2023

Exploring the Ecology: Beyond Cameron and Khanna

Patricia Kowalski

Annette Kujawski Taylor

Human Arenas (2024) 7:354–364
https://doi.org/10.1007/s42087-023-00359-1

ARENA OF SCHOOLING

Exploring the Ecology: Beyond Cameron and Khanna

Patricia Kowalski[1] · **Annette Kujawski Taylor**[1]

Received: 17 June 2023 / Revised: 19 June 2023 / Accepted: 17 August 2023 /
Published online: 2 September 2023

Abstract
In reviewing the Cameron and Khanna project, we find much to be commended. The large diverse sample of researchers and the collection of widespread student misconceptions will help focus students and instructors in the introductory course on teaching and learning the science of psychology. The recommendations we make provide a guide for looking beyond student belief and recognizing factors potentially contributing to and *supporting* misconceptions. Because teaching psychological science in the introductory psychology course is challenging, it is likely that misconceptions result from misinterpretations of the evidence. Investigating how textbooks and instructors' perceptions of claims perpetuate misconceptions would be an important contribution toward improving the teaching of psychology. Assessing student misconceptions about psychological science would document the prevalence of science misconceptions, would permit the investigation of change in knowledge and scientific attitudes with the introductory psychology course, and would provide a basis for studying links between misconceptions about psychology and misunderstanding (or lack of appreciation) of the very nature of science.

Keywords Introductory psychology · Misconceptions · Refutation · Teaching

Although getting into students' heads is a messy task, given our understanding of learning, it is a necessary mess to explore. If students' initial ideas contradict new claims, the learner could develop concepts that are very different from those intended (Bransford et al., 2000). Understanding students' prior conceptions, therefore, is critical for teaching and learning.

Cameron and Khanna's program to identify lingering student misconceptions following the introductory psychology course provides an important contribution to our exploration of students' mistaken beliefs. In this comment, we will describe what we appreciated in the multi-site project outlined. While commending the project's breadth, however, we will note the need to explore more fully some of the issues only sampled. Understanding the conceptual ecology generating and maintaining the array of student misconceptions (see Strike & Posner, 1992) may answer the additional questions of why students believe these claims, why beliefs persist, and how to develop a habit of inquiry in students that may

✉ Patricia Kowalski
kowalski@sandiego.edu

[1] Psychological Sciences, University of San Diego, San Diego, CA, USA

alter the tendency to believe false claims. We recommend going beyond measuring student misconceptions about psychology to also measure student misconceptions of science and instructor and text support for both science and psychology misconceptions.

To Be Commended

Cameron, Khanna, and collaborators (C&K from here on) are to be commended above all for bringing together a diverse group of scholar-practitioners to study an important concept in learning. Science is by nature dependent on community. A diversity of voices in open discussion permits the sharing and checking of assumptions in the pursuit of knowledge (Oreskes, 2019). A diverse team with specialists across subdisciplines is also key to identifying misconceptions and the alternative conceptions based on scientific consensus. Persisting in the face of the logistical challenges and IRB delays is worthwhile.

Increasing the participating sites also increases the participant sample and its diversity. Researching in this area ourselves, we have long struggled with sample size. Size is not only important for generalizing claims, but for being able to ask critical questions. As C&K recognize, assessing whether there is any *change* in students' misconceptions following the course requires longitudinal samples. Ideally, these longitudinal assessments would involve multiple testings, permitting some insight into whether the change is temporary and superficial or enduring and deep (see Zengilowski et al., 2021). There are also benefits to the diversity of samples. As C&K found, students differ in their beliefs in misconceptions and in the strength of those beliefs. We find differences across misconceptions and across cohorts of students (Taylor & Kowalski, 2012). Other researchers note differences across countries (Dekker et al., 2012; Hughes et al., 2013a). Large and diverse samples provide researchers with the opportunity to explore these differences.

In addition to size and diversity, the C&K project is commendable for gathering an array of popular student misconceptions. The set is useful for both researchers investigating student misconceptions and instructors surveying students to identify topics to address in class. Claims more frequently and confidently professed may require more attention. But because no single fix will likely be appropriate for all misconceptions (Chi, 2008; Zengilowski et al., 2021), researching differences will be useful. Some misconceptions may be addressed with refutation, whereas others, particularly those with personal and social consequences, may require more engagement. Elaborate engagement, such as that outlined by C&K and Bernstein (2017), will realistically need to be reserved for a critical few.

Further Exploration

Seeking to understand the persistence of student misconceptions is important if instructors are to have any hope of revising belief in false claims (Kendeou et al., 2014). However, understanding the task of overcoming misconceptions requires recognizing the context in which it occurs. Rarely is the process of learning that of adding an isolated piece of information to an empty space. Rather, the learner is learning within a conceptual ecology (e.g., Strike & Posner, 1992). Information is understood (sometimes incorrectly) in terms of prior knowledge, but also in terms of the learner's motivation, epistemology, existing metaphors, and past experiences. This broad view of learning reveals why the deficit model of

learning (filling empty spaces) is flawed. Aspects of students' past and present are likely contributing to and supporting the misconception. Instructors need to be aware of what *and how* students are thinking to promote belief revision. Attention to students' conceptual ecology would connect the multiple goals of the C&K project, i.e., assessing misconceptions, teaching critical thinking, understanding sources of misconceptions, and proposing strategies to reduce false beliefs. We address some of these connections and suggest strategies for reinforcing those connections.

Assessing Misconceptions

As discussed throughout the literature (see Zengilowski et al., 2021), assessment of misconceptions is challenging. Among assessment issues are problems in language, format, and prevalence. Generally, misconceptions are considered to be false beliefs held by more than 50% of respondents (see Brown, 1983). Yet responses vary with how the question is asked (Hughes et al., 2013a; Taylor & Kowalski, 2012). For example, when presented with a statement, respondents are more likely to respond "true" to familiar statements (often the result of the mere exposure effect). Adding a "don't know" option or taking confidence into account allows for a more precise assessment of belief (Gardner & Dalsing, 1986). C&K reflect on some of these challenges when they recognize that endorsement of claims varied across items and that responses may result from ambiguous wording or from the complexity of many psychological claims, e.g., claims that are not completely true or false and those that contain "grains of truth." In noting that they are attending to wording items carefully and going beyond true/false assessment, C&K are likely addressing some of these issues in their revised assessment. We also believe that some of these assessment issues can be addressed with a format that takes the definition of misconception and the context of belief into account.

Before assessing misconceptions, it is best to define what is meant by the concept of "misconception" (Hughes et al., 2013b). Although the measurement of misconceptions often involves presenting and assessing whether a false claim is believed to be true, definitions of misconceptions are more likely to reflect the nature of the misconception as it contrasts with the scientifically supported claims, e.g., "a belief that conflicts with currently accepted scientific explanations" (Tippett, 2010, p. 953) and "notions that are in sharp contrast to accepted scientific understanding" (Sinatra et al., 2014, p. 132). These definitions of misconceptions reflect the context of belief in that the false claim exists *in relation to* the contrasting scientific claim and that the two are differentiated by their support. In our view, these definitions are appropriate for misconception in psychological science. We also believe that misconceptions can be differentiated from myths. Myths more generally suggest a metaphysical component or a lack of contrast with clear scientific evidence (see Maddox, n.d.).

One way to assess misconceptions in context is to present the contesting claims together. An example is the forced choice format described by Bensley and Lilienfeld (2020). They provide guidelines for developing measures of unsubstantiated claims that include "… clearly identify each claim that is unsubstantiated and its alternative which is substantiated, based on high-quality scientific evidence" (p. 199). In their own work, they use an A/B format that contrasts the scientifically supported with the unsupported alternative. Using this format, we found a lower rate of endorsement when we presented items in contrast pairs versus single T/F claims (Taylor & Kowalski, 2012). The following is an example item:

Which statement about the effect of sugar on behavior is most true?

(A) Too much sugar, such as from eating candy and sugary snacks, causes hyperactivity in children.
(B) Sugar has a limited effect on behavior, similar to any carbohydrate, such as potatoes or pretzels.

Assessment of students' understanding of support for contrasting claims provides information on whether the student both accepts the correct claim and rejects the incorrect claim. The format also avoids the problem with true/false questions that are not entirely false by focusing attention on those claims that are clearly supported by scientific consensus. In addition to addressing measurement issues, assessing student's understanding of claims that differ in support ties with the APA's student learning outcomes for the teaching of psychology, improving students' knowledge of psychological conceptions and improving students' scientific thinking (e.g., 2.4 Examine how psychological science can be used to counter unsubstantiated statements, opinions, or beliefs, American Psychological Association, 2021). By assessing and then teaching contrasting claims through refutation or argumentation (e.g., Lombardi et al., 2013), IP would be simultaneously teaching the correct claim (content) and how claims can be differentiated by evidence (scientific justification).

It is important to recognize that a student's ability to differentiate claims based on evidence will likely depend on their understanding of "evidence" and how claims relate to evidence (see Sinatra & Hofer, 2016). As C&K noted, providing students with scientifically supported claims is unlikely to change misconceptions if students consider personal experience more valuable than empirical evidence. Unfortunately, students struggle with scientific literacy (i.e., scientific knowledge, epistemology, and values). How evidence differs from explanation and understanding the implications of uncertainty and the ongoing nature of science are challenging concepts for students and the public in general (Flemming et al., 2020; Kuhn, 2001; Kuhn & Modrek, 2018). People also have difficulty developing a scientific attitude, i.e., caring about evidence and being willing to change one's mind based on new evidence (McIntyre, 2019). Assessing student misconceptions about science and their scientific attitudes would document the prevalence of science misconceptions, would permit the investigation of change in knowledge and attitudes with the IP course, and would provide a basis for studying links between misconceptions about psychology and misunderstanding (or lack of appreciation) of the very nature of science.

We recommend using the A/B format to contrast misconceptions with empirically supported claims, including only items that are explicitly refuted by empirical evidence, and including items that address misconceptions of science and knowledge. Presenting conflicting claims and directing instruction at evaluating claims would link assessment, instruction, and critical thinking.

Instructors as Sources of Support for Misconceptions

Given our emphasis on contrasting supported and unsupported claims, we clearly agree with C&K that targeting and refuting misconceptions with supported claims is important in the reduction of misconceptions (see Kendeou et al., 2014). C&K's assessment of whether instructors addressed claims allowed them to suggest a modest correlation

between addressing and reduction. We believe attention to whether and how misconceptions are addressed is important in understanding the role of targeting in the classroom, but it is also important in understanding the role instructors play in potentially *supporting* misconceptions.

Although misconceptions researchers assume that instructors hope that at the end of their courses students will reject false claims (Bensley & Lilienfeld, 2020), it is not clear whether or how instruction addresses misconceptions in the IP classroom. In an early study of misconceptions, McKeachie (1960) asked instructors whether they disagreed with the keyed response and whether they would be unhappy if their students missed the question. Many of the items showing little student improvement were those instructors rated as unimportant. Similar studies suggest that misconceptions are unlikely to change when instructors do not see them as important (see Lamal, 1979).

An additional concern is the possibility that claims are addressed in class but inappropriately. For example, overemphasizing the misconception can result in a familiarity backfire effect or a continuing influence effect (Lewandowsky et al., 2012). Assessing sources of misconceptions is tricky; however, research consistently finds students reporting classes and instructors as sources of their incorrect beliefs (Landau & Bavaria, 2003; Richmond et al., 2023; Taylor & Kowalski, 2004). It may be that instructors are supporting student misconceptions because they are unaware of the scientifically supported claim, because they do not know how to refute a particular claim, or because they know but do not accept the scientific evidence.

The relatively little research on instructors' knowledge of psychological misconceptions suggests that psychologists hold fewer of these misconceptions compared with academics outside of social science and students (Gardner & Hund, 1983) (good thing!). Assessing students and teachers in Spain, Varea et al. (2022) found psychology teachers held fewer misconceptions compared with lower-level students but continued to report a belief in some misconceptions.

Several studies in a variety of countries report a high prevalence of education-related misconceptions among in-service teachers (e.g., Dekker et al., 2012; Ferrero et al., 2016). Some misconceptions may reflect a rejection of the supported claim (Lombardi & Sinatra, 2013). Many others may result from inappropriate generalizations from findings in cognition and behavior (Grospietsch & Mayer, 2019). Ferrero et al. (2016) suggests teacher education programs do not always teach student teachers how to interpret research findings. This lack of instruction on the empirical foundation of claims contrasts with courses, workshops, and books that offer a wide range of pseudoscientific theories and methods about how to improve learning, such as Brain Gym® (Hyatt, 2007). Teachers may also promote misconceptions because they believe the claims are actually based on science (or "neuroscience"). Dekker et al. (2012) reported that 49% of the teachers they surveyed endorsed 15 of the assessed "neuromyths." Yet, these false beliefs were frequently predicted by *higher* levels of general knowledge and interest in neuroscience. These findings suggest that knowledge may not prevent the belief in false claims if one does not know how claims are related to and limited by evidence.

Given the challenges of teaching the IP course, the likelihood that misconceptions in psychology are taught or result from misinterpretation of the evidence is high. As Halonen et al. (2021) note, IP is a course attracting a large and diverse set of students, attempting to cover a wide swath of content, by instructors who may not be well informed on all claims across the field. The result may be courses taught by instructors who are limited in their knowledge of the empirical evidence for claims in at least some of the areas addressed by the introductory course.

If instructors of psychology are expected to reject unsupported claims in the field (see American Psychological Association, 2023), assessing instructor perceptions of those claims would be an important step in identifying and eliminating sources of continued support for student misconceptions and improving the teaching of psychology. However, as C&K discuss, misconceptions-teaching is not always easy and requires instructors who are willing and able to exert the effort. Their description of teaching cognitive psychology shows the challenges even when teaching upper division students in one's area of expertise. Misconceptions-teaching is likely even more difficult for instructors with limited knowledge of the unsupported claims and of how the evidence justifies and supports the claims. Even as one of the contributors to the APS Teaching examples on Reinventing Psychology (Bernstein et al., 2018), PK has only had limited success in implementing the format and managing discussions of why right is right and wrong is wrong. A forum for instructors to share their success and failures with misconceptions teaching would be welcome.

Text Sources and Support of Misconception

The above discussion suggests that one reason why student misconceptions persist is that they are not clearly refuted by instructors. Given that instruction is often closely tied to text reading, C&K correctly allude to the persistence and perpetuation of misconceptions by textbooks. As Morawski (1992) has noted, textbooks are key transmitters of psychological knowledge to psychology students and psychologists. Instructors may rely on their texts as authority, particularly in areas where their knowledge is limited or less than current. APA's Ethical Code 7.03 states, "When engaged in teaching or training, psychologists present psychological information accurately" (p. 10, Habarth et al., 2011). Therefore, it is imperative to examine textbook accuracy and currency in terms of how they may be contributing to and maintaining students' psychological misconceptions.

IP textbooks appear likely to promote or perpetuate misconceptions, sometimes by ignoring them, sometimes by providing incorrect interpretations, or sometimes by failing to update knowledge. Despite the "replication crisis" (Open Science Collaboration, 2015) having demonstrated a concerning mismatch between claims and data, many of the studies that have failed reproduction continue to be covered in both depth and breadth in IP texts. What has always been sits in textbooks and lectures, "like grand historical monuments" (Tavris, 2014, p. 1), resulting in textbooks that are encyclopedic (see Weiten & Wight, 1992) and likely misrepresenting the science.

Although we are unaware of any systematic attempt to identify how introductory psychology texts address the common claims studied by misconceptions researchers, there are studies of how the learning styles claim is addressed in education and educational psychology texts (Cuevas, 2015; Wininger et al., 2019). The studies find few texts directly promote the claim, yet the texts rarely provide a clear discussion of the claim and of its lack of empirical support.

In reviews of IP texts, there is evidence for general errors, errors of omission, and "academic folklore" (Todd & Morris, 1992). Thomas (2007) examined errors in psychology textbooks and found the repetition of scientific urban legends along with errors of interpretation and misquoting. Steuer and Ham (2008) further detailed common errors in psychology texts, including coverage of the history of psychology, conditioning concepts, recovered memories, and diversity issues. Texts often represent psychological science as being more consistent, of higher quality, and more generalizable than it really is. Ferguson

et al. (2018) reviewed 24 of the more popular IP textbooks and provided evidence for factual reporting of errors across textbooks, for failing to inform students of the controversial nature of some research fields, and for the inclusion of anecdotes as evidence. Assuming that at least some students read some of the text (Clump et al., 2004), student errors may be derived from the texts.

Beyond specific errors in presentation, researchers have attended to the problematic presentation of "classic myths" in psychology. Publications by Griggs and colleagues (Bartels & Griggs, 2019; Griggs, 2015; Griggs et al., 2020) examined textbook presentations of various controversies in social psychology, including studies of conformity, obedience, and the Stanford Prison Experiment. They found little textbook coverage of published critiques, including archival records, providing evidence that the way these studies continue to be presented in textbooks is misleading (Le Texier, 2019; Perry, 2013). Conclusions often misinterpret the data or continue misinterpretations in the original papers, or present only partial data, leaving textbook readers with a false sense of the validity of these studies and/or their conclusions, as commonly taught.

Other research (see Griggs & Ransdell, 1987) indicates that rather than addressing false claims, texts may perpetuate misconceptions by ignoring them. Texts may also fail to refute misconceptions in a way that would alter prior knowledge (Lewandowsky et al., 2020). Findings that refutations matter (cf., Ferrero et al., 2020; Kowalski & Taylor, 2009; Menz et al., 2021) have contributed to recommendations for the inclusion of refutations in introductory texts (Tippett, 2010). The ideal would involve an inclusion of supported claims and how they are supported, as well as the elimination of unsupported claims. Refutation of classic studies would engage students in a discussion of the original claims and replace the claims with a scientifically justified alternative. Exposing the flaws and shortcomings of many "classic" studies would not only correct students' views about the studies but would also work to show students that psychology has the capacity to be a self-correcting science (Bartels & Griggs, 2019).

Finally, in addition to their presentation of science-based claims, texts also need to be reviewed for how they present science itself. As noted previously, how students think about evidence and claims is part of the conceptual ecology that contributes to their acceptance of claims. Some researchers have pointed out the limited discussion of the nature of science in introductory texts (cf., Amsel et al., 2011; O'Donohue & Willis, 2018). This limitation is particularly troubling given the emphasis of the IP class on psychology as a science when coupled with students' difficulties in understanding the nature of science.

In Conclusion

We appreciate the opportunity to comment on the C&K paper. It, obviously, got us thinking. The size of the project, despite the accompanying challenges, is its strength. The large diverse sample of student misconceptions will help focus students and instructors in the introductory course on the science of psychology and how to think about it. The recommendations we make should be seen as guides for how to take a broad perspective of student learning and unlearning in psychological science.

Not included in this discussion of a broader perspective are the numerous other sources, both within the individual and outside of the classroom, that support students' inaccurate beliefs and contribute to belief persistence. Media, social media and internet influencers, and peers have been shown to promote many claims that contradict scientific findings

(Allcott et al., 2019) and students, as young adults in general, are often exposed to these claims (Herrero-Diz et al., 2020). These sources likely repeat the unsupported claims in volumes, overwhelming the supported claims. So, as we commend getting into students' heads to assess prior beliefs and end-of-course misconceptions, we suggest going beyond those beliefs to explore support for those beliefs. It may be messy, but if we are going to guide students in learning psychological science, we are going to have to explore and address the mess. At this point, we wish everyone luck!

Author Contribution Both authors contributed equally to the preparation of this manuscript. The corresponding author confirms that they have read the journal policies and submit this manuscript in accordance with those policies.

Funding Open access funding provided by SCELC, Statewide California Electronic Library Consortium.

Availability of Data and Materials Not applicable. This manuscript is a commentary with no use of materials nor data.

Declarations

Ethical Approval Not applicable. No humans participated in nor were animals used in the preparation of this commentary; therefore, no Institutional Review Board oversight was required, and, appropriately, was not sought.

Competing Interests The authors declare no competing interests.

References

Allcott, H., Gentzkow, M., & Yu, C. (2019). Trends in the diffusion of misinformation on social media. *Research and Politics, 6*(2). https://doi.org/10.1177/2053168019848554

American Psychological Association. (2021). *APA Introductory Psychology Initiative (IPI) student learning outcomes for introductory psychology* [Framework]. Retrieved September 1, 2023, from https://www.apa.org/about/policy/introductory-psychology-initiative-student-outcomes.pdf

American Psychological Association. (2023). APA Board of Educational Affairs Working Group to Review the APA Principles for Quality Undergraduate Education in Psychology. *Principles for Quality Education in Psychology*. Retrieved September 1, 2023, from https://www.apa.org/about/policy/principles-quality-undergraduate-education-psychology.pdf

Amsel, E., Baird, T., & Ashley, A. (2011). Misconceptions and conceptual change in undergraduate students' understanding of psychology as a science. *Psychology Learning and Teaching, 10*(1), 3–10. https://doi.org/10.2304/plat.2011.10.1.3

Bartels, J. M., & Griggs, R. A. (2019). Using new revelations about the Stanford prison experiment to address APA undergraduate psychology major learning outcomes. *Scholarship of Teaching and Learning in Psychology, 5*(4), 298–304. https://doi.org/10.1037/stl0000163

Bensley, D. A., & Lilienfeld, S. O. (2020). Assessing belief in unsubstantiated claims. *Scholarship of Teaching and Learning in Psychology, 6*(3), 198–211. https://doi.org/10.1037/stl0000218

Bernstein, D. A. (2017). Bye-bye intro: A proposal for transforming introductory psychology. *Scholarship of Teaching and Learning in Psychology, 3*(3), 191–197. https://doi.org/10.1037/stl0000093

Bernstein, D., Chew, S., Hardin, E., & Kowalski, P. (2018, August 16). *Reinventing Introductory Psychology*. Retrieved from https://www.psychologicalscience.org/members/teaching-psychology/reinventing-introductory-psychology/suggested-lesson-plans

Bransford, J., Brown, A., & Cocking, R. (2000). *How people learn: Brain, mind, experience, and school*. National Academy Press.

Brown, L. T. (1983). Some more misconceptions about psychology among introductory psychology students. *Teaching of Psychology, 10*(4), 207–210. https://doi.org/10.1207/s15328023top1004_4

Chi, M. T. H. (2008). Three types of conceptual change: Belief revision, mental model transformation, and categorical shift. In S. Vosniadou (Ed.), *Handbook of research on conceptual change* (pp. 61–82). Erlbaum.

Clump, M. A., Bauer, H., & Bradley, C. (2004). The extent to which psychology students read textbooks: A multiple class analysis of reading across the psychology curriculum. *Journal of Instructional Psychology, 31*, 227–232.

Cuevas, J. (2015). Is learning styles-based instruction effective? A comprehensive analysis of recent research on learning styles. *Theory and Research in Education, 13*(3), 308–333. https://doi.org/10.1177/1477878515606621

Dekker, S., Lee, N. C., Howard-Jones, P., & Jolles, J. (2012). Neuromyths in education: Prevalence and predictors of misconceptions among teachers. *Frontiers in Psychology, 3*. https://doi.org/10.3389/fpsyg.2012.00429

Ferguson, C. J., Brown, J. M., & Torres, A. V. (2018). Education or indoctrination? The Accuracy of introductory psychology textbooks in covering controversial topics and urban legends about psychology. *Current Psychology, 37*(3), 574–582. https://doi.org/10.1007/s12144-016-9539-7

Ferrero, M., Garaizar, P., & Vadillo, M. A. (2016). Neuromyths in education: Prevalence among Spanish teachers and an exploration of cross-cultural variation. *Frontiers in Human Neuroscience, 10*, 496. https://doi.org/10.3389/fnhum.2016.00496

Ferrero, M., Hardwicke, T. E., Konstantinidis, E., & Vadillo, M. A. (2020). The effectiveness of refutation texts to correct misconceptions among educators. *Journal of Experimental Psychology: Applied, 26*(3), 411–421. https://doi.org/10.1037/xap0000258

Flemming, D., Kimmerle, J., Cress, U., & Sinatra, G. M. (2020). Research is tentative, but that's okay: Overcoming misconceptions about scientific tentativeness through refutational texts. *Discourse Processes, 51*(1), 17–35. https://doi.org/10.1080/0163853X.2019.1629805

Gardner, R. M., & Dalsing, S. (1986). Misconceptions about psychology among college students. *Teaching of Psychology, 13*(1), 32–34. https://doi.org/10.1207/s15328023top1301_9

Gardner, R. M., & Hund, R. M. (1983). Misconceptions of psychology among academicians. *Teaching of Psychology, 10*(1), 20–22. https://doi.org/10.1207/s15328023top1001_5

Griggs, R. A. (2015). The disappearance of independence in textbook coverage of Asch's social pressure experiments. *Teaching of Psychology, 42*(2), 137–142. https://doi.org/10.1177/0098628315569939

Griggs, R. A., Blyler, J., & Jackson, S. L. (2020). Using research ethics as a springboard for teaching Milgram's obedience study as a contentious classic. *Scholarship of Teaching and Learning in Psychology, 6*(4), 350–356. https://doi.org/10.1037/stl0000182

Griggs, R. A., & Ransdell, S. (1987). Misconceptions tests or misconceived tests? *Teaching of Psychology, 14*, 210–214. https://doi.org/10.1207/s15328023top1404_4

Grospietsch, F., & Mayer, J. (2019). Pre-service science teachers' neuroscience literacy: Neuromyths and a professional understanding of learning and memory. *Frontiers in Human Neuroscience, 13*, 20. https://doi.org/10.3389/fnhum.2019.00020

Habarth, J., Hansell, J., & Grove, T. (2011). How accurately do introductory psychology textbooks present psychoanalytic theory? *Teaching of Psychology, 38*(1), 16–21. https://doi.org/10.1177/0098628310390912

Halonen, J. S., Whitlock, K., & Arena, L. (2021). The introductory psychology course in the 21st century: The challenge of finding common ground. *Scholarship of Teaching and Learning in Psychology, 7*(3), 192–205. https://doi.org/10.1037/stl0000300

Herrero-Diz, P., Conde-Jiménez, J., & Reyes de Cózar, S. (2020). Teens' motivations to spread fake news on WhatsApp. *Social Media + Society, 6*(3). https://doi.org/10.1177/2056305120942879

Hughes, S., Lyddy, F., & Kaplan, R. (2013a). The impact of language and response format on student endorsement of psychological misconceptions. *Teaching of Psychology, 40*, 31–37. https://doi.org/10.1177/0098628312465861

Hughes, S., Lyddy, F., & Lambe, S. (2013b). Misconceptions about psychological science: A review. *Psychology Learning and Teaching, 12*, 20–31. https://doi.org/10.2304/plat.2013.12.1.20

Hyatt, K. J. (2007). Brain Gym/r: Building stronger brains or wishful thinking? *Remedial and Special Education, 28*(2), 117–124. https://doi.org/10.1177/07419325070280020201

Kendeou, P., & lsh, E. K., Smith, E. R., & O'Brien, E. J. (2014). Knowledge revision processes in refutation texts. *Discourse Processes, 51*(5–6), 374–397. https://doi.org/10.1080/0163853X.2014.913961

Kowalski, P., & Taylor, A. (2009). The effect of refuting misconceptions in the psychology classroom. *Teaching of Psychology, 36*(3), 153–159. https://doi.org/10.1080/00986280902959986
Kuhn, D. (2001). How do people know? *Psychological Science, 12*, 1–8. https://doi.org/10.1111/1467-9280.00302
Kuhn, D., & Modrek, A. (2018). Do reasoning limitations undermine discourse? *Thinking and Reasoning, 24*(1), 97–116. https://doi.org/10.1080/13546783.2017.1388846
Lamal, P. A. (1979). College students' common beliefs about psychology. *Teaching of Psychology, 6*(3), 155–158. https://doi.org/10.1207/s15328023top0603_8
Landau, J. D., & Bavaria, A. J. (2003). Does deliberate source monitoring reduce students' misconceptions about psychology? *Teaching of Psychology, 30*(4), 311–314.
Le Texier, T. (2019). Debunking the Stanford Prison Experiment. *American Psychologist, 74*(7), 823–839. https://doi.org/10.1037/amp0000401
Lewandowsky, S., Cook, J., Ecker, U. K. H., Albarracín, D., Amazeen, M. A., Kendeou, P., Lombardi, D., Newman, E. J., Pennycook, G., Porter, E. Rand, D. G., Rapp, D. N., Reifler, J., Roozenbeek, J., Schmid, P., Seifert, C. M., Sinatra, G. M., Swire-Thompson, B., van der Linden, S., Vraga, E. K., … Zaragoza, M. S. (2020). *The Debunking Handbook 2020*. Available at https://sks.to/db2020, https://doi.org/10.17910/b7.1182
Lewandowsky, S., Ecker, U. K. H., Seifert, C. M., Schwarz, N., & Cook, J. (2012). Misinformation and its correction: Continued influence and successful debiasing. *Psychological Science in the Public Interest, 13*(3), 106–131. https://doi.org/10.1177/1529100612451018
Lombardi, D., Sibley, B., & Carroll, K. (2013). What's the alternative? *The Science Teacher, 80*(5), 50–55.
Lombardi, D., & Sinatra, G. M. (2013). Emotions about teaching about human-induced climate change. *International Journal of Science Education, 35*(1), 167–191. https://doi.org/10.1080/09500693.2012.738372
McKeachie, W. J. (1960). Changes in scores on the Northwestern Misconceptions Test in six elementary psychology courses. *Journal of Educational Psychology, 51*(4), 240–244. https://doi.org/10.1037/h0048569
McIntyre, L. (2019). The scientific attitude: Defending science from denial, fraud, and pseudoscience. *MIT Press*. https://doi.org/10.7551/mitpress/12203.001.0001
Menz, C., Spinath, B., Hendriks, F., & Seifried, E. (2021). Reducing educational psychological misconceptions: How effective are standard lectures, refutation lectures, and instruction in information evaluation strategies? *Scholarship of Teaching and Learning in Psychology.* Advance online publication. https://doi.org/10.1037/stl0000269
Morawski, J. G. (1992). There is more to our history of giving: The place of introductory psychology textbooks in American psychology. *American Psychologist, 47*, 161–169. https://doi.org/10.1037/0003-066X.47.2.161
Maddox, M. (n.d.). Myth and misconception. https://www.dailywritingtips.com/myth-and-misconception/
O'Donohue, W., & Willis, B. (2018). Problematic images of science in undergraduate psychology textbooks: How well is science understood and depicted? *Archives of Scientific Psychology, 6*(1), 51–62. https://doi.org/10.1037/arc0000040
Open Science Collaboration. (2015). Estimating the reproducibility of psychological science. *Science, 349*(6251). https://doi.org/10.1126/science.aac4716
Oreskes, N. (2019). Why trust science? *Princeton University Press*. https://doi.org/10.1515/9780691189932
Perry, G. (2013). *Behind the shock machine: The untold story of the notorious Milgram psychology experiments.* The New Press.
Richmond, A. S., Boysen, G. A., Gurung, R. A. R., & Naufel, K. Z. (2023). A national study of student and instructor perceptions of introductory psychology. *Scholarship of Teaching and Learning in Psychology*. Advance online publication. https://doi.org/10.1037/stl0000345
Sinatra, G. M., & Hofer, B. K. (2016). Public understanding of science: Policy and educational implications. *Policy Insights from the Behavioral and Brain Sciences, 3*(2), 245–253. https://doi.org/10.1177/2372732216656870
Sinatra, G. M., Kienhues, D., & Hofer, B. K. (2014). Addressing challenges to public understanding of science: Epistemic cognition, motivated reasoning, and conceptual change. *Educational Psychologist, 49*, 123–138. https://doi.org/10.1080/00461520.2014.916216
Steuer, F. B., & Ham, K. W. (2008). Psychology textbooks: Examining their accuracy. *Teaching of Psychology, 35*(3), 160–168. https://doi.org/10.1080/00986280802189197
Strike, K. A., & Posner, G. J. (1992). A revisionist theory of conceptual change. In R. A. Duschl & R. J. Hamilton (Eds.), *Philosophy of science, cognitive psychology, and educational theory and practice* (pp. 147–176). State University of New York Press.

Tavris, C. (2014, September 30). *Teaching contentious classics.* Observer. https://www.psychologicalscience.org/observer/teaching-contentious-classics

Taylor, A., & Kowalski, P. (2004). Naïve psychological science: The prevalence, strength and sources of misconceptions. *Psychological Record, 54*, 15–25. https://doi.org/10.1007/BF03395459

Taylor, A. K., & Kowalski, P. (2012). Students' misconceptions in Psychology: How you ask matters... sometimes. *Journal of the Scholarship of Teaching and Learning, 12*, 62–77.

Thomas, R. K. (2007). Recurring errors among recent history of psychology textbooks. *American Journal of Psychology, 120*(3), 477–495. https://doi.org/10.2307/2044541

Tippett, C. D. (2010). Refutation text in science education: A review of two decades of research. *International Journal of Science and Mathematics Education, 8*(6), 951–970. https://doi.org/10.1007/s10763-010-9203-x

Todd, J. T., & Morris, E. K. (1992). Case histories in the great power of steady misrepresentation. *American Psychologist, 47*(11), 1441–1453. https://doi.org/10.1037/0003-066X.47.11.1441

Varea, E., Enesco, I., Guerrero, S., & Barrios, P. (2022). Myths of popular psychology among university students and teachers: Does training in psychology reduce belief in myths? *Teaching of Psychology*. https://doi.org/10.1177/00986283221129193

Weiten, W., & Wight, R. D. (1992). Portraits of a discipline: An examination of introductory psychology textbooks in America. In C. L. Brewer, A. Puente, & J. R. Matthews (Eds.), *Teaching of psychology in America: A history* (pp. 453–504). American Psychological Association.

Wininger, S. R., Redifer, J. L., Norman, A. D., & Ryle, M. K. (2019). Prevalence of learning styles in educational psychology and introduction to education textbooks: A content analysis. *Psychology Learning & Teaching, 18*(3), 221–243. https://doi.org/10.1177/1475725719830301

Zengilowski, A., Schuetze, B. A., Nash, B. L., & Schallert, D. L. (2021). A critical review of the refutation text literature: Methodological confounds, theoretical problems, and possible solutions. *Educational Psychologist*. https://doi.org/10.1080/00461520.2020.1861948