



Context Determines Strategies for ‘Activating’ the Inclusive Classroom

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A number of reports have called for the transformation of college science pedagogy. For instructors interested in transforming their own classrooms, the number of approaches, tools, and literature on pedagogical transformation can be overwhelming. The literature is rich with examples of the positive significant effects of active learning, but is lacking on frameworks that can help guide implementation. In this manuscript, I use Fink’s conceptual framework for “creating significant learning experiences” and a conceptual framework for inclusive teaching and learning to focus on how situation-specific drivers inform the choice of active learning strategies. I argue essentially that while, on average, active learning may promote greater academic outcomes, the context of the implementation matters. Using personal examples and evidence from the literature, I provide a Perspective here on why context considerations should be the main drivers of effective pedagogies.

BACKGROUND

Active learning is a broad concept. Inconsistencies in implementation and alignment with course learning outcomes and classroom structure can result in mixed results from its use (1, 2). Effective implementation can be negatively affected by an overly explicit focus on the tools themselves and not the situational factors that dictate their use. This can be a challenge for college instructors, as published examples of effective active approaches may not provide sufficient information about its transferability.

Applied without context, active learning approaches can be ineffective and also perpetuate or generate inequity. Consider a common feature of a flipped classroom, where online lectures are a pre-class activity. In situations where economic challenges prevent students from having the resources (e.g., time and access) to spend on free home online lectures, this strategy would favor only those with the means to use it. Situational context therefore requires a closer look. Many consider the discussion on the effectiveness of active learning in science, technology, engineering, and mathematics (STEM) classrooms closed (3), but some reviews and commentaries point to small effect sizes and biased sampling as evidence that we are yet to fully understand the many ways in which active learning can impact classrooms

(1, 4, 5). The sheer diversity of classrooms, student identities, subject matter, institution types, and instructors means that there are different ways in which active strategies can be applied. Therefore, while on average, there may be a strong relationship between active learning and improved academic outcomes, the context of the application is what will most matter for instructors considering employing these techniques in their classrooms.

Some studies have attempted to parse out this context. Almost two decades ago, Bonwell and Sutherland (6) used a conceptual framework based on various spectra of needs and individual comfort to suggest specific strategies that both STEM and non-STEM instructors can consider. Other studies have focused on situations where active learning resulted in academic improvement and deconstructed why, in those particular contexts, the approach was a success. Eddy and Hogan (7), for example, showed that for their population, moderate increases in active learning drove the most gains for underrepresented students. While useful, these studies are effectively posthoc analyses of an existing implementation whose situation may or may not match an interested instructor’s context.

Context-specific approaches to active learning implementation demand conceptual frameworks that force the instructor to consider components that can generalize to their particular situation. Inclusive teaching models provide opportunities for such an approach. In general, they ask instructors to consider various elements of their location-specific situation *before* considering the particular tools they use in their classrooms. Marchesani and Adams’s (8) model for inclusive teaching, for example, describes a quadrant framework, where understanding self and student is the lens

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through which pedagogies are developed. I use an example of one (8) to provide the backdrop that guides the specific considerations discussed below. I also use Fink’s taxonomical model (9) for creating significant learning experiences to model specific choices around active learning strategies. With this approach, active learning can be used as an effective tool for creating an inclusive classroom. For each component, instructors should be asking themselves key questions about their situation that can then determine how learning outcomes are constructed and addressed (Table 1). Using examples from the literature and my own practice, I will discuss how this approach can help instructors make strategy choices for their own particular situations.

DISCUSSION

Marchesani and Adams (8) described a quadrant model for instructors to consider for addressing diversity in the classroom. “Multicultural teaching and learning” in this framework requires instructors to 1) understand their personal psychologies, 2) know their students and their social contexts, 3) pay attention to the content material of the course, and 4) be mindful of the teaching techniques employed during the course’s implementation. Fink’s taxonomical model focuses on the specifics of practice (9). He describes his approach as an evolution of the almost canonical Bloom’s taxonomy

used for curriculum design for many decades. In describing the reasoning behind his new taxonomy, Fink indicated that his inspiration was partly instructors’ stated concerns that Bloom’s taxonomy did not address some of the affect skills students needed in today’s economy. This is an important consideration. Courses need not only focus on content-specific learning outcomes, but can be spaces where lifelong social behaviors of teamwork skills, caring, and empathy can be developed. To this end, Fink specifically includes particular components in his taxonomy that challenge instructors to incorporate affect explicitly into their courses. The six major components of Fink’s model are *Foundational Knowledge, Application, Integration, Human Dimension, Caring, and Learning to Learn*. My deconstruction of Fink’s model below will also describe in various ways how specific strategy adoptions are framed by the inclusive model described by Marchesani and Adams (8).

Foundational knowledge

This component of Fink’s model might be more closely associated with the ‘lower level’ action verbs from Bloom’s taxonomy. What then might be the best strategy to ensure students remember and retain fundamental knowledge in a discipline? One method is flipping the classroom such that reading, lecturing, and even quizzing on definitions can free class time to work on understanding how those definitions

TABLE 1.
Fink’s taxonomical model, Marchesani and Adams’s inclusive practice model, and key questions instructors can ask themselves to develop situation-specific, inclusive active learning pedagogies.

Fink’s Component	Key Questions to Ask	Marchesani and Adams Model Component
Foundational knowledge	What are the most efficient ways for students to retain foundational knowledge? How does resource availability affect the use of efficient technology-based tools?	Knowing the students How content is taught
Application	What are the varying levels of preparedness of matriculating students? How might promoting higher-order outcomes affect the extent of topic coverage?	Knowing the students How content is taught
Integration	In what ways is students’ sense of identity represented in the course structure? In what unique ways can your course incorporate diverse perspectives in the curriculum? What is the level of your own understanding of the social context of scientific research and thought?	Knowing self Knowing students Content material
Human dimension	What opportunities can you provide for students to learn from each other, both socially and academically, in the classroom? What competencies can your course incorporate to illustrate the importance of collaboration and teamwork?	Knowing students Content material How content is taught
Caring	What opportunities do you provide yourself to engage the voices of your students? What opportunities are provided for students for self reflection and dialoguing with each other? How have you reflected on your own biases and preconceptions concerning your students?	Knowing self Knowing students
Learning to learn	What resources are available to teach student metacognition?	Knowing your students How content is taught

are applied in context. Multiple studies have shown that people retain information better when that information is placed in the context of an overarching story or principle that is connected to it (10). Reinforcement of learning can occur by frequent assessments of knowledge achieved by quizzes both inside and outside of the classroom, forcing the student to constantly retrieve information from memory (11). Techniques used to increase retention may depend on the situation, however. Improvements in technology have allowed for immediate feedback, online lectures, and other web-based features to be much more robust. Here, however, we should think carefully about our students and their life situation before deciding on our active strategy. While the cost of web-accessing devices has declined over time and access to the internet has become easier, there may still be situations where all students may not have the resources to do so. In other scenarios, external commitments (such as employment) may reduce the time available for students to engage in large volumes of out-of-class work (12). In this situation, it would be difficult to outsource too much of the self-learning to outside the classroom. It would be worthy in this context to consider low-tech options (such as IFATs (Immediate Feedback Assessment Technique [13]) that might achieve the same purposes.

Application

In Fink's model, application refers to the higher-order skills of using foundational knowledge in novel ways. Verbs such as *analyze*, *dissect*, and *prove* speak to going beyond simply knowing something to understanding how the knowledge can be used. Students assessed only on foundational knowledge will be ill-prepared if application-type questions appear on major assessments. Therefore, like any other learning outcome, there should be intentional formative preparation for the development of this skill. Depending on the course, the nature of the student population, and the subject material, there may exist a preparation gap. Knowing the students' current social reality is therefore important. Students may enter the course with different ideas on best practices regarding being able to apply foundational knowledge. If the course is not designed to provide students opportunities to learn these preparation skills, then assessments expecting application-level learning outcomes will essentially serve as a weed-out for the underprepared. A major challenge with addressing this learning outcome, however, is the availability of time. Instructors would need to design learning activities that demonstrate to students how foundational knowledge can be used to solve unique problems, and limited time in the classroom may cause the instructor to run into a 'coverage' issue (14). Therefore, instructors should consider moving away from conventional voluminous content approaches toward a subset of pre-determined important concepts that can be used to achieve learning outcomes associated with application. "Flipping" recall content out of the classroom (with the caveats described above) can help by freeing in-class time for teaching students how to apply

their knowledge (15). Low-cost or free resources (thus not incurring significant additional costs to the student) are available as ready-made assignments that help students apply knowledge. An example of sources I have used is the National Center for Case Study Teaching in Science (16). Here, instructors can choose assignments that are appropriate for their course-specific learning outcomes, content area, and time available for teaching students how to apply concepts.

Integration

Learning outcomes associated with the integration domain provide excellent opportunities for instructors to incorporate social context into their classroom. Studies have shown that the explicit incorporation of diverse examples into course curriculum can go a long way toward improving students' sense of belonging in the classroom (17), itself a potent predictor of retention for historically marginalized students (18). Incorporating diverse perspectives and examples in the classroom should not simply be a reflection of classroom students' diverse identities, however, as it is important for all students, regardless of background, to understand and appreciate the diversity in both contemporary and historical scientific practice. Central to integration outcomes is the need for pedagogy in science to be reflective of the authentic diversity of the human experience. Instructors should ask themselves whether students leave their courses understanding that context, or solely with a body of content. Incorporation of social context should be deliberate. Conventional pedagogies that are content-focused do a disservice to integration goals in a couple of ways. First, they reinforce dominant culture narratives or perceptions that scientific discovery is the domain of a narrow group of identities. While historical social structures may have made this partially true, a much more diverse suite of investigators practice science in the present day. Second, it artificially dissociates the scientific process from the evolution of social thought and structure. For example, at several points in relatively recent human history, the scientific process was used to justify what in hindsight were atrocious crimes against humanity (e.g., Tuskegee Study [19]). As technologies evolve, humankind will continue to face ethical challenges emanating from the power and possibility that new scientific discoveries provide (e.g., CRISPR [20]). Instructors can consider historical examples of these challenges, and how they were addressed, as content concepts are introduced. For example, a unit on cancer can be introduced by briefly discussing the Henrietta Lacks story as context for ethics involving patient consent or historical distrust of the medical profession by disadvantaged communities (21). Case studies (described above) are useful for bringing in this context.

Human dimension

The human dimension of Fink's model implores instructors to develop learning outcomes related to the development

of the student as an ethical human being. Marchesani and Adams's (8) model states that the nature of pedagogy is instrumental to creating inclusive classrooms. Active learning provides robust opportunities for learning outcomes relating to human dimensions that can be powerful regardless of instructional context. Though active learning is discussed more broadly in the STEM education literature in terms of its specific tools, its underlying philosophy of constant dialogic engagement with the student is rooted in Freire's philosophies of critical consciousness pedagogy (22). Instructors need to make this dialoguing explicit as expressed in the learning outcomes for their courses. Learning outcomes relating to character building and teamwork can be addressed using small group formation and problem-solving activities. Students will not learn the values relating to the human dimension as an automatic consequence of simply being in a group. Like other content-specific learning outcomes, human dimension outcomes should have associated learning activities and a means of assessment. In my practice, I have used an economics problem-solving activity (POGIL [23]) to introduce to the students the concept of role responsibility within groups and the value of collective work. Group work also provides students a potential opportunity to engage with students with diverse backgrounds and personalities. This can mean planning projects with group members who work in addition to going to school, who possess implicit assumptions related to different identities, or who have different personality types (introvert versus extravert, for example). Instructors should be prepared to directly facilitate dialogue with individuals and/or groups that helps them successfully work with diverse individuals. The social context of instructors' classrooms should dictate which active learning tools they choose to achieve human dimension learning outcomes. Small groups can be effective in most contexts, but instructors should be mindful of the diversity in the classroom. The teachable moments within groups in a very socioeconomically diverse classroom will be different from those in a less diverse classroom. It behooves instructors, therefore, to have a full understanding of their particular classroom diversity to appropriately prepare for ways in which human dimension learning outcomes can be developed.

Caring

Students will more likely exhibit caring in the context of the course if the behavior is modeled in the way they are treated (24). Here again, as with other aspects of active learning, Freire's dialoguing provides a philosophical context (25). Dialoguing allows the instructor to understand the social reality and identity of the student and then situate their learning experience within that context. Marchesani and Adams (8) refer to this when their model talks about creating an inclusive classroom climate and knowing the students. Active learning techniques that seek feedback from students about their learning or ask them to reflect on their academics are effective ways of dialoguing. Large-enrollment

classrooms can make physical individual dialoguing difficult, but the use of technology can mitigate some of that. Discussion boards supported by Learning Management Systems (LMSs) provide virtual platforms that can also create a sense of community. In these platforms, instructors can monitor course performance and intervene early with students who might be showing signs of struggle within the course. Where possible, dialoguing can be most powerful in individual interactions with students. In these spaces, instructors can better demonstrate targeted concern for situational factors that might have put students at risk academically.

Learning how to learn

The metacognitive student is a student whose learning transcends the classroom. A student who has learned how to learn is free to pursue new knowledge without necessarily needing the physical presence of an instructor (26). Depending on class size and the nature of the students in the course, there are a number of strategies an instructor can consider to help students become better metacognitive learners. Institutions that mandate Freshman Year Experience (FYE [27]) courses for their freshmen can consider incorporating activities that model effective study strategies for students. McGuire (28), for example, provides a number of useful tips to help students improve their overall metacognition and can be used as a required course text in an FYE class. In my introductory biology course, I assign the five-part "How to get the most out of studying" video series by Chew (29) as a required assignment. These are free YouTube videos that students can watch at their own convenience. Students watch the videos and write a one-page reflection for credit on how they will adapt their study strategies based on the video's suggestions. Some institutions also create Living Learning Communities and/or programming associated with residential life. Student programming associated with these communities can be leveraged to incorporate study skills and metacognition strategies. The benefit of this is that activities do not subtract from the academic course time, and they create explicit connections between co-curricular programming and the learning outcomes of the classroom.

CONCLUSION

There are many different effective tools that can be incorporated into an active learning classroom. Central to their use is the philosophy of engaging the student in an authentic, continuous way. Inclusive pedagogy necessarily involves active teaching practices, but active teaching practices are not necessarily inclusive. Understanding situational context is the bridge that connects the two. Inclusive teaching models help provide the framework that guides how local contexts drive the choices made in the classroom. Central to inclusiveness is an understanding of self (the instructor) and student. Understanding of self requires a

long-term commitment on the part of instructors to be mindful of how their social history influences classroom culture. Understanding the student through dialoguing can help instructors understand what their students need in order to be successful. Contextual implementation demands that instructors engage in the work needed to understand the uniqueness of their classroom. This is neither simple nor short-term. Context consideration for active learning technique adoption means unpacking the potentially different experiences that historically marginalized students, adult learners, socioeconomically disadvantaged students, and others have in academic settings and implementing a pedagogy that mitigates the negative effects of those experiences. Instructors considering adopting active learning techniques should necessarily look to the literature for tools that have been effective but should ultimately look to their students to understand which tool to use. This dialoguing engineers the paradigm shift from active learning as a mechanistic strategy to a culture of pedagogical inclusiveness. Overall, STEM instruction will benefit as greater numbers of instructors consider active learning techniques for their classroom. However, instructors training on their use should focus not only on the nature of the tools themselves, but also on the local and broader social contexts that undoubtedly affect the nature of their implementation.

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