

EDITORIAL : Uncovering Instructor Misconceptions through Evidence-based Pedagogy.

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As described in this issue's [review](#) about scientific teaching, an evidence-based approach to pedagogy is gradually gaining momentum across a wide range of academic disciplines, most notably the STEM fields. A number of challenges still remain on the road ahead but substantial progress has been made. One topic to emerge as a particularly active research area is the identification of misconceptions in learning or teaching processes^{1 2 3}. Misconceptions of this type can be harbored by either the student or instructor (and sometimes both)^{4 5 6}. In recent years, an array of diverse research has been conducted to identify misconceptions across a number of academic disciplines, offering startling insights into the relationship between student or instructor perception and outcomes in different learning processes^{7 8 9 10 11}. In many respects, the results from this area have yielded some of the biggest surprises in evidence-based pedagogy.

One of the earliest examinations of student misconceptions was, not surprisingly, published by psychologists. This work, conducted in 1986¹², involved a fairly straightforward inventory of misconceptions regarding false urban legends about basic psychology facts. These urban legends were packaged as short statements in favor of, or against, various ideas. For example, one statement purported a strong positive relationship between high intelligence and madness (e.g. "the smarter you are, the more likely you are to go mad") while another advocated for the irresistible power of hypnosis (e.g. "no one can resist the power of a

professional hypnotist"). To determine the prevalence of belief in these urban legends, psychology undergraduates were asked to record their agreement with these statements during each year of their undergraduate career. Each year, as the students gained more experience and exposure to psychology, the overall prevalence of belief in these urban legends was found to decrease.

Although this research was not conducted with the same rigor we would expect today, one of the important surprises of the work was the fact that even graduating seniors still retained a fairly large number of misconceptions¹². These graduates, on average, still believed in about 20% of the urban legends tested. From the perspective of evidence-based pedagogy, a result of this type would qualify as the successful identification of an area of student need requiring targeted education reform to undo the high percentage of false beliefs.

Since the 1980s, a wealth of research has examined a wide range of other student misconceptions across various disciplines^{13 14 15}. In addition to a continued interest in psychology¹⁶, research into misconceptions about science^{17 18} and statistics¹⁹ has also emerged. This work has been accompanied by a significant expansion in the range of students examined to include K-12 children^{20 21} and non-university student adults in the general public²². A variety of demographic studies^{23 24} and examinations of biases towards technology-

based learning methods^{25 26} have also been published.

Of equal or perhaps greater importance is the issue of misconceptions harbored by instructors^{27 28}. These studies about teacher perception are more recent compared to their student counterparts but have greater potential impact because instructors are usually the ones primarily responsible for undoing student misconceptions^{29 30}. This issue's **Postdoc of the Month** highlight [article](#) by Amber Benedict and colleagues illustrates research of this type.

The competence of an instructor is of critical importance³¹, regardless of the area they are tasked with teaching. However, this competence is perhaps more pronounced in special education³², where students often require extra attention and customized modes of pedagogy to achieve meaningful learning outcomes^{33 34}. This month's highlight article by Benedict and colleagues examines the issue of this competence in elementary school special education teachers by focusing on the strategies these instructors use to teach reading. By employing a well-selected set of assessments including survey questions, direct observations, and post-observational interviews, the authors were able to determine a number of misconceptions harbored by the instructors in their sample. These misconceptions included contradictions in the instructors' understanding of the theory and practice of various reading techniques and inconsistencies in the application of these understood elements when conducting class. Both represent important potential targets for future education reform. Although the very small sample size of the work prohibits itself from being conclusive, the results and methods should still spark additional interest in this critical area, hopefully further

expanding the use of evidence-based pedagogy in improving special education.

Acknowledgements: I would like to thank Dr. Haigen Huang for helping to review the manuscript.

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