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Reducing Student Resistance to Active Learning: Applying Research Results to Faculty Development

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Abstract

Despite many studies confirming that active learning in STEM classrooms improves student outcomes, instructors' adoption of active learning has been surprisingly slow. This work-in-progress paper describes our broader research study in which we compare the efficacy of a traditional active learning workshop (AL) and an extended version of this workshop that also specifically highlights instructor strategies to reduce resistance (AL+) on instructors' beliefs about and actual adoption of active learning in undergraduate STEM classrooms. Through a randomized control trial (RCT), we aim to understand the ways in which these workshops influence instructors' motivation to adopt and the actual use of active learning. This RCT involves instructors and students at a large number of institutions including two-year college, four-year college, and large research institutions in three regions of the country and strategies to reduce student resistance to active learning. We have developed and piloted three instruments, which allow for triangulation of classroom data: an instructor survey, a student survey, and a classroom observation protocol. This work-in-progress paper will cover the current progress of our research study and present our research instruments.

Introduction

Past research has shown that instructors' use of active learning in the classroom can improve student learning, engagement, and interest in STEM; however, despite these findings, the translation of educational research to actual classrooms has been slow [1, 2, 3, 4]. Moreover, research suggests that the recurrent calls to increase the number, quality, and diversity of STEM graduates could, in fact, be substantially met if these evidence-based teaching practices were widely adopted in undergraduate STEM departments [5].

The primary challenge now is to increase the use of evidence-based teaching practices, specifically active learning, among STEM instructors. Previous research [6, 7, 8] has identified instructor-reported barriers to the adoption of these practices, including concerns about: 1) the efficacy of the teaching practices; 2) the preparation time required to implement the teaching practices; 3) use of classroom time and corresponding concerns about covering all course content; and 4) student resistance. Previous research has thoroughly examined the first three of these concerns [5, 9, 10, 11, 12, 13, 14] while, student resistance has not been systematically explored.

Here, we define student resistance as any negative behavioral response to active learning instruction that would discourage instructors from using that activity or active learning in the future. Examples include refusing to participate, vocally objecting in the class to doing the activity, giving low course evaluations, and/or distracting other students from participating. There are, however, effective strategies instructors can use to reduce student resistance [15, 16, 17]. These strategies fall into three categories: planning, explanation, and facilitation [18]. Planning strategies can be used during the development of an activity, in how it is organized, and how to evaluate its effectiveness. Explanation strategies emphasize how an instructor can frame the purpose and the goal of the activity. Facilitation strategies focus on how to better engage students in the activity [18].

Study Design

Previous research has identified strategies for reducing student resistance, and in response to this research, we have created a multi-institutional team to train instructors on these strategies [18]. Specifically, we seek to: (1) design a faculty development workshop that can change instructor behavior by promoting adoption of active learning and use of strategies to reduce student resistance to active learning; (2) ascertain factors that impact the efficacy of the workshop; (3) examine how the use of specific strategies impacts student affective responses and student resistance to active learning; and (4) examine how student resistance to active learning influences instructors' future plans to use active learning in their courses.

Research Questions

This study seeks to answer the following research questions:

1. To what degree does a faculty development workshop (AL+) promote the use of planning, explanation, and facilitation strategies to reduce resistance?
2. To what extent does instructor motivation (i.e., self-efficacy and value) for adopting active learning moderate the effect of the workshop on instructor behavior?
3. To what extent does student resistance vary with the instructor's experience using active learning?

To answer our research questions, we developed a RCT study with the goal of determining if an intervention that teaches instructors how to mitigate this barrier would lead to greater adoption of active learning in STEM classrooms. The study can be broken down into four phases, with the first phase of participant recruitment and instrument development undertaken in Fall 2019. At three separate sites in the Midwest, Southwest, and West, we have recruited STEM instructors from 2-year and 4-year institutions to participate in our study. At each site, we aim to recruit a minimum of 75 participants who will be randomly assigned to one of three groups:

1) Active Learning only (AL): participants will attend a workshop that gives guidance only on active learning
2) Active Learning Plus (AL+): participants will attend a workshop that expands upon Workshop A to also include strategies for reducing student resistance to active learning
3) Control: participants do not attend a workshop during this study but will be offered an opportunity to attend a workshop in 2021, after the study is complete.

Once assigned to their groups, researchers will collect baseline data about participants in each group. This pre-intervention data collection includes faculty surveys, student surveys, and observations for a random subsample of classrooms in Winter/Spring 2020. Participants will receive an intervention workshop, or in the case of the control group, no intervention, in Summer 2020, followed by post-intervention data collection in Fall 2020. A timeline for this study can be found in Table 1.

Table 1: Study Timeline

Term	Phase	Activities
Fall 2019	Preparation	Participant Recruitment and Instrument Development
Winter/Spring 2020	Pre-Intervention	Instructor Surveys, Student Surveys, and Classroom Observations
Summer 2020	Intervention	No Workshop - Control Workshop A- Active Learning Only (AL) Workshop B- Active Learning Plus (AL+)
Fall 2020	Post-Intervention	Instructor Surveys, Student Surveys, and Classroom Observations

Phase 1- Preparation

1.1 Participant Recruitment

Researchers in the Midwest, Southwest, and West are recruiting participants from colleges and universities within 150 miles of their respective campuses. This distance allows for in-person classroom observations by the researchers at each site. Participants were recruited via email, either to instructors directly or through department chairs when publicly listed on the institutions' website. Each regional site followed similar recruitment procedures and sent identical recruitment materials to reduce the variability between the sites.

Throughout this phase, we have recruited more than 300 instructors from over 105 schools across all three regions. Recruited instructors are teaching lecture-based STEM courses that are primarily taken by first- and/or second- year students. Particular attention was paid to ensure that instructors who are teaching at various institution types would be included in this study, including, community colleges, large research universities, minority serving institutions, and predominately white institutions.

In addition to recruiting instructors, we have collaborated with the IRB offices of these intuitions in order to ensure proper permissions are in place before data collection begins. We are currently in the process of finalizing IRB approval at sites and will report relevant statistics of how many participants we had to drop from this study as a result of institutional issues, as well as what types of institutions these instructors primarily teach at, in the final draft of this paper.

1.2 Instruments

The active learning approaches that instructors use, as well as student responses to those will be assessed through four different research methods: 1) instructor surveys given at the end of a class where active learning was used, 2) student surveys forwarded in an email after a class where active learning was used, 3) classroom observations, using a formal protocol, of the class session, and 4) pre- and post- workshop instructor surveys. All instructors, and their respective students, will be surveyed both pre- and post- intervention. Additionally, researchers will also travel to do in-person classroom observations for approximately 60 of these classrooms. These classrooms will be chosen at random with 20 observed in each of the three groups (AL, AL+, and control). The instruments are being built based on other validated instruments, including those that we have developed in our previous work [18]; however, since we are taking pieces from different surveys, we are doing additional validation with the surveys we build.

Instructor Survey
To assess instructors' perceptions of their use of active learning instruction, we designed a survey to measure instructors' use of active learning and their self-efficacy towards using it. Moreover, the survey was designed to identify perceived barriers instructors face when implementing active learning into their curriculum. The instructor survey measures 20 constructs with 99 total items and will focus on barriers, active learning use, planning strategies, explanation strategies, facilitation strategies, affective response, and behavioral response. Example items can be found in our previous work. [18]

Student Survey
In order to investigate students' perspectives of active learning instruction, we designed a survey to measure students' views of their instructor and how they perceived their use of active learning. Additionally, we will collect data that measures the students' engagement and perceived value of these activities. The student survey will measure ten constructs with 49 total items and will focus on active learning use, explanation strategies, facilitation strategies, affective response, behavioral response, belongingness, and self-efficacy. When possible, survey items were designed to correspond with the faculty survey items. Example items can be found in our previous work. [18]

Observation Protocol
Our observation protocol will document how often and for how long an instructor uses active learning within their classrooms. The observer will record information pertaining to how engaged the students are with any active learning activities and if there is any resistance occurring among the students. Additionally, the protocol will make note of how instructors are involved with the active learning activities and if they are using any of specific strategies to reduce student resistance to these activities.

Phase 2- Pre-Intervention

We have completed Phase 1 of this research and are beginning the pre-intervention data collection. Instructors will be assigned to treatment groups using stratified random sampling, based on their institution type as determined by the Carnegie classification. Once assigned to groups, we will administer the instructor and student surveys, as well as observe a random subset of the classes.

Phase 3- The Intervention

The AL workshop will focus on teaching instructors what active learning is and what the benefits are to using active learning in the classroom. After laying this groundwork, the workshop will delve into common concerns faculty have about using active learning in their classrooms, and strategies for successfully adopting active learning into their classrooms. The participants will experience active learning within the workshop, with the facilitator using it throughout the workshop, and they will also be given the opportunity to practice using active learning within the workshop.

The AL+ workshop will address everything that the AL workshop does, but it will also have an additional module that will focus on how faculty can reduce student resistance to active learning. The module will discuss why students resist active learning, as well research-based best strategies for overcoming resistance and will give instructors practice and feedback on using these strategies. We have created instruments in order to evaluate the planning, explanation, and facilitation strategies employed by instructors.

Phase 4- Post-Intervention

The same data collection as outlined in the pre-intervention section will occur post-intervention. All instructors and students will be surveyed, and again, 60 instructors will have an in-class observation. Through this data collection changes in instructor/student behavior from prior to the workshop are measured

Future Work/Implications

Student resistance is one of the key barriers cited by faculty against implementing active learning within their classrooms and helping faculty members overcome this barrier will hopefully lead to more adoption of active learning within their classrooms.

The results of our study will provide evidence-based support for whether student resistance is a measurable occurrence within classrooms and whether different strategies can be employed to reduce this resistance. The study also hopes to provide answers of if students are actually resisting active learning, as well as the instructors' perception of this resistance.

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