EDUCATION MATTERS

The Teachers' Mining Tour in Ontario – A Professional Development Program for Educators

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SUMMARY

The Teachers' Mining Tour is a professional development program for educators hosted at the Canadian Ecology Centre (CEC) located near Mattawa, Ontario. Each year in late summer for three years (2010–2012) approximately thirty Ontario teachers participated in a five day program that included presentations by mineral industry professionals, site visits to mines and mine manufacturing operations, and educational resource workshops. In 2013, to meet demand, the Tour program was expanded to include two tours, annually.

The goal of the Tour is to provide teachers with the information and resources that they need to become more proficient Earth Science teachers and to educate their students about the mining industry and, through this increased knowledge and experience, to encourage their students to pursue post-secondary education and careers in Earth Sciences and mining-related disciplines. Additional objectives are to create and cultivate a network of teachers using mining as a theme in their classrooms, and to promote informed opinions amongst participants with regard to the economic, social and environmental aspects of mining. The Tour content focuses on modern mining techniques and technology, environmental responsibility, workplace safety, and mining careers.

Tours consistently receive favourable reviews from teachers, industry participants and representatives from sponsor organizations. In addition to the feedback sought through evaluation forms at the conclusion of each Tour program, additional feedback is sought from participants in the following spring of each academic year. A formal survey is circulated, providing teachers with the opportunity to report back about how their Tour experience is influencing their teaching. Respondents report that they are satisfied with the information and resources that they received during the Tour, that the program is directly applicable to the subjects that they are teaching, and that their perceptions about mining changed because of their experience.

RÉSUMÉ

Le *Teachers' Mining Tour* est un programme de formation pour enseignants qui se tient au Centre écologique du Canada (CEC) situé à Mattawa, Ontario. Chaque année à la fin de l'été depuis trois ans (2010–2012) une trentaine d'enseignants d'Ontario ont participé à ce programme de cinq jours de présentations par des professionnels de l'industrie minérale, de visites de sites miniers et d'usines de transformation, et d'ateliers sur les moyens éducatifs. En 2013, pour répondre à la demande, le programme du *Tour* a été porté à deux sessions par année.

L'objectif de ce *Tour* est de fournir aux enseignants les informations et les moyens éducatifs requis pour devenir des enseignants en sciences de la Terre mieux qualifiés pour instruire leurs élèves sur la réalité de l'industrie minière et, par là, d'encourager leurs élèves à poursuivre une formation postsec-

ondaire et opter pour des carrières en sciences de Terre ou dans les disciplines de l'industrie minière. Ce programme vise aussi d'autres objectifs dont ceux de créer et promouvoir un réseau d'enseignants qui utilisent le thème minier dans leur enseignement, et faire en sorte que les participants en ressortent avec des opinions mieux éclairés sur les aspects économiques, sociaux et environnementaux de l'exploitation minière. Le contenu du *Tour* porte surtout sur les processus et la technologie de l'exploitation minière moderne, l'éco-responsabilité, la sécurité du milieu de travail et les opportunités de carrière dans l'industrie minière.

Ce programme d'activités est systématiquement louangé par les enseignants, les participants d'industrie et les représentants des organismes de parrainage. Le niveau de satisfaction est établi par l'administration de formulaires d'évaluation à la fin de chaque session du programme d'activités, et par les réactions colligées auprès des participants au printemps suivant l'année scolaire. Un sondage formel est soumis aux enseignants dans le but d'évaluer l'impact des activités du *Tour* sur leur enseignement. Les répondants se disent satisfaits des informations reçues et des moyens éducatifs enseignés pendant le *Tour*, confirment que le programme d'activités est directement applicable aux sujets qu'ils enseignent, et que leurs perceptions de l'exploitation minière en ont été changées.

Traduit par le Traducteur

INTRODUCTION

The Canadian Earth Science education and outreach community, and the mining industry share a collective concern with regard to the limited number of students choosing to pursue post-secondary education in Earth Science or mining-related disciplines. These groups have been working separately and collectively toward addressing this concern. One approach is to provide instructional development opportunities to educators so that they are able to teach about Earth Science or the mining industry more effectively, or integrate these themes into other subject areas. The Teachers' Mining Tour in Ontario, a professional development program for educators, is an example of such an opportunity.

The Tour is hosted at the Canadian Ecology Centre (CEC), a non-profit environmental science education facility located in Samuel De Champlain Provincial Park, near Mattawa, Ontario. The Centre provides environmental education to elementary, secondary and post-secondary students and the public, and delivers professional development programs to teachers.

BACKGROUND

Acknowledging the shift in the natural resources sector from forestry toward mining, the CEC became interested in developing and delivering a professional development program for teachers around mining sector themes. The program was modeled after the successful Canadian Institute of Forestry Teachers' Tour that had been delivered by the CEC for many years. Sponsors were approached and in-kind contributions were received, and the proposal was approved. For three years (2010–2012) approximately thirty Ontario teachers participated in a five day program during late summer. The program included presentations by mineral industry professionals, site visits to mines and mine manufacturing operations, and educational resource workshops. The Tour program expanded to include two Tours annually from 2013, reflecting increased demand.

The goal of the Tour is to expose teachers to mining and to provide them with additional information and resources that help them to become more proficient Earth Science teachers. The knowledge and experience gained are passed on to students, encouraging them to pursue post-secondary education and careers in Earth Sciences and mining. Additional objectives are to provide teachers with the opportunity to learn about modern mining, to emphasize the roles that environmental stewardship, sustainability and occupational health and safety play in the sector, and to inform about the wide variety of careers that the sector provides.

The Tour is fully sponsored and available at no cost to teachers. Sponsors include the Ontario Mining Association (OMA), the Canadian Institute of Mining & Metallurgy, Gateway and Sudbury Chapters, and EdGEO. Many OMA member companies contribute content to the Tour, provide access to their operations, and also encourage participation by their professional staff.

TOUR ITINERARY

Since the inception of the Tour, the CEC has worked collectively with sponsors and industry representatives to develop the Tour education program. Although the content varies from year to year, the core theme remains the same: providing educators with the opportunity to learn about mining by participating in a variety of activities including discussions, site visits and hands-on learning. The Tour content and schedules have changed in response to evaluations by participating teachers and comments from other participants and sponsors. An overnight camping trip was added to the program in 2011 and, in 2013, responding to demand and interest from sponsors, the program was expanded to include two annual Tours. Participation was also expanded, making the second Tour available to teachers from across Canada. The content of each Tour differs but includes some common elements. The first Tour continues to focus on operators, mines and manufactures in the Sudbury and North Bay areas, whereas the second Tour focuses on operations in the Timmins area.

Opening Day

The opening day of the program for both Tours starts in the late afternoon at the CEC. It includes an introduction to the facility, the staff and Tour participants, followed by presentations from industry and sponsoring organization representatives which focus on setting the groundwork and context for the Tour. The next two days of the Tour program involve field trips to the Sudbury or Timmins areas.

Sudbury Field Trip

First Day

Morning site visits hosted by Vale include presentations, followed by visits to the Copper Cliff smelter and refinery (Fig. 1). The afternoon has included: a site visit to a small-scale dimension stone operation at the McLaren's Bay Mica Stone Quarry; a geological excursion around the Sudbury Basin, facilitated by the Ministry of Northern Development and Mines, for the purpose of setting the geological context for the

Figure 1. Sudbury reclamation tour in Copper Cliff.

Tour; and an excursion facilitated by Laurentian University professors and members of VETAC, the Vegetation Enhancement Technical Advisory Committee. VETAC is an organization whose focus is the Sudbury Re-greening Program, and this excursion includes visits to sites of historical importance and research re-vegetation plots. In 2014, a site visit to Dynamic Earth, a Sudbury science centre, was added to the program. There, teachers toured mining and geology exhibits and met with a geologist to discuss the formation of the Sudbury Basin and the Sudbury mining camp. Teachers were also provided with an opportunity to learn about the Centre's Education Programming, including school visits and outreach programs, and the role that a science centre can play in support of their teaching. The first day concludes with an overnight camp at Windy Lake Provincial Park.

Second Day

The morning involves a site visit to Glencore's Nickel Rim South Mine (Fig. 2), the most modern mine in the Sudbury Basin, and includes both surface and underground visits. Before returning to the CEC for the evening, the afternoon is spent with a Prospector and Industrial Mineral Consultant at a North Bay sand and gravel pit, where teachers 'stake a claim' and learn about the role government regulations play in mineral resource development.

Timmins Field Trip

First Day

Site visits on the way to Timmins have included stops in New Liskeard, Cobalt and Haileybury, and are followed by a detailed regional geological excursion in the vicinity of Timmins (Fig. 3). The day is capped off with an overnight camp at Kettle Lakes Provincial Park.

Second Day

Site visits include an underground visit to Goldcorp's Dome Mine and a tour of their Coniaurum and Hollinger tailings reclamation sites. The evening of the third day involves travel back to the Canadian Ecology Centre.

Final Two Days

For both Tours, the final full day of the program features hands-on learning training workshops using "Deeper and

Figure 2. Timmins area geology tour.

Figure 3. Going underground at the Nickel Rim South Mine.

Figure 4. Teachers participating in an EdGEO workshop at the Canadian Ecology Centre, 2013.

Deeper" and "Discovering Diamonds" resources (from 'Mining Matters'), and "Bringing Earth Science to Life" and "Putting the Earth into Science" resources (from EdGEO) (Fig. 4). Site visits to North Bay mining manufacturers, includ-

ing Redpath, Cementation, Boart Longyear and Atlas Copco, and a geologically-themed canoe trip on the Mattawa River, a Canadian Heritage River, are also included. Presentations by a non-governmental organization, an environmental scientist or another representative who has worked in aboriginal engagement in the sector also form part of the program.

The final half day of the program is held at the CEC and focuses on the mineral resource development cycle, careers in mining, and innovation in exploration and development. Each of these topics is highlighted by presentations and opportunities for discussion. For example, in 2011 teachers participated in a focus group for the purpose of gathering feedback about education, and outreach resources and needs.

EVALUATIONS

Comprehensive feedback is sought from program participants immediately following the conclusion of each Tour. Teachers are asked to complete detailed evaluation forms that seek feedback about whether the Tour met their expectations, which components of the program they most enjoyed, what new perceptions they gained, how they will use the knowledge that they acquired, and how the Tour could be improved, adapted, or changed to enhance their experience. Opinions are also sought about the specific sites and speakers included in the program. The majority of participants reported that Tours exceeded their expectations and that they provide a thorough introduction to the mining sector. The comments included in evaluations influence the future content of Tour programs.

Follow-up Surveys

Tour sponsors and facilitators became interested in collecting additional feedback from teachers. Of particular interest was to ascertain if teachers were using what they had learned during their Tour in their classrooms, and how. Were they staying connected to the network of teachers and colleagues that they had met on the Tour? As a means of gathering this feedback a comprehensive follow-up survey was designed to be sent out, electronically, in the Spring following the year in which a teacher participated in a Tour. The first survey was issued in Spring 2011 to teachers who had participated in the inaugural Tour program. This survey was revised and expanded and forwarded to teachers who had participated in subsequent Tours. In 2012, a second follow-up survey was forwarded to the 2010 Tour participants. As with the evaluation forms distributed at the conclusion of Tours, the survey feedback would be used to influence the content of future Tours. The surveys consisted of 12–15 questions designed to gather feedback from respondents with regard to several criteria, including:

1) The grade level they are currently teaching;
2) The applicability of the Tour curriculum to their teaching;
3) Their level of satisfaction with the Tour information and resources;
4) Whether or not they have shared their Tour experience, information and resources, including videos and photos with colleagues and/or administration;
5) How their opinion of modern mining had changed because of what they learned on the Tour; and
6) Their greatest change in perception.

Results

The response rates of teachers to the 2010–2013 follow-up surveys were 50%, 36%, 16% and 18%, respectively. The second follow-up survey issued to the 2010 teachers in 2012 had a very low response rate and therefore was not representative and results are not included here. Although the 2012 and 2013 response rates were low, they are included in this discussion because they reflect existing trends. Taking into consideration the trend in response rate, the decision was taken not to proceed with collection in 2014.

Responses received indicate that although Tour participants teach in many levels of the education system most of the participants to date have been secondary school teachers (Table 1). Outdoor education, science outreach education, and teacher professional development instructors have also been participants. At the time of each survey, the majority of teachers who responded indicated that the Tour content directly applied to subject areas that they were currently teaching including: Geography, Canadian and World Studies, Environmental Science, Rocks and Minerals, and Biodiversity and Natural Resources.

Table 1. Teaching level of participants.

Year	2010	2011	2012	2013
Total Number of Respondents	14	14	5*	13*
Elementary	3	1	1	4
Middle	2	0	1	2
Secondary	7	8	3	9
Alternative	0	1	0	1
Other	2	4	1	1

* respondent teaches more than one level of education

When asked whether aspects of Tour content were directly applicable to their classrooms, Teachers' responses ranked 'Mining Matters' resources as the most applicable, followed by educational resources from other organizations like the Ontario Mining Association, the information shared by guest speakers and via presentations, and the experiences of mine and reclamation site visits, respectively (Table 2).

Table 2. Tour content that was found to be directly applicable to the classroom.

Year	2010	2011	2012	2013
Total Number of Respondents	14*	14*	5	13*
Speakers and Presentations	4	5	1	4
Site Visits	2	4	0	3
Mining Matters Resources	6	12	3	10
Other Resources	3	6	1	4

*multiple aspects applied to the classroom

Teachers ranked their greatest change in perception about mining as better understanding the role that environmental stewardship and sustainability play in the industry, followed by occupational health and safety, the role that mining plays in

their daily lives, and the variety of careers available in the sector (Table 3). Overall, teachers were satisfied with the information and resources they received on the Tour, most have shared their Tour experience, information and resources with their colleagues and administration, and most continued to network with the other teachers and tour participants

Table 3. Teachers' greatest change in perception about mining at the conclusion of Tours.

Year	2010	2011	2012	2013
Total Number of Respondents	14	14	5	13
Environmental Stewardship and Sustainability	8	4	3	6
Occupational Health and Safety	4	3	0	1
Mining Industry Careers	0	2	0	4
Mining in Our Daily Lives	2	5	2	2

CONCLUSIONS

The Teachers' Mining Tour provides teachers with the opportunity to learn about all aspects of the mineral resources development cycle, from prospecting to reclamation. The Tour experience provides education about the geology of important mining regions in Ontario, and allows participants to tour operating and reclaimed mine sites and mine manufacturing facilities. Teachers are familiarized with the variety of careers available in the sector and with Earth Science teaching resources for use in the classroom. Follow-up survey results indicate that into the academic year, teachers in a variety of educational settings continue to benefit from their participation in the Teachers' Mining Tour. Teachers indicate that they continue to find what they learned during the Tour to be an asset in the classroom. This is not only an excellent outcome for teachers and their students but a meaningful endorsement of the program for sponsors, industry participants and facilitators.