

Astronomy Education Review

2011, AER, 10, 010301-1, 10.3847/AER2011013

Good Reading from Other Sources on Astronomy Education and Outreach (Published in 2010)

Andrew Fraknoi

Foothill College, Los Altos, CA 94022

Received: 04/9/11, Accepted: 04/11/11, Published: 05/6/11

© 2011 The American Astronomical Society. All rights reserved.

Abstract

We present our sixth annotated listing of readings about astronomy education and outreach that appeared during the previous calendar year in publications other than *Astronomy Education Review*. To keep things manageable, we only cover readings directly related to astronomy (even though there are many articles about physics, geology, or chemistry education that could easily be applied to astronomy classrooms.) Only contributions that are in published journals and magazines (as opposed to newsletters or web bulletins) are listed. Suggestions for additions to the list are most welcome.

1. Papers and Articles on K-12 Astronomy Education

Barrier, R. 2010, "Astronomical Misconceptions," *Physics Teacher*, 48, 319. Pre-tests and post-tests on astronomical topics were given to 98 teachers who took 10-hour workshops on astronomical topics. Understanding improved, but many misconceptions remained. (May 2010)

Blown, E. and Bryce, T. 2010, "Conceptual Coherence Revealed in Multi-modal Representations of Astronomy Knowledge," *International Journal of Science Education*, 32, 31. A brief narrative description of the journal article, document, or resource. The astronomy concepts of 345 young people studied over a 10-year period using a multi-media, multi-modal method. Results support the theory of "conceptual coherence" over "knowledge-in-pieces".

Fidler, C. and Dotger, S. 2010, "Twinkle, Twinkle Little Star, How I Wonder Where You Are," *Science Scope*, 34 (3), 38. Outlines a lesson plan for using 3-dimensional models to illustrate the varying distances between Earth and the stars in Orion. (Nov. 2010)

Hannust, T. and Kikas, E. "Young Children's Acquisition of Knowledge about the Earth: A Longitudinal Study," *Journal of Experimental Child Psychology*, 107(2), 164. Followed 143 children ages 2-3 for 3 years to see how their mental model of the Earth developed and could be challenged. (Oct. 2010)

Hobson, S. *et al.* 2010, "Using a Planetarium Software Program to Promote Conceptual Change with Young Children," *Journal of Science Education and Technology*, 19(2), 165. 21 children ages 7-9 were interviewed before and after using *Starry Night* software and inquiry based activities to learn concepts related to the appearance of the Moon in the sky. Conceptual understanding increased despite how abstract the concepts were for that age group. (Apr. 2010)

Lee, V. 2010, "How Different Variants of Orbit Diagrams Influence Student Explanations of the Seasons," *Science Education*, 94, 985. Used 652 written surveys of 9th grade students to determine whether illustrations depicting Earth's orbit as highly elliptical contribute to misconceptions about the seasons. Despite earlier suggestions, elongation of the orbit was not found to have an effect, though other features of diagrams may.

Lelliott, A. and Rollnick, M. 2010, "Big Ideas: A Review of Astronomy Education Research 1974–2008," *International Journal of Science Education*, 32, 1771. Analysis of 103 peer-reviewed journal articles published between 1974–2008 (with a number of important ones from AER included and a few left out); most describe conceptions in astronomy, 40% investigated interventions. Authors make suggestions for future research directions.

Lidar, M., Almqvist, J. and Ostman, L. 2010, "A Pragmatist Approach to Meaning Making in Children's Discussions about Gravity and the Shape of the Earth," *Science Education*, 94, 689. How children make meaning of the shape of Earth and gravity and how artifacts can help with 2nd and 4th/5th grade classes.

Plummer, J. and Krajcik, J. 2010, "Building a Learning Progression for Celestial Motion: Elementary Levels from an Earth-based Perspective," *Journal of Research in Science Teaching*, 47(7), 768. Synthesis of previous research on elementary and middle-school students' knowledge of apparent celestial motion topics and learning trajectories. Uses a learning progression framework to analyze how students learn a big idea in science.

Price, A. and Lee, H. 2010, "The Effect of Two-Dimensional and Stereoscopic Presentation on Middle School Students' Performance on Spatial Cognition Tasks," *Journal of Science Education and Technology*, 19(1), 90. Flat and stereo representations of the same concepts were tried on 19 middle-school students visiting a planetarium. Their accuracy was the same, but things took longer with those working with stereo. (Feb. 2010)

Shen, J. and Confrey, J. 2010, "Justifying Alternative Models in Learning Astronomy: A Study of K-8 Science Teachers' Understanding of Frames of Reference," *International Journal of Science Education*, 32, 1. Most of 14 teachers believed that the geocentric model should not be used in instruction. Their long-held beliefs, lack of observational experience, and resistance in switching between two models made it difficult for them to have a deep understanding of the relationship of the two models.

Stinner, A. and Metz, D. 2010, "The Flight of the Space Shuttle Discovery (STS-119)," *Physics Teacher*, 48(3), 162. Uses a Shuttle mission's data to suggest a series of exercises and activities on realistic space flight. (Mar. 2010)

Sun, K., Lin, C. and Wang, W. 2010, "A 3D Virtual-Reality Model of the Sun and the Moon for E-learning at Elementary Schools," *International Journal of Science and Mathematics Education*, 8, 689. Four classes of Taiwanese 4th graders (N=128) were split, and one group received instruction using a virtual reality model. Pre/post test results and an attitudinal survey favored the use of the VR based instruction over the traditional.

Trundle, K. C., Atwood, R. K., Christopher, J. E., and Sackes, M. (2010). "The effect of guided inquiry-based instruction on middle school students' understanding of lunar concepts." *Research in Science Education*. 40, 451-478. Pre- and post-instructional interviews were used to investigate the impact of guided-inquiry instruction about the phases of the Moon on 20 eighth-grade students. (May 2010)

Wise, S. 2010, "Climate Change in the Classroom: Patterns, Motivations, and Barriers to Instruction Among Colorado Science Teachers," *Journal of Geoscience Education*, 58, 297. Discusses results of a survey of 628 middle- and high-school science teachers. (Nov. 2010)

2. Papers and Articles on College Astronomy Education

Fons, J. 2010, "A Year without Paper: Tablet Computers in the Classroom," *Physics Teacher*, 48, 481. Although not exactly about astronomy, this article may show a glimpse of our future. A general physics class was conducted entirely using a Windows tablet, on which students could write and make diagrams using an electronic stylus.

Gunter, R. *et al.* 2010, "Cosmic Collaboration in an Undergraduate Astrophysics Laboratory," *American Journal of Physics*, 78(10), 1035. Lessons learned during the first offering of a lab component of an intermediate astrophysics course at the University of Wisconsin-River Falls are discussed. (Oct. 2010)

Krisciunas, K. 2010, "Determining the Eccentricity of the Moon's Orbit without a Telescope," *American Journal of Physics*, 78(8), 834. An advanced activity, using a piece of cardboard with a small hole in it, which

slides up and down a yardstick, to show that it is possible to determine the eccentricity of the Moon's orbit. (Aug. 2010)

LoPresto, M. 2010, "Comparing a Lecture with a Tutorial in Introductory Astronomy," *Physics Education*, 45 (2), 196. On the development and use of a lecture tutorial on comparative planetology, and testing it versus a lecture-only control group. (Mar. 2010)

LoPresto, M. *et al.* 2010, "Assessment of a Solar System Walk," *Physics Teacher*, 48, 236. Using a pre-test and post-test to evaluate the effectiveness of a scale model solar system on campus in teaching about relative size and distance. (Apr. 2010)

Macica, A. 2010, "Observatories on the Web," *Sky & Telescope*, 119(3), 36. Compares four services that allow you to rent and use telescopes via the Web. (Mar. 2010)

Miller, B. and Brewer, W. 2010, "Misconceptions of Astronomical Distances," *International Journal of Science Education*, 32, 1549. An open-ended response format was used to compare 83 US undergraduate students' concepts of astronomical distance.

Newbury, P. 2010, "Exploring the Solar System with a Human Orrery," *Physics Teacher*, 48, 573. Discusses making a model of the solar system with students moving on scaled orbits as part of an introductory class. (Dec. 2010)

Plummer, J., Zahm, V. and Rice, R. 2010, "Inquiry and Astronomy: Pre-service Teachers' Investigations in Celestial Motion," *Journal of Science Teacher Education*, 21(4), 471. Knowledge of celestial motion measured before and after 18 education graduate students in an elementary science methods course designed and conducted their own investigations.

Sadler, P. and Night, C. 2010, "Daytime Celestial Navigation for the Novice," *Physics Teacher*, 48(3), 197. Lab activities to determine latitude and longitude from observations of the Sun. (Mar. 2010)

Trundle, K. *et al.* 2010, "The Use of Computer Simulations to Promote Conceptual Change: A Quasi-Experimental Study," *Computers & Education*, 54(4), 1078. Compared three methods of helping 157 pre-service teachers understand moon phases: *Starry Night* software alone, nature observations alone, or both. The three approaches produced the same effect on conceptual change. (May 2010)

3. Papers or Articles on Astronomy Outreach

Arcand, K. *et al.* 2010, "Surveying Aesthetics & Astronomy: A Project Exploring the Public's Perception of Astronomical Images and the Science Within," *Communicating Astronomy with the Public Journal*, issue 10, 13. Brief introduction to an online survey about multi-wavelength astronomy imagery and what it revealed. (Dec. 2010)

Cappelli, V. and Di Benedetto, C. 2010, "Celestial Themed Cartoons Captivate Children," *Communicating Astronomy with the Public Journal*, issue 10, 22. Describes collaboration between a research institute and Disney in Italy, creating a kit distributed to 30,000 children. Completely "show-and-tell" with no evaluation, but interesting ideas. (Dec. 2010)

Carbon, C. 2010, "The Earth is Flat when Personally Significant Experiences with the Sphericity of the Earth are Absent," *Cognition*, 16(1), 130. People were asked to estimate the distance to six cities on different continents and were interviewed. Those who had some personal experience with a round Earth did better in estimating distances, while those that didn't seem to make estimates compatible with the notion of a flat Earth.

Chaple, G. 2010, "Engaging Astronomy Teens," *Astronomy*, 38(9), 13. Column on projects and ideas to get teenagers interested in astronomy. (Sep. 2010)

Ciotti, J. 2010, "Museums and Planetariums: Bridging the Gap between Hawaiian Culture and Astronomy through Informal Education—A Case Study," *Forum on Public Policy*, 2010(2), 1. Describes a science center's

attempt to bring together scientists and native Hawaiian leaders over the issue of the use of Mauna Kea for astronomy. Available on the web at: <http://forumonpublicpolicy.com/spring2010.vol2010/spring2010archive/Ciotti.pdf>

Creighton, J. and Martell, S. 2010, "Constellations for All: Studying Identification Techniques," *The Planetarian*, 39(2), 20. Examines the responses of 355 planetarium visitors to assess what techniques are most useful to help people learn constellation patterns. (Jun. 2010)

Fonseca, R. and Russo, P. 2010, "Astronomy and Space Science in Portuguese Popular Newspapers at the End of the 20th Century," *Communicating Astronomy with the Public Journal*, issue 8, 30. Analysis of coverage in 1,971 articles in one newspaper from 1976 to 1999. Not many profound discoveries, but points the way for future research. (Jun. 2010)

Geller, H. and Frazier, W. 2010, "Assessing Planetarium Programs for Contents and Pedagogy," *The Planetarian*, 39(2), 9. Two university researchers recount how they did an evaluation of a K-12 planetarium facility for a county and what some general consideration of such evaluations might be. (Jun. 2010)

Hesser, J. *et al.* 2010, "An Initial Retrospective on the International Year of Astronomy 2009 in Canada," *Journal of the Royal Astronomical Society of Canada*, 104, 51. Overview of project undertaken and some lessons learned.

Keel, W. 2010, "Welcome to the Galaxy Zoo," *Astronomy*, 38(9), 30. Describes a citizen science program in which volunteers classify galaxies – and, now, other astronomical phenomena. (Sep. 2010)

Larsen, K. 2010, "Planetariums and the 2012 Hysteria," *The Planetarian*, 39(1), 13. On the claims of doom for 2012 being circulated on the web and in the media and how planetaria can help. (Mar. 2010)

Morrison, D. 2010, "Disinformation about Global Warming," *Skeptical Inquirer*, 34(2), 48. Frequent points made by those who try to argue against the reality of global warming and how educators can answer them. (Mar/Apr. 2010)

Morrison, D. 2010, "The Storms Over Climate Change," *Skeptical Inquirer*, 34(6), 54. Planetary scientist David Morrison reviews three key books about the understanding-of-science issues related to climate change and some of the political reasons why there is a controversy. (Nov/Dec. 2010)

Shanahan, M. 2010, "Making it Better: A Case Study of Improving a Planetarium Show through Formative Evaluation," *The Planetarian*, 39(1), 8. Using audience feedback to improve a public presentation. (Mar. 2010)

Vertesi, J. 2010, "Tweeting Spacecraft: Communicating Space Science in the Age of Web 2.0," *Communicating Astronomy with the Public Journal*, issue 10, 30. Explores the use and misuse of social media like Twitter to communicate space mission news and results. (Dec. 2010)

4. Books on Astronomy Education and Outreach

Asbell-Clark, J. *et al.* 2010, *Investigating Astronomy*. Armonk, New York: It's About Time Publishing. While we don't regularly include astronomy textbooks in this listing, this volume is sufficiently different to merit special consideration. It is a manual for a high-school course in astronomy built up from hands-on activities, investigations, group work, etc. It's an attempt to put into practice the results of the kinds of astronomy education research that is chronicled in the pages of *Astronomy Education Review*.

Bailey, J., Slater, S. and Slater, T. 2011, *Conducting Astronomy Education Research: A Primer*. New York, NY: W. H. Freeman. This concise volume is a superb introduction to the ideas and practice of research design, interpretation, and publishing. Should be on the desk of everyone thinking of writing a paper for this journal. Although the copyright date is 2011, it was published and distributed in 2010.

Barnes, J. *et al.*, eds. 2010, *Science Education and Outreach: Forging a Path to the Future*. San Francisco: Astronomical Society of the Pacific Conference Series vol. 431. Proceedings of a conference on astronomy education and outreach held in 2009, with 550+ pages of papers and panel transcripts.

deLeon, M. *et al.*, eds. 2010, *Mathematics and Astronomy: A Joint Long Journey*. College Park: American Institute of Physics Conference Proceedings, vol. 1283. Proceedings of a conference held in Madrid in Nov. 2009, with several chapters about education.

Acknowledgments

I would like to thank Janelle Bailey, John Percy, Chuck Fidler, and Mary Kay Hemenway for suggesting papers and articles to include in this survey. Special thanks are due to Erin Dokter and Julia Plummer, who compiled impressive lists of possible references and annotations, some of which I have adapted and included in this guide.

ÆR

010301-1–010301-5