Article Summary – Active Learning

Tharayil, S., Borrego, M., Prince, M., Nguyen, K. A., Shekhar, P., Finelli, C. J., & Waters, C. 2018. Strategies to mitigate student resistance to active learning. *International Journal of STEM Education*, *5*(1), 7, pp. 1-16.

Research Question(s)

Although much research has shown that active learning promotes a suite of desirable education outcomes for college students, instructors may be reluctant to fully adopt such strategies in their classrooms for a number of reasons such as increased preparation time, decreased content coverage, and student resistance.

The results presented in this paper (Tharayil et al. 2018) build upon findings from a larger study of 1051 engineering students enrolled in 17 different courses where instructors employ active learning strategies (Nguyen et al. 2017). Explanation and facilitation strategies were positively correlated with students' values and positivity, participation, and course evaluation in their broader analysis. This paper (Tharayil et al. 2018) analyzes the interview responses of the instructors teaching these courses to specifically answer the questions:

1) How are engineering instructors using the explanation and facilitation strategies that previous analyses have identified to be effective in reducing student resistance to active learning?
2) What other additional strategies are engineering instructors using to reduce student resistance to active learning and how are they using them?

Methodology

- Data from students, instructors, and the researchers' own observations were triangulated to establish and verify the type and frequency of active learning activities, instructor strategies for reducing resistance, and student resistance and participation.
- Email solicitations were posted on listservs to recruit engineering instructors for the study (N=17) from a broad mix of genders, ranks, course disciplines, class sizes, and institution types were represented (however, all but one instructor were of European descent).
- All courses were lecture-based (as opposed to lab-based) and were either 1st or 2nd year core courses for undergraduate engineering majors. Some of the larger courses had TAs.
- Individualized, semi-structured interviews were conducted in fall 2015 and spring 2016. Questions allowed the instructors to:
    - Compare the frequency of active learning instruction reported by students and instructors
    - Reflect on the purpose of using active learning in-class activities
    - Compare the instructor's beginning-of-term prediction of how students would respond to active learning to their actual end-of-term response
    - Compare student and instructor reports of frequency of strategies to reduce resistance
    - Consider possible explanations for student resistance
    - Reflect on characteristics of students' ideal type of instruction
    - Consider ways the instructor might approach the class differently to reduce resistance in light of the feedback
- Three authors conducted a systematic coding of themes in the data.
- Three common approaches to explanation strategies and eight common approaches to facilitation strategies emerged.

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Results

Explanation Strategies: these strategies involve the instructor explaining the components of a course or activities, the rationales behind course structure and activities, and clarifying how the activity helps meet course learning goals.

1) The following are paraphrased statements made by the instructors about ***explaining the purpose***:

- Every class period I make connections between what I'm about to do and whether we're working on procedural knowledge, conceptual knowledge, or meta-cognitive knowledge
- I ask my students how they are making meaning of their experiences [through discussion]
- To explain why I give them open-ended questions, I explained the context of what goes on in industry

2) The following are paraphrased statements about ***explaining course expectations***:

- On the first day of class we discuss what flipping the class is and why we are doing things this way
- I attach an extra page to the syllabus that explains the active approach and the responsibility of the students to engage and participate with me; at the end of the page I ask if they are in

3) The following are paraphrased statements about ***explaining activity expectations:***

- I plan to provide more structure in the future to make instructions clearer to students
- When using case studies, I reveal which have one correct answer and which may have multiple answers

Facilitation Strategies: these strategies are employed before and during activities to keep all students engaged

1) The following are paraphrased statements made by the instructors about ***walking around the room***:

- If you are at the front of the room not engaging with students, you've lost the opportunity to figure out what they are doing/understanding
- I don't just walk around but stop to talk with students about their work; it lowers the stakes a little and makes it OK for the students not to know, or to be wrong, or to try something
- You want to be there when the students run into a roadblock because a lot of times they won't raise their hand if they run into a roadblock
- When I see a mistake, I can immediately get students back on the right track

2) The following are paraphrased statements about ***approaching non-participants***:

- I don't like to confront students because I remember how badly that felt when I was a student
- If I see a student who doesn't have anything written down, I might ask "so, are you thinking or are you stuck?"
- Although I feel uncomfortable calling on students, I think it is important so that the conversation doesn't degrade to two or three people that like to talk to me
- I lower student anxiety by allowing students to discuss with their neighbors before asking for volunteers
- I offer whiteboard markers to students who seem disengaged and invite them to work on the next step in group problem solving
- I find time to privately talk to students to understand why they aren't participating and the implications

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3) The following are paraphrased statements about ***assuming an encouraging demeanor:***

- I try to give a sense of safety, like if I call on you and you're not ready, that's OK
- I use the first day of class to build rapport; I communicate how much I respect them and that I really care how they do in the course

4) The following are paraphrased statements about ***inviting questions***:

- Inviting student questions and cultivating an interactive, responsive, and generative environment is crucial; students need to feel like their voices are heard and valued
- Much of my lecture actually occurs while I'm answering students' questions
- I give students scenarios and ask them to give the types of questions that a professional (e.g. a contractor) may ask
- I scaffold students into asking questions by prompting them to think of two questions on material they don't understand

5) The following are paraphrased statements about ***soliciting student feedback***:

- At the end of a project I ask students what the muddiest point was
- I pay attention to facial expressions and turn-in rates as feedback
- Usually the first couple of weeks are pretty rough and we have multiple discussions about what can be improved

6) The following are paraphrased statements about ***developing a routine***:

- It takes time for students to get used to how they should respond and behave [to active learning]; starting each class with a routine reduces nervousness that students can have about unfamiliar activities
- I make sure I call on everyone in that first couple of weeks to set the tone of engagement in class
- Students work on problems in groups pretty much every week

7) The following are paraphrased statements about ***designing activities for participation***:

- I often do not ask questions for which the answers will be rote; it's an exploration usually
- I ask students to consider different perspectives by defining concepts for someone who is unfamiliar with the material
- I put students in groups frequently to discuss problems and critique each other

8) The following are paraphrased statements about **using scaffolding** (when an instructor breaks down a complex task and provides supports to help students achieve the task, gradually removing these supports as they are better able to handle more complex steps on their own):

- I use hints and maybe more fill-ins for key gaps before they start
- I set up the problem by providing students with the crucial first step and often model how to think about the problem
- I provide visual supports for solving a problem on the whiteboard

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Implications

This paper reports on a diverse array of techniques that are effective in changing students' emotions and attitudes about active learning. While some of the strategies can be used in an impromptu way, many require pre-emptive planning and benefit students most when used continuously throughout the semester. However, the authors caution that students can become bored with a highly repetitive activity and recommend that instructors employ a variety of activities to promote optimal participation. Active learning efforts among instructors should be more successful with the simultaneous application of these explanation and facilitation strategies discussed here. The results of this study are not discipline specific and can be applied to a broad range of college courses.

Additional Citation

Nguyen, K., Husman, J., Borrego, M., Shekhar, P., Prince, M., Demonbrun, M., & Waters, C. 2017. Students' expectations, types of instruction, and instructor strategies predicting student response to active learning. *International Journal of Engineering Education*, *33*(1), 2-18.

