MOOSE: Menu of Outreach Opportunities for Science Education

Developed for the AAS Astronomy Ambassadors Program by Andrew Fraknoi

Online: https://aas.org/outreach/moose-menu-outreach-opportunities-science-education

Contents

I. How to Be an AAS Astronomy Ambassador
   A. Outreach Training Programs at Other Scientific Organizations.................................2
   B. A Few Projects Already Being Done by Young Astronomers ....................................3
   C. General Presentation Techniques for Outreach........................................................3
   D. Miscellaneous Sites Useful for Outreach..................................................................4

II. Where to Be an AAS Astronomy Ambassador
   A. Types of Places & Finding Aids for Each Type.........................................................5
   B. Education Pages at Astronomy Organizations..........................................................7
   C. Examples of Outreach Options at Specific Astronomy Departments.........................7

III. What to Do as an AAS Astronomy Ambassador
   A. Where to Find Good Astronomy Activities.............................................................8
   B. Sites Where Public Astronomy Questions Are Answered ........................................10
   C. A Few Selected Sites for Finding Good Astronomical Images ..................................10
   D. Some Key Resources to Read About Astronomy Education and Public Outreach......11
   E. How to Evaluate Educational Programs ....................................................................14
I. How to Be an AAS Astronomy Ambassador

I. A. Outreach Training Programs at Other Scientific Organizations

- American Chemical Society
  - Science Coaches Program (chemists doing outreach)
    https://www.acs.org/content/acs/en/education/outreach/science-coaches.html

- American Geological Institute
  - Visiting Geoscientists: An Educational Outreach Guide for Geoscience Professionals (a useful booklet, with nice checklists for going into classrooms)
    http://www.agiweb.org/education/aapg

- American Physical Society
  - Outreach Guide (ideas and tips for physicists who want to do outreach)

- Astronomical Society of the Pacific
  - Project ASTRO (a program to train professional and amateur astronomers to adopt a classroom for a year and partner with 4th – 9th grade teachers)
    https://www.astrosociety.org/education/k12-educators/project-astro/
  - Family ASTRO (trains leaders to work with families using astronomy games and activity kits)
    https://www.astrosociety.org/education/k12-educators/family-astro/
  - Astronomy from the Ground Up (trains museum, nature center, and natural parks educators to do astronomy activities)
    https://www.astrosociety.org/education/parks-museums/
  - Night Sky Network (program to train amateur astronomers to do outreach)
    https://nightsky.jpl.nasa.gov/

- National Academies
  - Project RISE (Resources for Involving Scientists in Education; no longer active, but with interesting examples)
    http://www.nationalacademies.org/RISE/
  - Sharing Science with Children: Survival Tips for Your Classroom Visit (a very nice couple of pages on specific things to think about if you go into a classroom)
    http://www.nationalacademies.org/RISE/roles1a.htm

- National Girls Collaborative Project (a national network working to encourage girls to get involved in science and math)
  http://ngcproject.org/

- Oceanography Society
  - Education and Public Outreach (helpful booklet for scientists)
Pacific Science Center
- Portal to the Public (a national project started by the Pacific Science Center on training scientists to be effective outreach partners for science museums)
  http://popnet.instituteforlearninginnovation.org/

PBS SciGirls Program
- SciGirls Seven (a colorful and thought-provoking booklet from the PBS TV program on techniques for getting girls involved in science; the ideas apply to everyone)
  http://www.scigirlsconnect.org/scigirls/

Sandia National Laboratory
- Science Education in Our Elementary and Secondary Schools: A Guide for Technical Professionals Who Want to Help (a comprehensive guide that discusses the realities and pros and cons of different roles for scientists in our schools)
  http://www.nas.edu/rise/scied.htm

Society of Physics Students
- Science Outreach Catalyst Kits (SOCKS) Program
  https://www.spsnational.org/programs/outreach/science-outreach-catalyst-kits

TechBridge (a program that connects scientists and girl-scout groups; founded by Chabot Science Center in Oakland)
  https://techbridgegirls.org/index.php?id=420

I. B. A Few Projects Already Being Done by Young Astronomers

- Astronomy Live! (at UCLA) http://www.astro.ucla.edu/content/astronomy-live/
- Center for Astrophysics Science Research Mentoring Program (Harvard & Smithsonian)
  https://projects.iq.harvard.edu/shrimp/people
- Curious About Astronomy: Ask an Astronomer (Cornell) http://curious.astro.cornell.edu/
  (see also the Cornell Graduate Students Network http://dev1.astro.cornell.edu/graduate-student-network.html)
- Dark Skies, Bright Kids (U. of Virginia) http://faculty.virginia.edu/DSBK/
- Engage: The Science Speaker Series and Seminar (U. of Washington)
  http://courses.washington.edu/engageuw/about/
- Evenings Under the Stars (George Mason U.) https://cos.gmu.edu/observatory/

I. C. General Presentation Techniques for Outreach

- Better Conference Talks (an excellent web page by Emily Lakdawalla of the Planetary Society)
- Communicating Science: Tools for Scientists and Engineers (a basic tutorial website from the AAAS)
  https://www(aaas.org/programs/communicating-science
Communicating Science: Giving Talks (a booklet full of practical tips on public speaking to a variety of audiences, from the Burroughs Wellcome Fund)

http://science.sciencemag.org/content/285/5433/1527

How to Write a Boring Scientific Paper (hints by a biologist that apply to all scientific writing and presentations) http://onlinelibrary.wiley.com/doi/10.1111/j.0030-1299.2007.15674.x/pdf


Understanding Science (a nice site about explaining the scientific method to the public by the University of California Museum of Paleontology — but applicable to all science outreach) https://undsci.berkeley.edu/index.php

What Makes an Astronomy Story Newsworthy (concise, useful list by Rick Fienberg)
https://aas.org/media-press/what-makes-astronomy-story-newsworthy

I. D. Miscellaneous Sites Useful for Outreach

- SciStarter Site has a catalog of citizen science projects that are appropriate for school age kids https://scistarter.com/index.html
- NASA Wavelength (a catalog of NASA education and outreach resources that have been through NASA’s version of peer review) https://science.nasa.gov/learners/wavelength
- Satisfying the NSF Broader Impacts Criterion (explains some ways that NSF proposals can say that they benefit society at large; this is the selfish reason for being an ambassador) http://www.nsf.gov/pubs/2002/nsf022/bicexamples.pdf
- Cherilynn Morrow’s Papers for SSI on the Roles Scientists Can Play in Outreach http://www.spacescience.org/Education/extra/resources_scientists_cd/index.html
- Many Experts, Many Audiences: Public Engagement with Science (and Informal Science Education) (an 83-page report on how to get the public not just interested in, but engaged with, science — especially where there is controversy) https://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1011&context=eth_fac
- Surrounded by Science: Learning Science in Informal Environments by Marilyn Fenichel and Heidi A. Schweingruber; 2010, National Academies Press (summarizes research about how best to help people learn science outside the formal classroom) https://www.nap.edu/catalog/12614/surrounded-by-science-learning-science-in-informal-environments
II. Where to Be an AAS Astronomy Ambassador

II. A. Types of Places, with Finding Aids for Each Type

- **Elementary schools, middle schools, high schools**
  - To find a school near you, look for your local school district under the local government pages of a phone book or community website

- **Community colleges**
  - They are listed geographically on the American Association of Community Colleges College Finder [https://www.aacc.nche.edu/college-finder/](https://www.aacc.nche.edu/college-finder/)

- **Planetariums**

- **Observatories or other research facilities open to the public**
  - These are best found by asking astronomers and astronomy educators in your own area.

- **Science museums**
  - To find a science center/museum near you, see the Association of Science-Technology Centers’ Find a Science Center tool [https://www.astc.org/about-astc/about-science-centers/find-a-science-center/](https://www.astc.org/about-astc/about-science-centers/find-a-science-center/)

- **Nature and environmental centers**
  - To find a nature center near you, go to Wikipedia’s list of nature centers in the United States and click on your state’s list [https://en.wikipedia.org/wiki/List_of_nature_centers_in_the_United_States](https://en.wikipedia.org/wiki/List_of_nature_centers_in_the_United_States)

- **Science cafés**
  - Website by NOVA and WGBH-TV lets you find a café in your area [http://www.sciencecafes.org/](http://www.sciencecafes.org/)

- **Science festivals**
  - Science Festivals Alliance (lets you find a science festival near you) [https://sciencefestivals.org/](https://sciencefestivals.org/)
Scouts, 4H clubs, and other youth groups
- Boy Scouts (scroll down to see groups for different ages) https://beascout.scouting.org/
- Girls, Inc. https://girlsinc.org/find-girls-inc/
- 4H Clubs https://4-h.org/get-involved/volunteer/

National, state, and regional parks (some have, some want evening sky/astronomy programs)
- Find-a-Park Page of the National Park Service https://www.nps.gov/findapark/index.htm
- National Parks with Night Sky Programs https://www.nps.gov/subjects/nightskies/stargaze.htm
- Locator for State Parks, State by State https://www.stateparks.com/index.html#findPark

Summer camps
- Astronomy Camp at the University of Arizona http://www.astronomycamp.org/
- Astrocamp in Idyllwild, California http://astrocampschool.org/
- There are also a number of space-oriented camps around the country, although they tend to be more about astronauts than astronomers.

Afterschool programs
- The Afterschool Alliance lists activities by state http://www.afterschoolalliance.org/policyStateMap.cfm
- NASA Afterschool Universe (has resources and training) https://imagine.gsfc.nasa.gov/educators/programs/au/

Amateur astronomy clubs
- Astronomical League Club Directory https://www.astroleague.org/societies/all

Service clubs
- Service clubs sponsor weekly gatherings for business and other professionals, with speakers giving 20-minute talks. They are often looking for speakers who can give accessible public talks on a topic of general interest. To find a club near you, see, for example:
  - Lions Clubs Directory https://directory.lionsclubs.org/
- Kiwanis Club Locator http://locator.kiwanis.org/FindAClub
- Elks Club Lodge Directory https://www.elks.org/lodges/

- Public libraries
  - STARNet Libraries Project at Space Science Institute (science programs for public libraries) https://www.starnetlibraries.org/

- School or regional science fairs
  - Virtual Library of Science Fairs http://physics.usc.edu/~gould/ScienceFairs/

II. B. Education Pages at Astronomy Organizations

- American Geophysical Union https://education.agu.org/
- Canadian Astronomical Society https://casca.ca/?page_id=155
- Center for Astronomy Education (University of Arizona and NASA/JPL-Caltech) https://astronomy101.jpl.nasa.gov/
- International Astronomical Union Commission C1, Astronomy Education & Development http://iaucc1.frm.utn.edu.ar/
- International Astronomical Union Commission C2, Communicating Astronomy with the Public https://www.communicatingastronomy.org/
- National Optical Astronomy Observatory https://www.noao.edu/education/
- Society of Physics Students https://www.spsnational.org/programs/socks

II. C. Examples of Outreach Options at Specific Astronomy Departments

- Institute for Astronomy at the University of Hawaii (a good list as a sample of what such institutions can do) http://www.ifa.hawaii.edu/ifa2/outreach.shtml
- University of Texas Graduate Student Outreach Opportunities http://www.as.utexas.edu/astronomy/education/outreach.html
Public Outreach at the University of Virginia Astronomy Dept.
http://astronomy.as.virginia.edu/public_outreach

New Mexico State University Graduate Student Public Outreach
http://astronomy.nmsu.edu/agso/obsout.html

Columbia University Astronomy Dept. Public Outreach

University of Chicago Dept. of Astronomy & Astrophysics Outreach Programs
http://astro.uchicago.edu/outreach/programs.php

University of Wisconsin Astronomy Dept. Outreach http://www.astro.wisc.edu/the-public/


University of Washington Astronomy Dept. Outreach http://depts.washington.edu/astron/outreach/

Ohio State University Astronomy Dept. Outreach https://astronomy.osu.edu/outreach

Penn State University Astronomy Dept. Outreach http://astro.psu.edu/public-outreach

### III. What to Do as an AAS Astronomy Ambassador

#### III. A. Where to Find Good Astronomy Activities

Beyond the ASP’s *The Universe at Your Fingertips 2.0* ([https://myasp.astrosociety.org/product/DV122/the-universe-at-your-fingertips-20-dvd-rom](https://myasp.astrosociety.org/product/DV122/the-universe-at-your-fingertips-20-dvd-rom) which includes 133 selected activities) and *More Universe at Your Fingertips* ([https://myasp.astrosociety.org/product/BO123/more-universe-at-your-fingertips](https://myasp.astrosociety.org/product/BO123/more-universe-at-your-fingertips) which contains 25 additional activities), there are many other collections available on the Web. If you are looking for good activities to use in a K-12 classroom, open night, museum, fair, or family outreach setting, check out this sampling:

- American Association of Variable Star Observers Activities [https://www.aavso.org/education](https://www.aavso.org/education)
- Andrew Fraknoi’s Activities [http://www.fraknoi.com/articles-books/classroom-activities-on-astronomy/](http://www.fraknoi.com/articles-books/classroom-activities-on-astronomy/)
- Astronomical Society of the Pacific Hands-on Activities on the Web [https://www.astrosociety.org/education/hands-on-astronomy-activities/](https://www.astrosociety.org/education/hands-on-astronomy-activities/)
- Blue Marble Matches (Earth and planet comparisons) [https://www.windows2universe.org/teacher_resources/AGU-NESTA_GIFT/2012/Graff/2012_GIFT_BlueMarble.pdf](https://www.windows2universe.org/teacher_resources/AGU-NESTA_GIFT/2012/Graff/2012_GIFT_BlueMarble.pdf)
- Center for Astrophysics | Harvard & Smithsonian Resources [https://www.cfa.harvard.edu/resources/educators.html](https://www.cfa.harvard.edu/resources/educators.html)
- CERES Project (U. of Montana) [http://btc.montana.edu/ceres/html/EdActivities.html](http://btc.montana.edu/ceres/html/EdActivities.html)
- Dennis Schatz’s Activities [http://dennisschatz.org/activities.html](http://dennisschatz.org/activities.html)
- Everyday Classroom Tools (Center for Astrophysics) [http://hea-www.harvard.edu/ECT/thrcontents.html](http://hea-www.harvard.edu/ECT/thrcontents.html)
- Exploratorium Hands-on Activities [https://www.exploratorium.edu/explore/activities](https://www.exploratorium.edu/explore/activities)
- Galileoscope Education Resources (for use with the Galileoscope refractor kit) [http://galileoscope.org/resources/](http://galileoscope.org/resources/)
- Hands-on Optics Project [http://spie.org/education/education-outreach-resources/hands-on-optics?SSO=1](http://spie.org/education/education-outreach-resources/hands-on-optics?SSO=1)
- How to Smile (an oddly named guide to activities from various educational organizations) [https://www.howtosmile.org/topics/astronomy](https://www.howtosmile.org/topics/astronomy)
- Kepler Mission Educators Activities [https://www.nasa.gov/kepler/education/formal](https://www.nasa.gov/kepler/education/formal)
- Lunar & Planetary Institute Activities [https://www.lpi.usra.edu/education/resources/](https://www.lpi.usra.edu/education/resources/)
- Mars Exploration Activities [https://mars.nasa.gov/participate/marsforeducators/](https://mars.nasa.gov/participate/marsforeducators/)
- McDonald Observatory Activities (U. of Texas) [http://mcdonaldobservatory.org/teachers/classroom](http://mcdonaldobservatory.org/teachers/classroom)
- Modeling the Universe Activities (CfA) [https://www.cfa.harvard.edu/seuforum/mtu/](https://www.cfa.harvard.edu/seuforum/mtu/)
- NASA List of Educational Publications (including Educator Guides) [https://www.nasa.gov/audience/foreducators/topnav/materials/A-Z_Pubs.html#I](https://www.nasa.gov/audience/foreducators/topnav/materials/A-Z_Pubs.html#I)
- National Optical Astronomy Observatory Activities [https://www.noao.edu/education/teachers.php](https://www.noao.edu/education/teachers.php)
- Night Sky Network Demos and Activities [https://nightsky.jpl.nasa.gov/download-list.cfm](https://nightsky.jpl.nasa.gov/download-list.cfm)
- Paper Plate Education (“Serving the Universe on a Paper Plate”) [http://analyzer.depaul.edu/paperplate/activities.htm](http://analyzer.depaul.edu/paperplate/activities.htm)
- Planetarium Activities for Successful Shows (Lawrence Hall of Science) [http://www.planetarium-activities.org/](http://www.planetarium-activities.org/)
- Science Education Gateway (Space Sciences Lab, U. of California, Berkeley) [http://cse.ssl.berkeley.edu/SegwayEd/index.html](http://cse.ssl.berkeley.edu/SegwayEd/index.html)
- Seeing in the Dark Activities (PBS-TV) [http://www.pbs.org/seeinginthedark/for-teachers/](http://www.pbs.org/seeinginthedark/for-teachers/)
- Solar Science (by Schatz & Fraknoi) Sample Activities [http://static.nsta.org/pdfs/samples/PB403Xweb.pdf](http://static.nsta.org/pdfs/samples/PB403Xweb.pdf)
III. B. Sites Where Public Astronomy Questions are Answered

- Ask an Astronomer at Lick Observatory (Graduate students and staff members at this California observatory answered selected astronomy questions, particularly from high school students.) [http://www.ucolick.org/~mountain/AAA/](http://www.ucolick.org/~mountain/AAA/)
- Ask an Astronomer (A site that was run by Caltech’s center for infrared astronomy; it let kids submit questions and read the answers to questions other kids have asked. Does not accept new questions.) [http://coolcosmos.ipac.caltech.edu/asks](http://coolcosmos.ipac.caltech.edu/asks)
- Ask the Astronomer (This site, run by astronomer Sten Odenwald, is no longer active but lists 3,001 answers to questions asked in the mid-1990s, nicely organized by topic.) [http://sten.astronomycafe.net/faqs/](http://sten.astronomycafe.net/faqs/)
- Ask the Experts at PhysLink (Lots of physics questions answered, with some astronomy as well, at this physics education site. Most answers are by physics teachers, not astronomers. Still taking new questions.) [https://www.physlink.com/Education/AskExperts/index.cfm](https://www.physlink.com/Education/AskExperts/index.cfm)
- Curious About Astronomy (An ask-an-astronomer site run by graduate students and professors of astronomy at Cornell University. Has searchable archives and is still answering new questions.) [http://curious.astro.cornell.edu/](http://curious.astro.cornell.edu/)
- Ask an Astrophysicist (Questions and answers at NASA’s Laboratory for High-Energy Astrophysics focus on x-ray and gamma-ray astronomy, and such objects as black holes, quasars, and supernovae.) [https://imagine.gsfc.nasa.gov/ask_astro/index.html](https://imagine.gsfc.nasa.gov/ask_astro/index.html)
- Ask an Astrobiologist (On this site from the National Astrobiology Institute at NASA, astronomer David Morrison answers questions about the search for life on other planets, the origin of life on Earth, and many other topics.) [https://astrobiology.nasa.gov/ask-an-astrobiologist/](https://astrobiology.nasa.gov/ask-an-astrobiologist/)
- Ask an Infrared Astronomer (A site from Caltech, with an archive focusing on infrared (heat-ray) astronomy and the discoveries it makes about cool objects in the universe. No longer taking new questions.) [http://coolcosmos.ipac.caltech.edu/cosmic_classroom/ask_astronomer/faq/index.shtml](http://coolcosmos.ipac.caltech.edu/cosmic_classroom/ask_astronomer/faq/index.shtml)
- Ask the Space Scientist (An archive of questions about the Sun and its interactions with the Earth, answered by astronomer Sten Odenwald. Not accepting new questions.) [https://image.gsfc.nasa.gov/poetry/ask/askmag.html](https://image.gsfc.nasa.gov/poetry/ask/askmag.html)

III. C. A Few Selected Sites for Finding Good Astronomical Images

- Hubble Space Telescope Images [http://hubblesite.org/categories/news](http://hubblesite.org/categories/news) (See also the European Space Agency’s Hubble page: [https://www.spacetelescope.org/images/](https://www.spacetelescope.org/images/))
National Optical Astronomy Observatory Image Gallery
https://www.noao.edu/image_gallery/ (See also the photos from NOAO’s Advanced Observing Program for nonprofessional guest observers: https://www.noao.edu/kpvc/observers/bestof.html)


European Southern Observatory Photo Gallery https://www.eso.org/public/images/

Isaac Newton Group of Telescopes Image Gallery
http://www.ing.iac.es/PR/images_index.html

Canada-France-Hawaii Telescope Images (Some remarkable color images from a major telescope on top of the Maunakea peak in Hawaii.)
http://www.cfht.hawaii.edu/HawaiianStarlight/HawaiianStarlight-Archive.html

Spitzer Infrared Space Telescope Image Gallery http://www.spitzer.caltech.edu/images

Chandra X-ray Observatory Images (Growing collection of images that show the universe as seen through “x-ray eyes.”) http://chandra.harvard.edu/photo/category.html

Gemini Observatory Images https://www.gemini.edu/gallery?option=com_gallery

National Radio Astronomy Observatory Image Gallery https://public.nrao.edu/gallery/

Multiwavelength Astronomy Gallery (Shows same astronomical objects in different bands of the spectrum.)
http://coolcosmos.ipac.caltech.edu/cosmic_classroom/multiwavelength_astronomy/multiwavelength_museum/gallery.html

NASA Human Spaceflight Image Gallery on Flickr (Here is where to find the great astronaut images from the different missions.) https://www.flickr.com/photos/nasa2explore/albums

NASA Images https://images.nasa.gov/ (See also the NASA Flickr site: https://www.flickr.com/photos/nasacommons/albums)

Quasars and Active Galactic Nuclei (From astronomer William Keel at the University of Alabama.) http://pages.astronomy.ua.edu/keel/agn/

SOHO Satellite Images of the Sun https://sohowww.nascom.nasa.gov/

Solar Dynamics Observatory Images of the Sun https://sdo.gsfc.nasa.gov/gallery/main/

TRACE Satellite Images of the Sun https://sdo.gsfc.nasa.gov/gallery/main/

III. D. Some Key Resources to Read About Astronomy Education and Public Outreach

Books & E-Books

Asbell-Clarke, Jodi, et al., Investigating Astronomy (https://ia.terc.edu). 2010, It’s About Time Publishers. This is an activity-based high-school astronomy textbook, which Suzy Gurton (now at NRAO, formerly at the ASP) had a hand in developing. Put together by TERC, a non-profit educational organization, and supported by the National Science Foundation.


Online Articles

American Astronomical Society Astronomy Education Board, “An Ancient Universe: How Astronomers Know the Vast Scale of Cosmic Time” (Booklet for teachers and those who work with them on how we have measured the age of the cosmos and how to respond to religious claims that the Earth and the universe are much younger.) [https://aas.org/files/resources/An_Ancient_Universe.pdf](https://aas.org/files/resources/An_Ancient_Universe.pdf)


Fraknoi, Andrew, “Unheard Voices: The Astronomy of Many Cultures” (a compilation of resources to teach about the astronomy of non-western cultures.) [http://multiverse.ssl.berkeley.edu/multicultural](http://multiverse.ssl.berkeley.edu/multicultural)

Helfand, David, “Surviving the Misinformation Age” from *Skeptical Inquirer*, May/June 2017. (Former AAS President Helfand writes eloquently and angrily about how to deal with times when alternate facts and realities seem to get lots of public affirmation.) [https://www.csicop.org/si/show/surviving_the_misinformation_age](https://www.csicop.org/si/show/surviving_the_misinformation_age)

Impey, Chris, et al., “Non-Scientific Beliefs Among Undergraduate Students” in *Astronomy Education Review*, 2012. (A multiyear, multicampus study of over 11,000 undergraduates underscores how resistant they are to changing beliefs that we would consider to be outside the bounds of science.) [http://dx.doi.org/10.3847/AER2012016](http://dx.doi.org/10.3847/AER2012016)


Entradas, Marta & Bauer, Martin, “Bustling Public Communication by Astronomers Around the World Driven by Personal and Contextual Factors” in Nature Astronomy, 26 Nov. 2018. (A survey of 2,600 members of the IAU about their outreach work. Not free, but often available through academic libraries. We include this because it may help you to show a supervisor or oversight committee that outreach is more accepted as part of what astronomers do than some may suppose.) https://www.nature.com/articles/s41550-018-0633-7

Online Journals/Magazines/Newsletters

- *Astronomy Education Review* (journal formerly published by the AAS; link points to an index of the 255 papers published over its 12-year run) https://aas.org/teach/subject-index-papers-astronomy-education-review-2001-2013
- *Communicating Astronomy with the Public Journal* (published by the IAU Office for Astronomy Outreach) https://www.capjournal.org/
- *The Universe in the Classroom* (the ASP newsletter on teaching astronomy in grades 3-12) https://www.astro society.org/publication/universe-in-the-classroom/
- Resource Guides for Astronomy Education and Outreach (from Andrew Fraknoi) http://www.fraknoi.com/resource-guides-on-astronomy-education/
- *Journal of Astronomy and Earth Sciences Education* (as of 2014, a journal that publishes refereed papers that significantly contribute to the scholarly understanding of cutting-edge issues across science education) http://clutejournals.com/index.php/JAESE

III. E. How to Evaluate Educational Programs

Key Documents [start with these]

and specific ideas and includes chapters on evaluating exhibits, mass media, youth and community programs, learning technologies, and collaborations.)


- Elements of a Program Evaluation (A concise introduction to and checklist for evaluation, from the NASA IDEAS Program.) http://ideas.stsci.edu/Evaluation.shtml


Specific Web-based Articles Related to Astronomy Evaluation

- Bailey, Janelle & Slater, Timothy, “Finding the Forest Amid the Trees: Tools for Evaluating Astronomy Education and Public Outreach Projects” in *Astronomy Education Review*, vol. 3, issue 2, p. 47. (Although the examples in this nice primer are drawn from evaluating teacher training workshops, there is basic information here on evaluation that can be useful for other kinds of projects as well.) http://dx.doi.org/10.3847/AER2004016

- Brogt, Eric, et al., “Regulations and Ethical Considerations for Astronomy Education Research” (3-part article) in *Astronomy Education Review*, vol. 6, issue 1, p. 43 (http://dx.doi.org/10.3847/AER2007004); vol. 6, issue 2, p. 99 (http://dx.doi.org/10.3847/AER2007021); vol. 7, issue 2, p. 57 (http://dx.doi.org/10.3847/AER2008020). (Under recent law, important issues arise when you interview or observe human subjects in any kind of research. This article sets out the issues and gives examples, including one from an informal learning setting.)

- Dussault, Mary, “How Do Visitors Understand the Universe?” (Some studies testing the understanding of astronomical concepts — rather than mere factoids — by museum visitors.) http://www.astc.org/resource/visitors/universe.htm See also:


Stroud, Nicholas, et al., “Toward a Methodology for Informal Astronomy Education Research” in *Astronomy Education Review*, vol. 5, issue 2, p. 146 (http://dx.doi.org/10.3847/AER2006023). (Proposes a technique called “action evaluation” and shows how it can be used in museums.)

A Few Useful General Websites on Science Education Evaluation

- Informal Science Website Evaluation Page (This is a website for informal science education professionals, funded by NSF. Their evaluation page has a number of good general resources and a number of finished evaluation reports specific to astronomy and physical science.) [http://www.informalscience.org/evaluation/](http://www.informalscience.org/evaluation/)
- National Girls Collaborative Project: Evaluation and Assessment (This page summarizes and points to a variety of resources for evaluation.) [https://ngcproject.org/evaluation-assessment](https://ngcproject.org/evaluation-assessment)
- Online Evaluation Resource Library (Funded by NSF, this is a repository of documents and plans for evaluation professionals.) [https://oerl.sri.com/](https://oerl.sri.com/)
- Visitor Studies Association Archives (This is a place you can search the past publications of this organization, devoted to the systematic study of how their audiences perceive and use museums.) [http://vsamatrix.msu.edu/index.php](http://vsamatrix.msu.edu/index.php)

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