

COLLABORATIVE PLANETARY SCIENCE OUTREACH STRATEGIES: A CANADIAN PERSPECTIVE. G. R. Osinski¹, H. Henry¹, M. Mader¹, L. Thomson¹, A. Gilbert¹, C. Marion¹, A. Papadimos¹, and P. Brown¹, ¹Centre for Planetary Science and Exploration, University of Western Ontario, London, ON, N6A 5B7 Canada (gosinski@uwo.ca)

Introduction: The Centre for Planetary Science and Exploration (CPSX) at The University of Western Ontario (UWO) is initiating a comprehensive outreach and education program focusing on planetary science and exploration. By collaborating with existing organizations and with funding from the Canadian Space Agency and UWO, the program strives to: (1) Encourage young people to learn about the Earth and the Universe by engaging them in activities related to planetary science; (2) Inspire students to consider a career in science by developing their interests in planetary science and exploration; (3) Provide instruction and resources to science teachers to enable them to more easily and accurately teach planetary science and exploration topics; (4) Provide training and teaching experience for graduate students using an inquiry-based problem-based methods.

Approach: The collaboration with community organizations is the central approach for this initiative. Many successful activities have already been developed and delivered by providing training, resources, and leading activities within the community. Currently, the activities being performed can be divided into three broad categories: (1) educational/curriculum based activities, (2) outreach/community based activities, and (3) training.

Education. The educational activities that have taken place are all based on the Ontario curriculum and have been developed with the support of the local school board and teachers. In addition to this collaboration, members from organizations such as Smarter Science and Let's talk Science have also been consulted so as to not duplicate efforts that have already been put into place. Using the approach and material designed by Smarter Science, inquiry-based learning activities have been developed and used in a classroom setting with the support of Grade 9 teachers. The success of these curriculum based activities lies in the collaboration with existing organizations.

Outreach. The outreach activities are generally community based and focus on emphasizing Canadian planetary science to the public. These activities are, once again, carried out in partnership with other organization and affiliations. By liaising with the Department of Astronomy outreach group, "Exploring the Stars (and Planets)" has continued to thrive as a public group observation nights. This activity is also held in collaboration with the London Centre of the Royal Astronomical Society of Canada (RASC). Efforts are

made to set up booths wherever possible. This has been done successfully at UWO during our Discovery Days and Open House and at the Science Teachers Association of Ontario (STAO) Conference in 2010. Future collaboration with the Virtual Researcher on Call (VROC) organization is being planned and possible field work outreach is being discussed with Ontario-based Science Centres. A specific tool that has been developed in collaboration with the Planetary Science Institute is the Explorers Guide to Impact Craters (www.psi.edu/explorecraters) featuring virtual tours of impact sites, simulations, and impact rock kits. Available online, this site allows for anyone to take a tour of an impact crater using their computer and gain knowledge about planetary sciences.



Figure 1: Graduate student, Laura Thomson, presenting the Cratering Activity to a group of Grade 9 students.

Training. Training activities are among the most critical activities of this program. Because this program is being run out of a university centre, the CPSX, it is critical that the students of this centre benefit. Training for graduate students wishing to become Outreach Assistants has been possible in collaboration with the Canadian Space Agency (CSA) via their CSA public speaking program. This collaboration ensures that the students are trained to a standard equivalent to CSA representatives. The training of teachers is also a critical component of the program because it is by training the teacher that a maximum number of students can benefit. Currently teacher training programs and workshops are being developed to make sure that

teachers have the tools necessary to help their students. The CPSX is also collaborating with student teachers at UWO and hopes to have them contribute to the program more steadily in the future.

On-going Activities: The activities related to this program that have already been performed are numerous and span all three categories. Among them are outreach events held at the Cronyn Observatory, at the UWO campus and at a Middle school. The STAO Conference was attended by CPSX graduate students first in 2009 and then again in 2010 when a presentation on the developed inquiry-based lesson plans was presented with a London based high school teacher. In the 2009/2010 school year CPSX graduate students visited some of the local London, Ontario schools to share planetary science activities with the students, lead inquiry-based labs, and help teachers be prepared for the astronomy related sections of the curriculum. Six visits were made on themes varying from lunar phases to impact cratering. Curriculum links for all classroom activities and presentations are available publically and can be found at the CPSX education page (<http://cpsx.uwo.ca/Outreach/learning.html>) to make it easier for teachers to use the educational material.

Case Study – A Cratering Activity: The CPSX web page also contains the lesson plans and activity work sheets for a Cratering Activity. This inquiry-based activity is part of the educational/ curriculum based activities was designed to have students learn by designing their own experiment.



Figure 2: Material used in the Cratering Activity.

As the Cratering Activity is available online, teachers can perform the experiment independently or request the support from a CPSX outreach member. The activity is designed with the following structure: (1) The teacher gives a background presentation (provided by CPSX) which describes crater processes throughout our solar system (specifically comparing Earth to other planets), the consequences of impacts on Earth, the origins of impactors (small bodies) in our solar system, and the mechanical process of an impact. (2) The teacher demonstrates an impact event. Students are to make observations in their lab handout, and sketch what they see. (3) Students (either individually or as a

group, based on abilities) outline the independent variables, and design an experiment. This is conducted in groups after the proposed experiment is approved by the teacher. (4) Students draw conclusions on their experiment, and present results in the lab hand out and to their peers.

Learning outcomes based on the Ontario curriculum have been pre-identified allowing the teachers to know what portion of the curriculum is being taught. Possible unit test questions with answers are also provided to teachers to round off the learning experience and emphasize the key learning objectives.

Results: Forseen benefits for this programme include: increased number of high school students wishing to pursue STEM related studies, increased collaboration between STEM focused education centres in the London, Ontario area, increased outreach collaboration between Canadian Space Sector contributors (both private and public), improved training and teaching abilities among CPSX graduate students, increased public awareness of Canadian Space Programme activities and increased applicants to UWO by encouraging students through classroom presentations and research topics presented. As can be seen from the list of benefits, the impact of this programme has the potential to reach far beyond the students in the classroom.

Future activities: Future activities include increasing the number of activity-based learning themes and modules available, developing and implementing more Teacher Training Courses and workshops, increasing the number of schools that participate to the programme and continuing to participate in the annual Science Teacher's Association of Ontario Conference. Improving communication with all collaborators is extremely important as it is vital to the approach taken by all activities.

It is understood that feedback from students, teachers, and other education based institutions will need to be incorporated to allow the programme to achieve the most success. Feedback, suggestions and collaborators are always welcome to contribute ideas and improve the programme.

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