength of these communities is the fostering of constructive feedback and the development of peer mentoring relationship that can act as support from carrying through intention to actualized behavior (Corbo et al. 2016; Cox and Richlin 2004; Kezar et al. 2017).

One of the newer implementations to encourage active learning at a group level has been through the University of Colorado-Boulder Departmental Action Team (DAT) project. A DAT is an externally facilitated working group of 4–8 faculty, staff, and/or students that is created by a department to achieve two goals: (a) to create sustainable change around a broad-scale issue related to undergraduate education in the department by shifting departmental structures and culture and (b) to help DAT participants become change agents through developing facilitation and leadership skills.

Thus, DATs support their participants in making meaningful change, and also in developing their own capacity to continue leading change in the future. To meet these goals, external facilitators from a centralized project team who have expertise in STEM education, facilitation, organizational culture, and education research support the DAT. Additionally, a core feature of DATs is that participants choose their DAT's focus; in the past, these have included both curricular concerns (e.g., restructuring a course sequence) and cultural concerns (e.g., improving undergraduate sense of belonging).

Conclusions

Our chapter was written to give insight into common levers and barriers to instructional innovation. Although our goal was to present a subset of the common barriers, we expect to continue unpacking relationships between attitudes, norms, context, and teaching practice for years to come. Our research team at Fresno State will be continuing their work to examine how organizational climate intersects with teaching practice. We are also part of a greater team working through the Accelerating Systemic Change Network (ASCN) Working Group 1. As the research community explores faculty teaching practices and how to empower us all to do more, we note that there is no consistent model for explaining adoption of active learning pedagogies. As we move forward, we wonder if it is possible to look at our own teaching practices and organizational climate through both an individual cognitive model and a systemic change model. This work will require STEM change researchers to work closer with STEM faculty than ever before, and we encourage STEM faculty to continue to be willing to open their classrooms to the science education community and to continue to pursue excellence in their teaching.

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