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**Using The Results From Research on Undergraduate Learning in Cosmology to Create an Immersive
Web-Based Curriculum**
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Powerful new observations and advances in computation and visualization have led to a revolution in our understanding of the structure, composition, and evolution of the universe. These gains have been vast, but their impact on education has been limited. We are bringing these tools and advances to the teaching of cosmology through research on undergraduate learning in cosmology as well as the development of a series of web-based cosmology learning modules. In addition to the open-ended written surveys administered at multiple institutions, additional data from a single minority-serving institution includes in-depth student interviews, homework assignments, lab responses, and exams gathered throughout an introductory astronomy course. Topics include the structure, composition, and evolution of the universe as in the open-ended surveys, with an additional study of student perceptions of distances. Results are consistent with the surveys at the beginning of the course and indicate that while students do make strides toward scientific understanding over the semester, they frequently retain some critical misunderstandings. Furthermore, results indicate that using “authentic” lab experiences with “real” data can address the common student pre-course ideas that scientific conclusions are simply “made up.” Informed by our research on student learning, we have created a series of cosmology learning modules in which students master the scientific concepts and reasoning processes that lead to our current understanding of the universe, through interactive tasks, prediction and reflection, experimentation, and model building.