

Implementing an education and outreach programme for the Gemini Observatory in Chile

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Abstract. Beginning in 2001, the Gemini Observatory began the development of an innovative and aggressive education and outreach programme at its southern hemisphere site in northern Chile. A principal focus of this effort is centered on local education and outreach to communities surrounding the observatory and its base facility in La Serena, Chile. Programmes are now established with local schools using two portable StarLab planetaria, an internet-based teacher exchange called StarTeachers and multiple partnerships with local educational institutions. Other elements include a CD-ROM-based virtual tour that allows students, teachers and the public to experience the observatory's sites in Chile and Hawaii. This virtual environment allows interaction using a variety of immersive scenarios such as a simulated observation using real data from Gemini. Pilot projects like "Live from Gemini" are currently being developed which use internet video-conferencing technologies to bring the observatory's facilities into classrooms at universities and remote institutions. Lessons learned from the implementation of these and other programmes will be introduced and the challenges of developing educational programming in a developing country will be shared.

Keywords. Gemini Observatory, astronomy outreach and education, Chile

1. Introduction

The Gemini Observatory is an international partnership of seven countries including the United States, United Kingdom, Canada, Chile, Australia, Brazil and Argentina. Gemini consists of twin 8-metre optical/infrared telescopes located at two of the best locations on our planet for astronomical research: Hawai'i and Chile. Together these telescopes can access the entire sky.

The Gemini South telescope is located at an elevation of over 2 700 metres on a mountain in the Chilean Andes called Cerro Pachn. This location is about 20 kilometres from the long-established Cerro Tololo Inter-American Observatory (CTIO) which is operated by the U.S. National Optical Astronomical Observatory (NOAO). The Frederick C. Gillett Gemini North Telescope is located on Hawaii's Mauna Kea and is part of the international community of observatories that have been established there to take advantage of the superb atmospheric conditions on this long dormant volcano that rises over 4 000 metres into the dry, stable air of the Pacific.

Both of the Gemini telescopes have been designed to take advantage of the latest technology and thermal controls to excel in a wide variety of optical and infrared capabilities. One example of this is the unique Gemini coating chamber that uses "sputtering" technology to apply protected silver coatings on the Gemini mirrors to provide unprecedented infrared performance.

Gemini's progressive instrument programme keeps the observatory at the cutting edge of astronomical research. By incorporating technologies such as laser guide stars,

multi-conjugate adaptive optics and multi-object/integral-field spectroscopy, Gemini is well-suited for investigating the most challenging questions in astronomy today.

The Gemini telescopes have been integrated with modern networking technologies to allow remote operations from control rooms at the base facilities in Hilo and La Serena Chile. With the flexibility of “queue scheduling”, researchers anywhere in the Gemini partnership will be assured the best possible match between observation, instrument and observing conditions.

2. Gemini outreach programme

The technology of operating the Gemini telescopes is also integral to many of our education/outreach programmes and experiences. Such an ambitious scientific endeavour requires sustainability, and this is why Gemini has implemented a multi-faceted public information and outreach (PIO) programme at both sites. The Gemini PIO effort provides each community with diverse and innovative educational resources and programming designed to encourage the implementation of science within the local school curriculum, motivate students to study astronomy, create awareness (and actions) about light pollution/dark skies and share our exploration of the many unsolved questions about our universe with both our local and international communities.

Gemini has consistently put considerable effort into educational programming for the two host communities (Hawaii and Region IV of Chile). This has resulted in an increased awareness in our local communities of the benefits of having state of the art observatories nearby, and created consciousness about preserving dark skies to allow other scientific projects to take place in the future.

However, having two telescopes located so far apart gives Gemini a unique set of circumstances that need to be considered when implementing any educational programming. These circumstances also provide a powerful combination of resources and synergies that allow for the development of innovative programmes that are not available to other institutions.

3. Outreach at Gemini South in Chile

Of the two Gemini telescopes, I will focus on Gemini South due to its location in Chile. The country of Chile provides a compelling backdrop given the country’s geography, economy and political history. So, how does Gemini fit into this backdrop?

Chile is quite well known for many things, including its wine, skiing, and Easter Island, but the scientific community is probably most familiar with the extraordinary conditions that parts of Chile provide for astronomical observations. As an active participant in the local Chilean community it is our responsibility to make sure that local citizens are aware of how extraordinarily fortunate we are to have the natural resources of clear, dark skies and low humidity. In addition Chile’s stable economy and supportive political environment combine to make it possible for international organizations like Gemini to build their astronomical research centres in Chile.

How does Chile benefit from hosting an observatory facility like Gemini? What are the jobs that are available to Chileans at an astronomical observatory? What training and education is necessary to participate in this work? What can students do now to prepare for the type of work at an institution like Gemini? What are the other economic and educational benefits that come from our presence? These are just a few of the many issues that need to be shared with our local communities.

Given Chile's long and thin geography it is frequently said that any project in Chile needs to be adapted to the area or region where it is located. This is one of the biggest and most challenging issues that the PIO department has had to face when a new programme is planned and launched.

Two StarLab portable planetariums have been utilized for educational programming at Gemini South for the past five years. When they were purchased, the instructions clearly stated that the equipment would provide the best experience in a carpeted, air-conditioned room. If that was the case, the programmes would not have been able to run more than three times a year. Instead, the Chilean staff decided to leave one of the StarLab in the city area and one exclusively to cover the remote country locations and other regions in Chile. It is not rare to access the schools riding a horse, mule or the city hall special transportation, and if not outside, to be under an improvised netting. The StarLab programme has also run inside a church, the only local building big enough (barely) to hold the portable planetarium.

When visiting the native Mapuches in the south of Chile, the rain and mud made it impossible to set up outside the schools, so they accommodated the StarLab inside their local hospital.

Teachers have always been Gemini's best link to educate students and families with new approaches in astronomy. Once a year about 30 to 40 teachers are trained in basic astronomy, and they are assisted by Gemini's staff throughout the school year in order to provide the best resources and educational experiences for their students. The Gemini Observatory has profoundly impacted teachers that have participated in Gemini's StarTeachers teachers' exchange programme. This programme has been offered twice to date, and six Chilean teachers have participated in this in-depth exchange with teachers in Hawai'i.

During the StarTeachers exchanges, the participating educators made reciprocal visits to Gemini host communities (in Chile and Hawai'i), and were given the opportunity to experience the execution of Gemini's astronomical research programmes while sharing insights on each other's culture and educational systems. The teachers also presented live, interactive video-conference classes between their home and partner's students using Gemini's Internet2 technologies.

Beginning in 2005 the Astronomical Society of the Pacific's FamilyAstro programme is also being implemented in Chile. In this programme teachers are trained in different modules that later are introduced at events at each school for the students to share with their families. These events have always been a success, not only in the number of interested families that want to attend the workshops, but also because the families take their kits home and continue playing different games while learning and reinforcing many astronomical concepts.

4. Gemini virtual tours and CD-ROM

One of the major attractions that Gemini provides to any interested resident is a tour/visit to our sites. Unfortunately, because of its high altitude and thin air, children in Hawaii and people younger than 16 years of age are unable to visit the Gemini North telescope. In response to this, Gemini created a virtual tour that provides anybody with access to a computer with CD-ROM capabilities the ability to virtually visit the Gemini telescopes.

This CD-ROM has hours of magnificent photos, animations, videos, and games that enable any user to get the most of the interactive experience. Users can even make a simulated observation using real Gemini data and print a custom image. Currently this

CD-ROM is available in English and Chilean Spanish and a French version is currently under development.

5. Talking to astronomers

For students or anyone who ever wonders what it is like to be an astronomer, or what they are doing at 5 a.m., the 'Live from Gemini' programme can provide some insights. As a pilot programme, 'Live from Gemini' is available to educational groups with access to a high-speed IP address or access to videoconference equipment.

Whether in Chile or Hawaii participants will join a Gemini staff host in one of our control rooms and be able to talk to the astronomers on site and answer any of the questions that students might have wondered about. This is a wonderful opportunity to open the control room doors into the world and allow people to share with scientists events that could be of world-wide interest at that time. An example of this is during the Deep Impact collision with comet Temple I in which students from Chile were able to see and talk with astronomers on Mauna Kea at the same moment the impact was taken place in space and visible from Hawai'i.

In all, education can be a challenging role, but we need to make sure that the current generation of young people are growing up with a new mentality in which they can not only identify a few constellations for fun or deep interest, but also understand the role that science plays in their future, their community and why we need to preserve the resources that we have.

For more information, please visit <http://www.gemini.edu>.

6. Conclusion

The Gemini Observatory provides the astronomical communities in each partner country with state-of-the-art astronomical facilities that allocate observing time in proportion to each country's contribution. In addition to financial support, each country also contributes significant scientific and technical resources.

The national research agencies that form the Gemini partnership include: the US National Science Foundation (NSF), the UK Particle Physics and Astronomy Research Council (PPARC), the Canadian National Research Council (NRC), the Chilean Comisión Nacional de investigación Científica y Tecnológica (CONICYT), the Australian Research Council (ARC), the Argentinean Consejo Nacional de investigaciones Científicas y Técnicas (CONICET) and the Brazilian Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq). The Observatory is managed by the Association of Universities for Research in Astronomy, inc. (AURA) under a cooperative agreement with the NSF. The NSF also serves as the executive agency for the international partnership.