

Limitations in experimental design mean that the jury is still out on lecturing

Freeman et al. (1) make a valuable contribution to the field of science, technology, engineering, and mathematics (STEM) education in their meta-analysis. However, instead of ceasing to include lecturing as an experimental condition because of its proven inadequacy, I argue that lecturing as it is currently conceptualized be discontinued because it is done so in a methodologically problematic manner. The problem is that the term “lecturing” is often operationalized imprecisely, which raises questions about the reliability of much of the literature.

My own research on teaching in STEM classrooms demonstrates that teaching is a multifaceted phenomenon that belies easy categorization. In classes with a high percentage of verbal exposition, faculty may also use a variety of teaching modalities and rhetorical strategies. The intensity of exposition can also vary substantially (e.g., from 10 to 100% of a class), such that lecturing is rarely an either/or proposition (i.e., a dichotomous variable) (2).

It is often difficult to discern precisely what researchers mean by “lecturing.” The criteria used in the meta-analysis to identify data for inclusion in the “traditional lecturing” condition is that of “continuous exposition by the teacher,” but with no further details provided. Other problems include tautological definitions where lecturing is defined as “passive-student lectures” (3), and instances where some forms of verbal exposition are considered “lecturing,” whereas

others are not. In a widely cited paper the interactive teaching condition is described as follows: “There was no formal lecturing; however, guidance and explanations were provided by the instructor throughout the class” (4).

In addition, no standardized definition of lecturing exists in the field. For example, traditional lecturing is considered by some to include the use of PowerPoint slides to present content, demonstrations, and clickers for summative evaluation (4). Such a multimethod view of lecturing differs from the more restricted definition used in the meta-analysis.

If what STEM education researchers are attempting to contrast with other types of instruction is “pure” lecturing, then more precise and consistent definitions for this condition are necessary. The failure to do so has major implications for the rigor of scientific inquiry in this area, as it is currently impossible to replicate many studies and to determine if subsequent results verify or falsify prior evidence.

Skepticism is therefore warranted regarding the assumption that all of the 225 studies were measuring (or controlling for) the same type of instruction. It is also premature to claim that lecturing results in an “inferior education” or is “the pedagogical equivalent of bloodletting” (5).

This is not to suggest that active learning techniques should not be a part of instructors’ pedagogical toolkits. It is simply that

adequate instrumentation is rarely used to identify and control for more nuanced types of teaching beyond the crude dichotomies currently in use. Thus, I agree with the authors about the need for “second-generation” research that examines teaching at a more fine-grained level, and also suggest that factors such as student study habits and the organizational context be taken into account when examining the relationship between teaching and learning.

Matthew T. Hora¹

Wisconsin Center for Education Research,
University of Wisconsin–Madison, Madison,
WI 53706

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¹Email: hora@wisc.edu.