StarDate

Frank N. Bash Visitors Center

Teacher-Professional Development

K-12 Student Programs

Photo credit: Ethan Tweedie Photography
2014 Education and Outreach Report:
Bridging the Gap in Science Education

McDonald Observatory’s founding mission — to join the world’s best institutions in astronomical research, and to ignite the public’s imagination toward astronomy — is as relevant today as it was more than 75 years ago when the Observatory was first established as a result of a private bequest.

Through the innovation of engineers and scientists, Texas astronomers are undertaking astronomy’s most pressing research. Using instruments like the Hobby-Eberly Telescope and the future Giant Magellan Telescope, they are working to uncover the mysteries of the universe and to answer the most basic questions that science can explore — including questions that examine the very beginning of time. Just as scientific discovery will add richly to humanity’s understanding of complex phenomena like dark energy and how the universe began, the public has the opportunity to engage in the same quest and learn as astronomers do through science education and outreach.

Each year, the McDonald Observatory Education and Outreach Office invests millions of dollars in programs for the public, students, and teachers. These strong ties to the public, coupled with outstanding programs and services, are what make McDonald Observatory one of the world’s best astronomy centers.

As we work to improve astronomy education over the airwaves, online, at the Frank N. Bash Visitors Center in West Texas, and through distance-learning, your partnership is a gift that is helping the next generation gain ground in science, technology, engineering, and mathematics (STEM).

The following report includes information on the outcomes of your partnership in 2014 and how, together, we are giving students of all ages the best access to astronomy and space science.
**StarDate:**
A National Flagship Astronomy Program

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The Lynn Lyles Brill Education and Outreach Endowment

With additional support from the Friends of McDonald Observatory

Listeners nationwide have been tuning in to StarDate since 1978, making it America’s longest-running science program to date. A National Science Foundation grant helped McDonald Observatory create and launch it, and generous support from corporate and individual sponsors has helped sustain and grow the program’s outreach to the community.

Throughout 2014, StarDate aired on more than 300 radio stations across the U.S. Among those are 244 National Public Radio stations. Broadcast daily, StarDate gives listeners the insider’s view of the night sky. It explains astronomy as researchers are making discoveries today, and it provides up-to-date astronomy news concerning space missions and findings. StarDate has grown to include accessibility via podcasts and apps such as iTunes and Stitcher Radio.

The StarDate Web site provides K-12 teachers with resources that may be incorporated into classroom curricula, and it connects the public with videos, images, and informational guides that concern studies of the universe and how to see the stars from their own backyard.

**Audiences at a Glance**

**Radio**
2,100,000 listeners a day
337+ radio stations

**Magazine**
7,500 readers in U.S., and
75,000 pass along readership

**Web**
6,500,000 pageviews/year
StarDate.org

**Podcasts and downloads**
More than 4,000,000 downloads/year

**Project Share Texas**
1,000,000 teachers and students online

**Social media**
More than 40,000 fans

StarDate gives listeners the insider’s view of the night sky. It explains astronomy as researchers are making discoveries today.
McDonald Observatory celebrated 75 years in 2014 and used the historical event as another way to connect audiences of all ages with space science and its education and outreach mission. West Texas locals attended events such as Special Viewing Nights, the West Texas Open House, and science talks held in the area. An astronomy lecture series was held in cities throughout Texas and drew more than 1,750 guests over 13 events; and an interactive blog allowed visitors to share their personal histories about McDonald Observatory.

Through a successful crowd-sourcing campaign, many friends and fans helped ensure that the 82-inch Otto Struve Telescope model made its way back to the Lone Star State to be shared there. First on exhibit at the Bob Bullock Texas State History Museum in Austin, the Warner & Swasey model ended the 75th year on exhibit in the Frank N. Bash Visitors Center, where it remains on display.

Ranked as a top destination in Texas and the U.S., the Observatory’s Frank N. Bash Visitors Center takes the monumental West Texas night sky and shares it — along with its astronomy expertise, resources, and knowledge — with more than 80,000 visitors a year.

In 2014, a new video about the Observatory, called “Illuminating the Darkness,” was created for use in the Frank N. Bash Visitors Center which teaches visitors about cosmology and the Observatory’s current research. The exhibit hall at the visitors center was updated to include an exhibit called “Do Stars Have A Life?”; and a record number of visitors attended Star Parties, Solar Viewings, and telescope tours.

The visitors center is the home of McDonald Observatory’s K-12 programs for teachers and students, and it’s where astronomy comes alive just about every day of the year.

The McDonald Observatory Web site — McDonaldObservatory.org — offers a landing place for online visitors who are eager to learn about the cosmos, and through the use of social media, McDonald Observatory is connecting with a diverse and growing audience worldwide.

### Social Media Audiences

- **Facebook**: More than 20,000 fans
- **YouTube**: More than 580 videos
- **Twitter**: More than 1,600 followers
- **Flickr**: More than 2,600 photos
Teacher Development:
Making Inroads in the Classroom and Out

Each summer, McDonald Observatory’s K-12 education team welcomes elementary and secondary teachers to West Texas for multi-day, immersion-style professional-development workshops in a number of areas of study.

This teacher-training program is a favorite among science educators, and through the program teachers may earn 20 or more continuing-education credits. Many teachers who start out as workshop participants grow deeper ties with the Observatory and go on to work with the education team to co-facilitate other professional-development workshops for continued exposure to astronomy and science.

Nearly 300 Teachers Trained — In summer 2014, 85 teachers attended on-site workshops and engaged in a packed, live-work type of schedule for astronomy instruction which could also be shared with their home schools. Additionally, the Observatory presented shortened professional-development workshops for 200 teachers at the 2014 Conference for the Advancement of Science Teaching (CAST) in Dallas. And 20 teachers, through a program at Sul Ross State University in Alpine, Texas, participated in professional development about astronomy via videoconference.

Student Impact — More than 2,000 teachers have participated in McDonald Observatory workshops over the last decade. Because each teacher works with 100 students a year on average, graduates of McDonald Observatory teacher-professional development workshops have gone on to provide enhanced science instruction for more than two million* students.

Many teachers who start out as workshop participants grow deeper ties with the Observatory and go on to work with the education team ... for continued exposure to astronomy and science.

<table>
<thead>
<tr>
<th>Summer 2014 Teacher-Professional Development Workshops</th>
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<tbody>
<tr>
<td>Date</td>
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<tr>
<td>June 14-18</td>
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<tr>
<td>June 19-21</td>
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<td>June 23-25</td>
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<td>June 29-July 1</td>
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<td>July 8–10</td>
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</table>

*Figure assumes annual teacher attrition rate at 15%.
Teacher Development: Making Inroads in the Classroom and Out

Special Support From:
- Albert and Ethel Herzstein Charitable Foundation
- Communities Foundation of Texas
- Joe and Lucy Parsley
- McDonald Observatory education and outreach endowments

No matter the medium, McDonald Observatory’s professional-development workshops help teachers by giving them instruction in space science and content that aligns with National Science Education Standards (NSES), the Next Generation Science Standards, and Texas Essential Knowledge and Skills (TEKS). The extras they receive include the chance to interact with astronomers, tour the research facilities, observe the dark night sky, and form a network of peers and experts with whom they can confer and collaborate long after the workshop is over.

As the teachers themselves remark in evaluations, it’s the entirety of the workshop that inspires them to teach students about astronomy and space science with purpose and passion year-round.

Teacher Workshop Comments

“I have taught for 15+ years and this workshop will rank in the top-three staff development experiences. . . . Thank you!” —Worlds Beyond Our Solar System

“To all responsible for making the workshop available: Thank you. . . . I learned new techniques for my classroom plus a lot of new information to pass on to my students. I enjoyed staying here and getting to ‘rub elbows’ with the experts.” —Arlington, Texas

“This is the most valuable professional development — connecting science teachers with scientists. Thank you for making this possible!” —St. Louis, Missouri

“Great presentation. I love how you . . . meet us where we are and take us further.” —Worlds Beyond our Solar System (CAST)

1 teacher trained = 100 students a year benefit from that teacher’s new educational and instructional knowledge in science.
Teacher Development:
K-12 Education and the Giant Magellan Telescope

Among the many partners involved in the extraordinary project to build the Giant Magellan Telescope in Chile, McDonald Observatory began the work of connecting teachers with the GMT last year. Through a professional-development workshop offered at McDonald Observatory June 29-July 1, and a shortened workshop conducted at CAST in the fall, 35 secondary teachers participated in professional development about the GMT in 2014. They learned about the instrument’s powerful research capabilities and its application in science, technology, engineering, and mathematics (STEM).

Teachers learned how to conduct hands-on activities with their students to make rigorous science concepts tangible and understandable. They explored stars, galaxies, the origin of the universe, and the GMT itself and were trained in how to give students the same kind of awe-inspiring opportunities to learn about science as astronomers have.

The learning experiences I will take back to my students will have a tremendous impact.

—Rockwall, Texas

Thank you so much for supporting this workshop! The information and wonder I received has inspired and educated me and will do the same for my students. I hope to continue an association with both McDonald and GMT!

—Fort Worth, Texas

“I plan to use the universe expansion activity, and I plan to share the additional training opportunities with colleagues. I enjoyed hearing about real collaborative efforts [between UT and Texas A&M] and will share that information with my students.” —GMT workshop (CAST)

Special Support From:

GMT Organization

For every professional-development workshop that McDonald Observatory offers, an outside evaluation is conducted based on teacher comments and feedback. The report for the 2014 workshops includes summative and formative evaluation and overwhelmingly indicates participants’ favor for the workshops and for how they positively affect the participants’ ability to teach science in the classroom.
K–12 Student Programs:
Encouraging a Direct STEM Connection

Special Support From:
Communities Foundation of Texas
Meyer Levy Charitable Foundation
Permian Basin Area Foundation

Across the board, students in the U.S. are less likely to choose careers in fields like science and engineering than their counterparts worldwide. For this reason, encouraging students’ early engagement with STEM and providing frequent experiences with hands-on, inquiry-based science is paramount when addressing the science-education gap in the U.S.

Because astronomy is so often considered a gateway science that inspires students to become interested in STEM fields, McDonald Observatory delivers videoconference and on-site programs to address this need. The inquiry-based lessons interest students in science just as they foster hands-on science experiences.

In 2014, more than 14,500 students in Texas and the U.S. participated in McDonald Observatory programs on site and via videoconference.

McDonald Observatory also continued serving students from low-income areas surrounding McDonald Observatory through the K-12 West Texas Scholarship Program. Through foundation funding, more than 400 students attended an interactive field trip at the Observatory and became acquainted with the academics of science as well as the excitement.

Texas public schools and teachers face the challenge of engaging students who traditionally have not been drawn to STEM fields and who are from under-served areas. As is the case nationwide, the future of Texas depends on changing that tradition.

Encouraging students’ early engagement with STEM and providing frequent experiences with hands-on, inquiry-based science is paramount when addressing the science-education gap in the U.S.
K–12 Student Programs:
Encouraging a Direct STEM Connection

The “Live From McDonald Observatory” Astronomy Day program was held over seven days for more than 13,000 students. Nationwide, students from Alaska, Arizona, California, Kansas, Nebraska, New Hampshire, New Jersey, New York, North Carolina, Ohio, Oklahoma, Texas, Virginia, Wisconsin, and Washington participated. Through McDonald Observatory’s K-12 programs, students interact with science and learn from those who work in the field each day.

Letters From the Teachers

Dear Mr. Wetzel,

You have done it again — totally engaged and amazed our classes every day. Thank you for this fun and wonderful peek into astronomy. The lessons you presented about the sun were right on target giving our students “mega-more” than our carefully selected books and dedicated teachers could ever accomplish alone. . . . I loved the respect and encouragement you gave all the “young scientists doing science” with you each day. Astronomy Day was an amazing week of learning here. Thank you so much for your generous gift to our students at Mustang Valley Elementary.

—Media Technology Director, Mustang, Oklahoma

Dear Mr. Wetzel,

I would like to take this time to thank you for the wonderful opportunity you gave my students. It was a wonderful learning experience that will last them a lifetime. We really appreciate the lesson you provided and we hope to continue observing future lessons.

Respectfully, Ms. C., Kindergarten teacher

Astronomy Day Connections Across Texas

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<th>City</th>
<th>No. classrooms</th>
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<td>R20</td>
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K–12 Student Programs:  
2014 Astronomy Day Program Evaluations

Evaluations for the “Live From McDonald Observatory” Astronomy Day programs rely on teacher feedback in answering ten questions about various aspects of the program, as well as their students’ interaction with the content before, during, and after the videoconference lesson is presented.

Respondents may select answers according to choices which include “strongly agree,” “agree,” “do not agree nor disagree,” “disagree,” or “strongly disagree.”

Of the evaluations received, an overwhelming majority of teachers agreed or strongly agreed that their students were engaged with the videoconference program. They also indicated high satisfaction with the communication and program expectations leading up to the event, and remarked that Astronomy Day enhanced classroom teaching and curriculum about astronomy in ways that are otherwise not possible in class.

Teacher Evaluation Questions

1. Communication about the program was timely, and I knew what to expect and how to prepare my students.
2. My students were engaged during the program.
3. I used one or more of the suggested pre-conference materials with my class.
4. The program provided enhanced my classroom instruction and the curriculum.
5. The videoconference session illustrated astronomy in ways not possible in my classroom.
6. The presenter used appropriate teaching techniques for my students.
7. I plan to use one or more of the suggested post-conference materials with my class.
8. Both the video and audio connection of the presentation was clear and not distorted.
9. I use NASA materials such as lesson plans, images, websites and/or posters.
10. I would schedule a different program with this content provider.

Teacher Evaluation Comments

“The presenter relates well to the students. He makes it easy to understand.”

“I would use NASA materials if I knew how to get them/if they were made available to me. The kids loved the visuals.”

“Thanks for the concrete examples of light/heat. My students enjoyed the demonstration of magnetic field.”

“Presenter was energetic and excited about the material and helped relay the information to students.”

“It was extremely informational!”

“Very clear, amazing, engaging. . . . Students really appreciated being mentioned and addressed directly — thanks. Your enthusiasm is priceless!”

The evaluations are instrumental in determining effectiveness and usefulness of the pre- and post-videoconference resources that McDonald Observatory offers to participating teachers. Most teachers report that they use the resources in addition to the videoconference. Teachers may also write lengthier comments to evaluate the program in more depth.
Acknowledgments:
The Legacy of Partnership

McDonald Observatory works on behalf of students, teachers, and the general public and finds its success thanks to the generous support of individuals, foundations, and corporate sponsors. In 2014, the Education and Outreach budget consisted of more than $519,000 in gifts. Endowment support of $891,412 created $41,652 in funding and ensures support in perpetuity.

Contributions from the Friends of McDonald Observatory provide reliable funding for the Observatory’s education and outreach mission. At more than 1,000 members strong, the Friends donors show a love of astronomy just as they encourage others’ participation in it. Of the Friends of McDonald, members of the Orion Circle and Orion Circle Supernova committed extra generous support for education and outreach.

McDonald Observatory, including its scientists, staff members, and education team, gratefully acknowledge all donors who bolstered its work and mission in 2014.

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Semmes Foundation
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The Hugh Ragg Educational Endowment
The Lynn Lyles Brill Education and Outreach Endowment
The Leopold Tedesco Educational Endowment
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