Rick Reis <reis@stanford.edu> February 25, 2013 5:37 PM
To: tomorrows-professor <tomorrows-professor@lists.stanford.edu>
TP Msg. #1232 What Do You Mean Active Learning Doesn't Work!?!

While the article's title is jarring and certainly grabs one's attention, the general thrust of this research is not that active learning is inherently ineffective, but active learning can be executed poorly, just like any other teaching technique. Most instructors need coaching, examples of good practice, and faculty development programs that encourage a fundamental shift in pedagogical approach if it is to be effective.

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Folks:

The posting below raises some questions about the general assumption regarding the effectiveness of active learning compared to more traditional methods. It is prepared by the Research and Evaluation Team, Office of Information Technology, University of Minnesota - Twin Cities. http://z.umn.edu/research. In an effort to make research in the educational technology field more accessible, OIT\'s Research & Evaluation team produces frequent brief synopses of important recent studies. These synopses may be freely shared and used for non-profit academic purposes. http://z.umn.edu/briefs. For further information contact Dr. J.D. Walker (jdwalker@umn.edu).

Regards,

Rick Reis
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UP NEXT: Categorizing Educatioal Research

Tomorrow's Teaching and Learning

---------- 1,123 words ----------

What Do You Mean Active Learning Doesn't Work!?!

1. Andrews, T.M., Leonard, M.J., Colgrove, C.A., & Kalinowski, S.T. (2011). Active learning not associated with student learning in a random sample of college biology courses, CBE-Life Sciences Education, 10, 394-405. Retrieved 11 April 2012. DOI:10.1187/cbe.11-07-0061

Active Learning

Although "active learning" as an approach to classroom instruction has been around for decades, its widespread acceptance and deployment has been hastened by the publication of numerous studies demonstrating that active learning techniques have a positive and significant impact on student learning. As an "instructional method that engages students in the learning process" (Prince, 2004, p. 223), active learning is comprised of a host of classroom activities such as class discussion, group-work, structured student debates, simulations, games, and collaborative problem-solving. Along with its corollaries – constructivism, collaborative learning, team-based learning (Michaelsen, Bauman-Knight, & Fink, 2003), & problem-based learning – active learning often is contrasted with passive learning, a modality most frequently

associated with lecture-based pedagogies.

Among the most important studies that have secured active learning's place of prominence in the scholarship of teaching and learning is a seminal meta-analysis conducted by Michael Prince, who concludes that, "Although the results vary in strength, this study has found support for all forms of active learning examined" (2004, p. 7). However, the authors of the study considered here note that there is the potential for significant bias in existing scientific literature on the impact of active learning techniques. Andrews, Leonard, Colgrove, and Kalinowski contend that given that most studies are authored by instructors who 1) are deeply interested in science education, and 2) are engaged in the scholarship of teaching and learning, it is possible that this interest and engagement might enhance their ability to deploy active learning effectively resulting in the gains observed and reported. The authors, therefore, hypothesize that the results produced by instructors with extensive experience using and researching active learning teaching techniques are not comparable to the larger population of science instructors who may not be engaged in educational research.

Data & Methods

The authors randomly selected 77 colleges and universities from a list of 144 institutions (comprised of the 2 largest in each state + top 50 according to the U.S. News & Report rankings). From these randomly selected schools, the authors identified introductory biology courses that included a unit on natural selection and invited 88 instructors to participate in the three-semester study. Of these, 33 (38%) instructors accepted the invitation resulting in a sample that included 29 courses at 28 institutions in 22 states; controls for self-selection bias were employed using comparative data collected from non-participants.

For student data, the authors employed the Conceptual Inventory of Natural Selection (CINS) – Abbreviated version, a 10-question multiple-choice test on the topic of natural selection that has been subjected to validity tests by instrument developers and inter-rater reliability testing by the authors. Additionally, students completed an open-ended question in which they applied knowledge of natural selection to a question regarding the adaptive ability of cheetahs to run quickly; responses to these questions were graded using an established rubric, the results of which were subjected to inter-rater reliability testing (Pearson's r = 0.93). Data regarding student experiences, instructor teaching methods, frequency of classroom activities, and the like were collected via instructor and student surveys.

For the analysis, the authors primarily used the Cohen's d for repeated measures statistic to measure learning gains, but compared the Cohen's d results with other established learning gains measures (e.g. normalized gains, % change, raw change) to confirm their findings. To establish the relationship with the theoretical variables of interest, the authors employed a generalized linear regression model that included a host of controls for instructor and student variation.

Findings

There are four main findings reported in this article. First, instructors reported using active learning techniques frequently (8.03 instances/week). Second, learning gains were modest for both the CINS test (Cohen's d = -0.11 to 1.26; mean effect size = 0.49; normalized gain = 0.26) and the open-ended question (Cohen's d = -0.16 to 0.58; mean effect size = 0.15; normalized gain = 0.06). Third, no association between the frequency of active learning activities and how much students learned about natural selection was found. That is, student learning was not positively associated with the amount of active learning used. Fourth, other factors, such as overcoming misconceptions, course difficulty, and how interesting a course was, were positively associated with student learning.

Discussion and Implications

The implications of the finding that active learning is not associated with student learning has implications for two important groups in the academy: 1) researchers and faculty development professionals, and 2) instructors. For the former, the authors recommend that researchers need to identify what it is about active learning that makes it effective. Those findings, in turn, need to inform the development of a broad set of active learning strategies and exercises that are fungible [i.e.,interchangeable], useful, and easily distributed to a broad population. Faculty development programs can be built around these strategies and exercises to train and support the general population of instructors in using active learning more effectively. For the latter, instructors cannot assume that they are effective teachers just because they are using active learning exercises; they need empirical evidence that is garnered through a carefully planned assessment protocol to help them understand what is and what is not working. Furthermore, given that it is highly unlikely that students will not alter their a priori beliefs about a particular topic (e.g. natural selection) without targeted instruction, instructors need to identify what preexisting beliefs students possess and plan their approach to the topic accordingly.

Four methodological issues may limit the effectiveness and accuracy of this study. First, the selection process does not really appear as random as the authors purport with an a priori winnowing of possible participants and participants' self-selection into the study. Second, self-reported frequencies of events and activities is a highly individuated task that can introduce biased or incorrect responses due to a host of factors, not the least of which is individual memory. Third, the number of courses included in the analysis is relatively small, limiting the statistical power to detect with a great deal of accuracy the impact of active learning techniques. Fourth, although the CINS is both a valid and reliable instrument, it might not be the appropriate instrument given the amount of instructor, course, and institutional variation inherent to the study.

While the article's title is jarring and certainly grabs one's attention, the general thrust of this research is not that active learning is inherently ineffective, but active learning can be executed poorly, just like any other teaching technique. Most instructors need coaching, examples of good practice, and faculty development programs that encourage a fundamental shift in pedagogical approach if it is to be effective.

References

Michaelsen, L., Bauman-Knight, Arletta, & Fink, D. (2003) Team-based Learning: A Transformative Use of Small Groups in College Teaching, Sterling, VA: Stylus Publishing.

Prince, M. (2004). Does active learning work? A review of the research. Journal of Engineering Edu

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1. The authors used multiple calculations for learning gains, each of which were highly intercorrelated, to demonstrate general consistency in results regardless the methodology used.

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