



Earth Science Education 5. Effective Industry Outreach. Two Leading Examples from the Mineral Industry

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SUMMARY

In an effort to provide information to the public through educators, resource-based industries have commonly produced glossy literature and graphics packages that were not necessarily appropriate for the school curriculum, and therefore remained under used. A major change in approach, that of engaging teachers to design and develop the outreach resources, was successfully implemented by the Mining Association of British Columbia in 1991. Following on this success the Prospectors and Developers Association of Canada developed a similar program in 1994. Since their inception these programs have collectively distributed their resources to more than 10,000 teachers, who have in turn used them in teaching hundreds of thousands of students. It is hoped that this review of these programs will encourage other industry groups to develop similar approaches to outreach resource material.

RÉSUMÉ

Suite à la mise en commun d'efforts de vulgarisation par l'entremise d'éducateurs, des sociétés du secteur des ressources naturelles ont produit une documentation de haute qualité, mais pas forcément adaptée aux programmes scolaires et qui, en conséquence, est demeurée sous-utilisée. Par un changement radical d'approche réussi, la *Mining Association of British Columbia* (association minière de Colombie-Britannique) a recruté, en 1991, des enseignants qui ont eu mandat de concevoir et de mettre au point une stratégie et des outils de communication appropriés. Suivant leurs traces, la *Prospectors and Developers Association of Canada* (l'association des prospecteurs et des promoteurs miniers du Canada) a mis au point un programme similaire en 1994. Depuis leur création, ces programmes ont permis de rejoindre plus de 10 000 enseignants, lesquels, à leur tour, ont pu toucher plusieurs centaines d'étudiants. Nous espérons que cette rétrospective des programmes de vulgarisation existants incitera d'autres groupes de l'industrie à concevoir et à lancer d'autres programmes de vulgarisation au service de l'industrie des ressources naturelles.

INTRODUCTION

In the interest of increasing public awareness of earth science, there are an increasing number of programs offered by professional geoscientists to both teachers and students. Resource-based industry has long been concerned with its public image and perception and the knowledge of educators delivering courses relating to the industry. Traditional attempts to deliver information about resources, their geological creation, and their development have commonly involved production of expensive and glossy resources. The youth in our schools are generally identified as the ultimate target audience for such information in order to nurture an informed future citizenship. It is therefore vital that educators in the classroom not only obtain but actually use factual and credible resource materials. As impressive and well-intentioned as the produced material may be, much of its value can be diminished by not being readily useable in the classroom. If the teacher is not given any training in how to use the resource material and the material is not necessarily

appropriate for the curriculum, it is left to the teacher to determine if, and where, the material could be used. Educators are severely challenged to deliver ambitious quantities of material in their annual curricula and are more likely to use classroom resources that are keyed to the curriculum. The most effective and efficient method of ensuring that material is appropriate and useable is to engage educators in its development. In response to this reality a number of programs and resources presented to teachers are now keyed to the curriculum (e.g., EdGeo workshops, Calgary Science Network workshops, some company-school partnerships; see Clague *et al.*, 2001; Nowlan and Neale, 2000; and Dudley and Doram, 1999).

This paper reviews two of the first programs created by industry to deliver such curriculum keyed resources. It is hoped that by providing an outline of these programs, other industry groups will be encouraged to develop similar types of resources rather than the less-effective resources of the past. One of the first groups in Canada to recognize and employ this approach was the Mining Association of British Columbia (MABC).

The MABC, in attempting to update information available to schools, struck a formal partnership with British Columbia's classroom teachers in 1991. In order to ensure the utility of the products, teachers were to write the instructional units and select support materials; the MABC was to support all aspects of developing the resources and provide effective distribution of these to interested teachers throughout the province. The partnership, now 11 years old, has produced eight resource units and kits, that are matched to British Columbia curriculum from kindergarten to grade 12, a university credit course for teachers, field trips for teachers and students, seminars and short courses, and work experience for secondary students. Some 5800 teachers have been helped by these activities, and through them, more than 525,000 students have benefitted.

The success of the MABC program attracted the attention of the Prospectors and Developers Association of Canada (PDAC) education committee, and in the summer of 1994 it hired teachers to design a unit for the Ontario school

system. At that time, in this educational jurisdiction, there was no specific requirement to teach minerals, rocks, or the minerals industry. Thus there was a challenge to create a unit so appealing that teachers would choose to integrate these topics in their teaching as a way of fulfilling requirements in a number of subjects such as language, science, geography, and mathematics. Heeding the keys to the success of the MABC partnership, PDAC ensured that teachers had the freedom to create the unit, without dictating content. Since 1994 PDAC has created the grade 7 level Mining Matters and Mining Matters II - The Earth's Crust units, supplementary mini units, and a grade 4 unit. More than 5250 teachers (2600 grade 4, more than 2650 grade 7) have become a part of the program.

MABC EDUCATION PROGRAM History and Process

Established by an act of the legislature in 1901, the MABC is one of the oldest industry associations in British Columbia, representing the collective needs and interests of operating coal, metal, and industrial mineral mining companies. It liaises with government legislators, lobbies for regulatory advancement, and publicly promotes the economic and social value of mining. Public and political attitudes figure prominently in the activities of the association.

In 1990, it was brought to the attention of the MABC by classroom teachers that most of the information on British Columbia's mineral industry available to schools was 20-30 years out of date. By coincidence, industry surveys at that time were indicating that public perception of the industry was extremely negative or that there was no perception at all. The MABC was offering some learning opportunities for students in the province's schools, and through this activity valuable links were made to some very creative and enthusiastic teachers. In discussion with the teachers, a suggestion was made that the MABC work together with classroom teachers in researching and developing up-to-date teaching units supported by practical, usable teaching resources. The teachers needed to learn about the industry in order to meet the demands of the curriculum.

The Curriculum Development

Branch of the Ministry of Education was aware of MABC's interest in collaborating in producing mineral relevant information for teachers. The Curriculum Branch advised MABC to work directly with classroom teachers to help them connect with industry, government, and interest groups in order to develop resources that they could use to enhance the existing curriculum. The Ministry of Education develops curriculum but the teachers have to find the "tools" to do their job; resources were what the teachers needed.

To meet the interests and needs of both the mineral industry and classroom teachers, a formal partnership was formed in 1991 between the MABC and the province's classroom teachers, and thus the MABC Education Program was born. In this partnership, specific roles were defined. The teachers would write the teacher instructional units and select all support materials. The MABC, representing industry, would support all aspects of the development of the resources, including the implementation of the resources to other teachers across the province.

A small group of teachers familiar with previous MABC activities agreed to participate in this program development. It was agreed that the teachers' costs (substitute teacher costs and out-of-pocket expenses) would be covered, and they would receive an honorarium for their time in developing the resources and for presenting/instructing the workshops to other interested teachers.

These teachers spent 6 weeks collecting background information by visiting mines, talking with the employees, and meeting with government, environmental groups, and mining executives. The "team" then developed two programs for social studies at the elementary and secondary levels. The developed material was presented to an industry committee, in a teacher work-

shop format, and then pilot tested for 3 months in three school districts. Formal inservice to teachers began in May 1992. "Inservice" refers to workshops that not only provide teachers with the curriculum resources, but also in-depth instruction on how to use the resources in the classroom. Through the inservice workshops, teachers become familiar with the contents and purpose of the Resource Unit by participating in mini lectures, hands-on activities, demonstrations, and open discussion. The resource units are designed such that teachers can immediately use them in the classroom after the workshop.

Products

In 11 years the partnership has developed eight stand-alone classroom "Resource Units and kits" (Table 1). These include three videos co-directed and produced by teachers and students with a focus on careers, the environment, and the mining process.

These teacher-written resources are matched to curriculum, and span kindergarten to grade 12. In British Columbia earth science is threaded throughout the curriculum and provides an opportunity to use it as an example in other subject areas. The MABC resources are therefore integrated into many subject areas including language art, social studies, geography, math, economics, environmental studies, art, sciences, and careers.

The resources, written and selected by teachers, include teaching lesson plans and activities, rock and mineral samples, slides, videos, CDs, maps, posters, books, and product samples.

In addition to the classroom resources, the program features an educational Web site www.bcmineals.ca for teachers and students that currently provides teachers with information on the MABC program and resources and links

Table 1 MABC Education Program resource units and kits.

- K-3 Rocks and Minerals Integrated Science Kit
- Grade 5 Integrated Resource Unit on Mining
- Social Studies 10/11 Resource Unit on Mining
- Science of Mining Resource Unit
- Earth Science 11/Geology 12 "Resource and Ideas"
- Careers In The Mineral Industry (video resource on careers)
- Digging For Answers (video resource on environmental issues at mine sites)
- Rocks and Dirt Just Aren't My Thing...Or Are They? (a mining process video)

to other useful sites. The Web site was launched last year and is still in its infancy. Teacher and student field trips, classroom visits from industry, and courses and seminars for teachers are co-ordinated upon request. Also, by assisting with work experience placement for high school students, and collaborating with other interest groups and post secondary institutions, effective academic and social links are developed for students interested in the mineral industry as a career.

A university course (four credits over 10 days) for teachers entitled "Mineral Resource Development: Applications to the Social Studies and Science Curriculum" was developed and launched by the MABC Education Division in July 2001. This new course is the first of its kind in Canada. Seventeen teacher participants and 29 presenters from industry, academia, government, and First Nations covered topics including geology and exploration, economics, mine development, waste management and reclamation, coal and energy, sustainability, land issues, regulation, and decommissioning. Three field trips to a mining museum, an operating mine, and a metal fabricating plant enhanced classroom learning. The course will be offered again in July 2002 through Simon Fraser University Field Programs in the Faculty of Education in partnership with MABC.

A team of classroom teachers, working with the MABC's Education Division, guides all aspects of the MABC Education Program. They write resources, instruct the inservice workshops to other teachers, and provide input into other learning opportunities for teachers and students that are co-ordinated through the MABC Education Division.

Keys to Success

The partnership has been successful and effective because of mutual trust and commitment. Standing by our agreement to work together and respect each other's abilities, we achieve our goals and make a difference. Teachers need the linkages to industry to provide their students with the tools they need to make well balanced and informed decisions. Education is the only way to build long term awareness, acceptance and support for responsible mineral resource development. This

program works because it is written by teachers for teachers.

As successful as the program is, there is still a fragility that surrounds it. It must be maintained and continue to evolve and that means money. All aspects of development and implementation are made possible from financial and in-kind support from the mineral industry companies and service sector companies, interest groups, individuals, and government. In a typical year, such as 2000, resource units were provided to 800 teachers at a cost of \$250,000!

Annual fundraising is undertaken and is a huge effort that demands time away from the focus of the program. However, it is necessary and meeting each year's goals depends on it. But fundraising remains an ongoing challenge, not only in British Columbia, but for all groups undertaking these kinds of education initiatives. We will make our resources industries strong through building an outstanding knowledge base that is sustained in classrooms across the country. If we are going to take the future of our natural resources seriously, from public perception, the economy, regulations and land use issues, we must make a stand and work together through education.

Future Plans

Our future plans include some new initiatives. In February 2002 we started the groundwork for a "Mining Games" school program. In collaboration with the University of British Columbia (UBC), the British Columbia Institute of Technology (BCIT), and the British Columbia Museum of Mining, school students will compete in a variety of activities using "brain and brawn." The activities are relevant to the mineral industry and teachers are providing guidance along with interested students.

A "British Columbia Mining Class of the Year" will be promoted annually as a result of its recent inaugural success at the Canadian Institute of Mining and Metallurgy (CIMM) Annual General Meeting Conference and TRADEX Show held in Vancouver, April 2002. Four schools participated in the "British Columbia Mining Class of the Year" contest and eight grades 3-6 classes were invited to exhibit their models and

projects in the TRADEX Show. This event was very well received by all participants, including 12 teachers, 220 students, 50 parents, and the conference delegates.

In collaboration with the University of British Columbia and BCIT, students in the relevant diploma and degree programs will work with classroom teachers to develop a program "Rock It Science" that will take mineral, mining and geoscience activities into classrooms throughout the province. The first phase of this project will focus on science at the intermediate level. Target date for pilot testing is 2003.

Partnerships between industry and education are an investment in the future. Initiating and maintaining collaborations and building networks at local and national and global levels are essential. MABC collaborates supportively with several organizations that include museums, post secondary institutions, government agencies and community groups and other like organizations with similar initiatives. Our communication is open, and sharing experiences and information has resulted in complementary programs being established, such as that developed by the PDAC.

PROSPECTORS AND DEVELOPERS ASSOCIATION OF CANADA MINING MATTERS What is PDACMM?

Established in April 1997, Prospectors and Developers Association of Canada Mining Matters (PDACMM) is a registered charitable organization whose activities are directed toward:

- Educating students about Canada's geology and mineral resource endowment and promoting awareness of the importance of rocks, metals, minerals and mining through the dissemination of information and the development and distribution of educational programs and material, and
- Co-ordinating with other charitable, educational or governmental agencies or organizations in developing education programs and material.

History and Process

In 1994, the chair of the Prospectors and Developers Association of Canada (PDAC) Education Committee (Barry

Simmons of Teck Corporation) identified a goal for the work of the committee; to “provide children with balanced information on mining to enable them to make informed decisions in the future regarding the minerals industries.” The work of the MABC was seen as very successful and a valuable model to adopt in designing and providing classroom teachers with resources to enable them to teach about the minerals industry. In particular, it was recognized that a key to success was having the resources and teaching activities written not by academia, industry or government, but rather by active classroom teachers with technical input from industry professionals. Teachers active in the current education environment are the most knowledgeable about the curriculum opportunities to teach about the minerals industry, are familiar with the needs of teachers, understand the demands of the educational administration and are sensitive to the challenges of the classroom environment. Further, it was recognized that, with education being provincially administered, Ontario presented an enormous opportunity to extend the MABC model to reach a large number of students.

Three teachers were hired to design a unit for the Ontario school system over the summer of 1994. The teachers reported to the PDAC Education Committee that the grade 6-7 level seemed to be the best age and grade for the launch of an integrated activity-based unit. However, in Ontario’s Common Curriculum (the predecessor to the current Ontario Curriculum) there was no specific requirement to teach anything about minerals, rocks or the minerals industry. Their advice was to create a unit so teacher-friendly and so interesting that teachers would set aside their own materials to teach this exciting, new topic. Additionally, the teachers recommended that the unit should be available in French and English, introduced through a teacher workshop, be unbiased and contain no “corporately” produced materials. There was much concern about the latitude the teachers would have with the design of the unit. However, after the first few meetings they were comfortable that the content was not going to be dictated and that the Education Committee was there as a resource of technical

information to support their efforts.

During the period of June 1994 to August 1995 the “Mining Matters/Une Mine de Renseignements” unit was written, edited, translated, printed and 600 kits (450 English, 150 French) assembled in the Toronto offices of Teck Corporation. School boards were contacted in the late spring of 1995 alerting them to the availability of the unit in September. The kit was distributed free of charge to teachers provided they attended the inservice workshop (Fig. 1), signed a partnership agreement committing to using the unit within 1 year and agreeing to provide feedback on the activities. The first teacher inservice workshops were held in August 1995 by two of the teachers who designed the unit. Distribution of these 600 kits was concentrated in the urban areas of Toronto and Ottawa where it was felt there was the least understanding of our industry. Teacher response to the unit was so positive that the Education Committee committed to further production and over the period 1996 to 1998 an additional 1550 kits were distributed to every school board in Ontario.

Linda Lilge, one of the teacher designers, took a leave of absence from the York Region School Board to become project co-ordinator in 1996 and the project gained charitable status in April 1997. In addition to the Mining Matters kit production, Linda established a communication program with the teachers. Since then, two newsletters/year describing new resources and providing supplementary information have been distributed. Also, two complementary

units were designed and offered to teachers. PDACMM regularly attended conferences to raise awareness about the unit and our activities both with educators and industry. The Mining Matters unit won the Partnership Focus award from the Conference Board of Canada for “promoting science literacy for the world of work” in 1997. Another important aspect of Linda’s responsibilities included sharing our experience with other educators. We like to work with groups in other jurisdictions to assess the best fit in their educational environment, using regional examples and local resources. The Mining Matters unit is specific to Ontario’s education system and curriculum requirements, and it uses Ontario resources (maps, statistics, minerals, examples, and case studies wherever possible). While some generic resources are incorporated (posters, video) most activities and materials have been selected and designed for the Ontario teacher.

Over the period 1994 to 1998 the Ontario curriculum was modified twice. Although much of the original Mining Matters unit has ongoing relevance under the new requirements, the latest curriculum has a specific earth science strand and provides a new opportunity for the PDAC Education Committee to support Ontario teachers. A new team of teachers was assembled to identify the gaps between the existing unit and the new curriculum and to rewrite the unit with an emphasis on the earth science elements. In 2001 the grade 7 unit was rewritten and is still in the process of being distributed.

The new Ontario curriculum for



Figure 1 A key to the success of both the MABC and PDAC programs is the inservice workshop that introduces teachers to the contents and purpose of the resource units or kits. Claude Picard, teacher-unit designer, conducts an inservice workshop for the Mining Matters unit.

Science and Technology, mentioned above, contains a specific strand called "Rocks, Minerals and Erosion" for the grade 4 level. The Education Committee decided to build on the success of the grade 7 unit and agreed to expand its work to develop a grade 4 resource. Following the model, a new teacher design team was assembled and a unit that fulfilled 100% of the curriculum learning requirements was developed. More than 2600 grade 4 units have been produced and distributed since 1999.

The Products

Similar to those of the MABC, the PDACMM products include a variety of materials commonly provided by government and the industry and have been designed to fulfill curriculum requirements in a variety of subject areas including language, geography, mathematics, and social studies.

1. Mining Matters – The Grade 7 Program

Now no longer in production, Une Mine De Renseignements/Mining Matters was an integrated, activity-based, grade 7 teaching unit that came in kit form with all of the materials necessary to complete the activities. The unit was developed to introduce students to the exciting, high technology world of mining.

Students learned about the importance of metals, minerals and rocks in their everyday lives. They studied the various physical and chemical properties of minerals and were introduced to basic rock types. They also simulated different techniques used in mineral exploration, built models of open pit and underground mines and learned how mining companies reclaim mining lands and rehabilitate quarry sites. The culminating core activity was a debate in which the students assumed the roles of various groups in a community to consider a proposed new mining project. As an integrated unit, the program fulfilled educational requirements in many subject areas: language, science and technology, geography and mathematics.

2. Deeper and Deeper – The Grade 4 Unit

Aller au fond des choses/Deeper and Deeper is an integrated, activity-based

unit that is available in both French and English. It was designed with reference to "The Ontario Curriculum Grades 1-8." As a result, 100% of the Ministry learning requirements, called Expectations, for the Rocks, Minerals and Erosion strand in Science and Technology are addressed along with many Expectations from Social Studies, Mathematics, and Language.

As with the grade 7 unit, Deeper and Deeper comes in kit form with all of the materials needed to complete the activities (rock and mineral samples, aerial photographs, pictures, magnifiers, protractors, etc.). The unit is divided into three main topics: Talking Soil, Slip Sliding Away (Erosion), and Rocks and Minerals. In the first topic, Talking Soil, the students learn about the formation and composition of soil. This forms a natural basis for the next topic, Slip Sliding Away. In this very hands-on topic, students make a landscape model, simulate the different types of erosion and develop and test a solution to an erosion problem using their model. In the third topic, Rocks and Minerals, students learn to distinguish between rocks and minerals, to test the physical properties of minerals and to classify rocks. They locate mineral deposits in Ontario on a map and become familiar with these natural resources. Several math and visual arts activities are incorporated into this topic.

These kits are given to teachers at inservice workshops provided they sign the Partnership Agreement. The workshops are designed to help the teachers understand the structure of the programs and how to effectively implement them in their classrooms. In the Partnership Agreement, the teachers commit to implement the unit within a 1-year period and to complete teacher evaluation surveys. A minimal fee offsets a portion of the shipping costs and expenses related to the workshops. Workshops have been held throughout Ontario.

3. Update – Our Newsletters

The teachers in the original design team stressed the importance and need for ongoing support for teachers implementing the units. A Mining Matters Hotline was established to provide guidance to teachers and to answer questions about the resources. In addition, a newsletter

Teachers' Comments

"This was one of the best workshops I have been at! Fabulous. The materials were great and will be well used! Thank you so much. This is what we teachers are always looking for. The time spent there is worth the pay off in the long run! Can't think of anything I would change."

Virginia Currie, grade 5, Qualicum SD

"Ann and Sheila were incredible! What a lot of fun! This kit and binder is amazing – how helpful. Don't I wish there was more sharing like this amongst teachers. Thank you! Nice balance to the delivery. I have been eagerly awaiting for this for 2 yrs."

Brenda Panton, grade 2, Qualicum SD

"The overview of the program was excellent. The instructors were very helpful and knowledgeable and conveyed their enthusiasm through the presentation. It was well worth attending and will be extremely useful in the classroom. Thanks for providing this workshop."

Jim Price, grade 6, Cariboo-Chilcotin SD

"The kit (Mining Matters) is fabulous! The students were amazed to discover how greatly our lives are affected by mining. I'll definitely use it again next year!!"

Deanne Nowosel, grade 7,

Wentworth District School Board

"It (the grade 7 Mining Matters unit) was fantastic, very easy to use. I love the teacher explanations and extra information included. What a treat having all materials ready to go. The best kit I have ever had the privilege of using."

Sharon Scobie, Renfrew County D.S.B.

"The students thoroughly enjoyed the Deeper and Deeper unit. The many hands-on activities were appropriate. It was great to have all the necessary equipment set up and ready to use. Saved a great deal of time! I appreciated the background information and I learned a lot!"

*Nancy Laroche, Westdale Park,
Limestone DSB*

"These Updates are unique to this kit and are greatly appreciated! Thanks.!"

*Cathy Dunne, Frenchman's Bay School,
Durham Board of Education*

program consisting of two *Updates* per academic year has become an effective vehicle to distribute additional information and notices about events of interest. Brochures about Earth and Space Week at the Ontario Science Centre, announcements about events at the Royal Ontario Museum, data sheets on mining from government departments and pages from various publications have all been included as part of this program over the years. The newsletter articles cover the spectrum from information about upcoming events such as the Science Teachers' Association of Ontario Conference and lists of new Web sites to visit for valuable information (e.g., Earthnet; see Clague *et al.*, 2001).

Industry Editions of the *Updates* are produced periodically to keep our supporters and industry colleagues apprised of our activities and to assist with fundraising.

4. Complementary and Supplementary Resources

Since 1995 several additional resources have been designed to extend the learning in the grade 7 unit. "Mineral Crystal Clusters" and "Gold Digger Days", both very popular mini units, can be used at semester end. The MABC-developed video "Careers in the Minerals Industry" has also been offered to Ontario teachers with the grade 7 and grade 4 units.

MINING MATTERS II – THE EARTH'S CRUST

In 2001 the grade 7 unit was rewritten with reference to the Ontario curriculum – The Earth's Crust. Thirty-five 40-minute lessons and hands-on activities take students through the structure of the Earth, the plate tectonic theory, the rock cycle, mineral characteristics and identification, natural hazards, geothermal energy, and the minerals industry. French translation is in progress. Since September 2001 there have been 700 units produced and distributed, and by the end of academic year 2002-2003 it is expected that a total of 1400 copies of this unit will have been distributed to teachers, including schools in First Nations communities in northern Ontario.

Challenges

Each year fund-raising activities have to

generate about \$200,000 to support the production and distribution of educational resources for Ontario teachers. Without these financial contributions and the in-kind support donated by many organizations and individuals within the minerals industry these projects will end. It is important to note that as a charitable organization it is a requirement that 80% of the funds for which tax receipts are issued must be expended during the year to maintain charitable status. In the absence of a major gift or bequeathal from which interest income could be derived, a significant effort has to be made each year on fund-raising! The scope of our programs is dependent on and will vary with the success of our fundraising activities each year. We have waiting lists for our units – a frustrating situation for our teachers who are keen to provide valuable learning experiences to their students. The industry's willingness and ability to support our initiatives is often tied to the metal cycles. Our education initiatives have momentum and are respected by educators but we need to be there for the long term. We are struggling to ensure our ongoing viability well into the future and fear that we will become yet another one of those industry initiatives that failed for lack of long-term support and are remembered so vividly by our members.

Future Plans

In the second half of 2002, efforts will continue on the production and distribution of some 700 additional copies (200 French) of the Mining Matters II grade 7 unit through teacher inservice workshops in Ontario. The newsletter program will continue and PDACMM will participate in conferences, ensuring that teachers can learn about our resources through a variety of venues. As always, fundraising activities will be a part of the program. In 2001, we were particularly fortunate in that we received grants from the Ontario Ministry of Enterprise, Opportunity and Innovation, and the Ontario Ministry of Northern Development and Mines to enable us to reach our ambitious goals. We continue to benefit from financial and in-kind donations from many corporations, individuals, and associations.

The new Ontario Science Curriculum for grades 11 and 12 was released in 2000. Commencing academic year

2002-2003 Earth and Space Science will be offered as a grade 12 university preparation science course. This course focusses on the Earth as a planet, and on the basic concepts and theories of earth science and their relevance to everyday life. The course is divided into five components:

- The Earth as a Planet
- Introduction to Earth Sciences
- Earth Materials
- Internal and Surficial Earth Processes
- Earth History

It is exciting from the minerals industry's perspective to note that one of the learning expectations for the Earth Materials portion of the course states that:

By the end of this course, students will demonstrate an understanding of society's dependence on Earth materials, of the effects of developments in technology on exploration and mining of Earth materials, and of the ways in which the use and extraction of Earth materials have affected natural and human-made environments.

PDACMM hopes to be able to respond to this opportunity and may direct attention and resources to this new course after the grade 7 unit is completed. The grade 12 course presents an interesting challenge because at the secondary level students select their courses and have many choices. Therefore we may not reach as many students as we would like or are able to with the current elementary programs.

CONCLUDING REMARKS

It is important to recognize that, unlike many past education initiatives, the MABC and PDACMM programs have concentrated on providing resources to teachers to enable them to feel comfortable and qualified to teach about earth science topics and issues as required by the curriculum. The resources are relevant, specific, and developed by writers well familiar and experienced with the classroom. Engaging members of the end-user group in resource development is key for the success of any outreach program, but perhaps especially so in the case of resource industry interests. Providing the educators with the liberty to create what they need, using industry professionals as a resource, overcomes much of the initial skepticism over industry motives in

becoming involved in curriculum development. It is also critical that the industry partners truly buy in to the value of such a collaborative effort in favour of past approaches such as independently creating glossy materials in the hope that they will be useful. Most teachers have not had to understand the importance of geoscience but are now faced with having to teach it. Our units are in demand because they allow the teacher to proceed with confidence to deliver the subject material and create enthusiasm about it with their students. Whether a teacher has an inherent interest in earth science or not we are reaching them and helping them do their jobs. Based on user feedback such as that distributed throughout this article, we believe our focussed approach is successful.

FIND OUT MORE

To find out more about these two successful industry supported outreach programs use the following contact information.

1. Mining Association of British Columbia, Education Division
www.bcminerals.ca
2. MABC, Education Division
840 West Hastings Street
Vancouver, British Columbia V6C 1C8
phone: 604-681-4321 ext. 115 or 108
fax: 604-681-5305
mel@mining.bc.ca
3. PDAC Mining Matters.
The PDACMM Web site can be reached by going to www.pdac.ca and clicking on "Education" or by going directly to www.pdac.ca/miningmatters. The management office of PDACMM is housed in the Toronto offices of Teck Cominco Limited. For more information contact:
Project Co-ordinator
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