In the past decade, colleges and universities have hired increasing numbers of traditionally trained scientists to focus their careers on improving undergraduate science education (Bush et al., 2013). In parallel, new academic journals, professional societies, and funding sources focusing on undergraduate science education have expanded. These trends are due in part to concerns about the quality and quantity of learning in undergraduate science classes; many studies suggest that instruction is poor, learning outcomes are low, and science degree completion remains below workforce needs (National Research Council [NRC], 2007). These concerns extend to the preparation of science teachers because they receive the bulk of their scientific training in undergraduate courses.

In response to these trends, the National Science Foundation commissioned the NRC to explore the contributions, impact, and sustainability of what they term “discipline-based education research” (DBER). *Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering* is the report from this study. It will be of interest to professionally trained science educators, in particular those wondering what role they might play in the political, institutional, intellectual, and economic restructuring of educational research efforts relating to undergraduate science education. The report is organized into three sections: (I) status of discipline-based education research, (II) contributions of discipline-based education research, and (III) future directions for discipline-based education research. Each of these sections advances ongoing discussions of disciplinary dimensions in science education research.

In the first section, chapters 1 and 2 attempt to address fundamental questions likely to arise in the minds of readers of *Science Education*—What, exactly, is DBER? What features distinguish DBER from other lines of educational inquiry? What has motivated the NRC to coin a new cross-disciplinary (e.g., physics, chemistry, biology, engineering, geoscience) designation for postsecondary science education research? How does DBER relate to the efforts of the broader community of more traditionally prepared science educators?

While the early sections of the report address these questions, the answers that are provided may be less than satisfying. For example, in the report DBER is contrasted with the fields considered to be “related” to it (p. 11): the scholarship of teaching and learning, educational psychology, cognitive science, and educational evaluation. It is surprising that the fields of “science education” and “learning sciences” are absent from the discussion of
disciplinary relatedness in chapter 1. Science educators familiar with the deep historical roots of their discipline may also be puzzled by the absence of an explicit discussion of how DBER relates to the past century of postsecondary science education research. The goals of DBER outlined by the committee might strike some readers as similar to their own scholarly pursuits. Specifically, the goals of DBER are to

... understand how people learn the concepts, practices, and ways of thinking of science and engineering; understand the nature and development of expertise in a discipline; help identify and measure appropriate learning objectives and instructional approaches that advance students toward those objectives; contribute to the knowledge base in a way that can guide the translation of DBER findings to classroom practice; and identify approaches to make science and engineering education broad and inclusive. (NRC, 2007, p. 9)

Has not this been the core mission of traditionally prepared science educators for the past half century?

At the end of chapter 2, readers may wonder about the advantages (or drawbacks) of establishing DBER as a discipline of educational research. A balanced exploration of the rationale for an umbrella DBER designation would have strengthened the report. One obvious benefit of the DBER designation is that scholars from different science disciplines might join forces, share findings, and catalyze reform efforts. But an equally convincing argument could be advanced for encouraging formal connections between individual DBER areas (e.g., biology education research) and the more established field of science education.

Section II begins by addressing broad questions of what DBER entails and its cross-disciplinary commonalities. Given that “disciplinary perspectives” are considered to be at the heart of DBER’s distinctiveness and touted as unique contributions to science education research (separate from other disciplines such as cognitive psychology, learning sciences, and science education), it was surprising that these perspectives were never fully explored in the report. Scientists do bring unique and important disciplinary knowledge to teaching and learning, but convincing examples were lacking in the report. Indeed, it would have been helpful if the report more explicitly outlined the disciplinary contributions that have changed science teaching and learning at the undergraduate level and illustrated why these perspectives are best situated in a new field outside of the traditional confines of science education. Other chapters in the section summarize findings likely to be familiar to science educators, particularly those with backgrounds in the learning sciences. Problem-solving, transfer, and motivational aspects of learning have been topics of research in science education for nearly a century, and few of the examples discussed were shown to be uniquely characteristic of undergraduate science learners.

Section III of the report reviews evidence illustrating the slow pace of educational reform in many undergraduate disciplines and emphasizes important opportunities for studies of faculty practices. In many respects, the report attempts to shoehorn disparate lines of inquiry into a template reminiscent of physics education research, which has much more homogeneous disciplinary structures and lines of inquiry than, for example, research in life science education. Questions arise as to whether the report has delineated scholarly activity about science teaching and learning along logical seams, and whether the NRC’s new educational taxonomy will ultimately help or hinder attempts to integrate evidence-based innovation into the K-16 educational system.

At the end of the report, some readers may wonder whether their work would be classified as DBER or not. Although the subtitle of the report (“Understanding and Improving Learning in Undergraduate Science and Engineering”) suggests that DBER is situated in
undergraduate education, the report makes clear that work in K-12 settings and in teacher education may also qualify as DBER. For more than a century, the latter two pursuits have historically taken place in colleges of education and been situated within the field of science education. While the report makes clear that all levels of educational work can fall under DBER, it remains less clear on potential relationships between DBER and the discipline of science education.

Some of the historical claims in the report also cloud attempts to pin down DBER or understand its intellectual roots. Historians may question particular claims put forth in the report and be concerned about overgeneralizations. For example, empirical, quantitative research on undergraduate learning of chemistry and biology was well under way in the 1930s (e.g., Hollister, 1939), yet the report makes clear that "true DBER" (p. 20) only emerged in the 1970s through the 1990s. Rather than attempting to reframe historical contributions, the report could have summarized the contributions that different disciplines (e.g., science education, educational psychology) historically have made to the study of undergraduate learning (see Rudolph, 2008).

Despite these weaknesses, the report is an important contribution to science education. First, the number of new hires in postsecondary science education is increasing dramatically (Bush et al., 2013), and more science educators need to be aware of this national trend. Second, recent work acknowledges the low quality of educational research being conducted in undergraduate science education (e.g., see criticisms by Ruiz-Primo, Briggs, Iverson, Talbot, & Shepard, 2011; Campbell and Nehm, 2013), and the report discusses the challenges of establishing research norms for scientists with little academic preparation in science education. Third, the report is likely to spark discussion and debate about the disciplinary structure of science education, how research efforts should be organized and funded, and whether DBER researchers should receive formal training in science education.

In closing, given the endorsement of the NRC, it is likely that “DBER” is here to stay. Indeed, scientists, postsecondary educational organizations (e.g., the Society for the Advancement of Biology Education Research, or SABER), and governmental reports have already begun adopting “discipline-based” language. Time will tell whether the invention of a new academic discipline—and the unavoidable academic fragmentation that comes with it—will be more beneficial to students, or to select groups of academics and educational stakeholders. But what is clear is that the disciplinary structure of science education is evolving, and practitioners who identify with the traditional field of science education must think seriously about how their intellectual contributions are envisioned by new communities of practice.

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DOI 10.1002/sce.21091

Published online in Wiley Online Library (wileyonlinelibrary.com).