

Editorial: Focused Collection: Astronomy Education ResearchJanelle M. Bailey¹ and Julia D. Plummer²¹*Temple University, Philadelphia, Pennsylvania 19122, USA*²*Pennsylvania State University, University Park, Pennsylvania 16802, USA* Published 15 June 2018DOI: [10.1103/PhysRevPhysEducRes.14.010004](https://doi.org/10.1103/PhysRevPhysEducRes.14.010004)

It is our pleasure to introduce this Focused Collection on Astronomy Education Research (AER). One of the challenges in conducting and publishing in AER is the wide variety of outlets where existing literature can be found. For example, the Resource Letter by Bailey and Slater [1] includes publications in 29 peer-reviewed journals in addition to books, conference proceedings, and dissertations/theses; Lelliott and Rollnick's [2] 35-year review includes many of the same works but also cites studies in 22 additional journals. *Astronomy Education Review* was a central location for astronomy education research during its 12-year existence, but closed in 2013.

The desire to continue to support the AER community was part of the impetus behind the Focused Collection. The *Physical Review Physics Education Research* (PRPER) Editorial Board approved the idea in June 2016. A call for papers was issued on August 12, 2016 [3] and resulted in 51 proposal submissions, which was about twice as many as we had originally hoped for—an exciting development for the field.

The proposals were reviewed by at least one of the guest editors and two advisory board members. Sixteen proposals were encouraged to submit a full paper and eleven proposals received “submit with reservations” responses indicating specific concerns that would need to be addressed in the manuscript.

Nineteen full manuscripts were received by the due date of May 15, 2017. Each manuscript was reviewed by one advisory board member plus two to three additional reviewers and guided through the process by one of the two guest editors, with consultations with the PRPER Editor and Managing Editor as needed. At the end, we are pleased to announce that there are 14 papers in this collection.

The present collection demonstrates the expansive, rich, and varied nature of what we call astronomy education research and allows for many pathways to be forged in the future. The first two contributions to the collection are review articles. Laci Brock and colleagues reviewed the literature on students' understanding of cosmological time and propose a framework for improving instructional efforts [4]. Merryn Cole and colleagues reviewed the literature on spatial thinking in astronomy education research and recommend future directions for research and curriculum development [5].

The remaining dozen articles are empirical in nature and are discussed in alphabetical order. Daniel Barringer and colleagues investigated the effectiveness of using video games for instruction in an online introductory astronomy course [6]. Jennifer Blue studied the views about the nature of science held by introductory astronomy students [7]. Sanlyn Buxner and colleagues investigated the links between introductory astronomy students' knowledge, beliefs, and science literacy [8].

Arturo Colantonio and colleagues developed a learning progression about stars and stellar properties [9]. Kim Coble and colleagues continued in their exploration of students' understanding of cosmology, focusing here on what astronomers mean by the curvature of the Universe [10]. Silvia Galano and colleagues investigated the use of different types of visual representations in helping students learn about common astronomical phenomena [11].

Allison Gonsalves conducted an ethnographic case study of two women astrophysics doctoral students to better understand the challenges faced during their program [12]. Rommel Miranda and colleagues used the Baltimore Project ASTRO program to better understand what characteristics are held by astronomers and educators within effective partnerships [13].

Luisa Rebull and colleagues explored the motivations of teachers who participate in a NASA-sponsored, year-long research experience [14].

Colin Wallace and colleagues followed up previous work on the Light and Spectroscopy Concept Inventory by employing item response theory to further refine the instrument [15]. Jennifer Wilhelm and colleagues described the results of middle school teacher professional development in terms of teachers' understanding of motion, scale, and geometry within the Sun-Earth-Moon system [16]. Michelle Wooten and colleagues explored the impacts of bringing authentic research experiences into undergraduate astronomy coursework [17].

This Focused Collection offers the AER community ideas for productive lines of research. Multiple authors recommended future research around how to design and use visualizations and representations to support learning in astronomy [4,11,12]. Other authors highlighted methodological challenges that need to be addressed to make progress on pressing questions in astronomy education research. Two papers in this focused collection call for the increased use of longitudinal research methods [9,12]. Mixed-methods research—combinations of in-depth qualitative and quantitative analyses—is important for any study of innovative methods of instruction in Astronomy 101 [6]. AER should also expand to new research topics. Spatial thinking in astronomy is an important area that would benefit from rigorous experimental research [5]. Student motivation and related constructs are also currently underdeveloped in the context of AER [14,16,17].

Of course, these are not the only possible research directions for AER. There are many areas in which we can continue to make contributions to the broader literature, and we hope that PRPER will continue to be a resource and publication outlet for such contributions in the future.

We would like to thank Editor Charles Henderson and the PRPER Editorial Board for supporting this Focused Collection. Managing Editor Debbie Brodbar went above and beyond in helping us through the submission, review, and publication processes. Our collection's advisory board members—Sanlyn Buxner, Andy Elby, Tom Foster, Doug Lombardi, and Shannon Willoughby—were instrumental in helping us and the authors produce high quality work. Finally, we want to thank all of the authors who submitted proposals and manuscripts for making this collection a success.

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