



Final Report

14th Annual

Minnesota Minerals Education Workshop

June 21-23, 2011

Mesabi Range Community and Technical College
Eveleth, MN

Prepared by

Jim Miller

University of Minnesota Duluth
2011 MMEW Chairman
MCMRE Vice-chair for Operations

Executive Summary

A total of 76 participants attend the 14th annual Minnesota Minerals Education Workshop (MMEW) held June 21-23, 2011 at the Mesabi Range Community and Technical College. Attendees were largely K-12 earth science teachers from throughout Minnesota, but also included college educators, students, and non-teachers. The workshop involved over 30 volunteers from various academic institutions, K-12 schools, state agencies, and mining and geo-engineering companies. The first day of the workshop was devoted to participants attending four out of 17 short course offerings on a variety of geologic and mineral resource topics. Teachers were presented with a box of educational resources at the end of the day, which included gifts of a pen magnet and hand lens. Most attendees gathered at the Minnesota Museum of Mining that evening for a tour of museum and a picnic dinner.

The second and third days of the workshop were devoted to field trips in the central Mesabi Range. Wednesday morning, the participants visit PolyMet Mining facilities (tailings basin, crushing and milling plants, and core logging shed). In the afternoon, several geological sites of interest in the former LTV taconite mine and an exposure of the Wetlegs Cu-Ni prospect were visited. On Thursday morning, the group was split into two with one group visiting Idea Drilling's operation in Virginia, then visiting UTac's Thunderbird Mine, while the other group received a tour of the Fairlane processing facilities at Forbes. The two groups met up at the mine site to watch a noon-time blast (a big hit with everyone). In the afternoon, the two groups swapped site visits.

Financially and content-wise, the workshop was a great success. The final costs came in several hundred dollars under budget. Feedback received in surveys completed by nearly all participants was largely favorable and contained many helpful comments and suggestions for improving future workshops. Plans are already underway to hold the 2012 workshop at Winona State University.

Introduction

A list of participants, instructors, and volunteers with contact information is given in Appendix A. The workshop and short course schedule is provided in Appendix B. The information reported in this summary comes largely from responses to surveys given to all participants after each day of the workshop (see Appendix C). All but one of the 76 participants replied to general workshop questions and short course questions, 87% replied to questions about Field Trip 1, and 79% replied to questions about Field Trip 2. The budget for the workshop is summarized in Appendix D.

Participants

A total of 76 participants to the workshop fell in the midrange of the attendance level sought and planned for (55-90). Participants came from throughout the Minnesota, with over 70% of participant driving over 3 hours to attend meeting. Four participants came from neighboring states (IA and SD).

This was the first MMEW meeting for 28 participants (38%). A total of 22 participants (30%) had attended at least one previous MMEW and 14 (18%) had attended at least 5 previous meetings. One person has attended 10 previous workshops and another has attended 12!

About 86% of attendees teach in a public or private K-12 classroom with over 60% having more than 10 years of experience. Most teach middle school (grades 5-8- 47%) and high school (grades 9-12 - 42%). The most common discipline taught is earth science (42%), with a considerable number teaching life science (17%), physical science (15%), or general science (11%).

Instructors and Volunteers

Over 30 people from academia, K-12 schools, government agencies, and mining and engineering industries volunteered as instructors, field trip leaders, or meeting assistants during the workshop with five more assisting with pre-planning (See Appendix A, pg. 3). Ten volunteers came from UMD (NRRI or Geology Dept.), two came from the U of MN Twin Cities campus, and six came from other colleges and universities. Three K-12 teachers volunteered their time, with particular recognition given to Cheryl Sill, from Thief River Falls High School. Cheryl organized teacher resources, taught a short course, and helped with set-up and tear-down. The MN-DNR, IRRRB, and the MGS each contributed a volunteer. Eight volunteers from industry represented Polymet Mining, Cliffs Natural Resources, Idea Drilling, Barr Engineering, and Golder Associates.

We thank the individuals listed in Appendix A for their time and efforts and their host organizations for allowing their involvement.

Workshop Planning

Five planning meetings were held at the NRRI between November 2010 and May 2011, with many volunteers phoning in. At the onset, ten subcommittees were established and volunteers recruited to handle the various tasks needed to plan and organize the workshop. These committees and the principal volunteers were:

- 1) Meeting Site Logistics – Jim Miller, Marsha Patelke
Duties: arranges classroom needs, meals for short course and field trips, busses for field trips
- 2) Registration – Julie Heinz, Marsha Patelke
Duties: compiles registration list, processes payment, distributes receipts, creates nametags,
- 3) Field Trips – Mark Severson, Rich Patelke, Jeff Price, Peter Jongewaard
Duties: develops trip content and route, prepares brief guidebook, leads trips
- 4) Curriculum – Barb Lusardi , Devon Brecke
Duties: plans short course schedule, recruits instructors, compiles curriculum notebook
- 5) Promotion and Evaluation – Jim Miller, Kent Gordon, Lee Schmitt, Margie Menzies
Duties: develops promotional flyer, sends out email notices to past participants, MESTA members, and other potential participants; develops workshop and field trip surveys to evaluate effectiveness and solicit feedback
- 6) Website – John Heine, Jim Miller
Duties: manages and updates MMEW website
- 7) Teacher Resources – Cheryl Sill, Marsha Patelke

Catering

Meals provided for the participants included 3 continental breakfasts, 1 lunch buffet, 2 bag lunches, and 1 dinner buffet (at the Minnesota Museum of Mining). Several catering options recommended by Mary Gorman were investigated before settling on Paul's Market out of Eveleth. They delivered all meals on time and with ample portions. Based on the survey (appendix C), the participants were very pleased with the lunches and dinners, though many complained about the lack of variety for continental breakfasts. This was the fault of the organizers, however, not the caterer. Lesson learned for next year.

Transportation

With a total of about 90 people for the two field trips, two 55 passenger coach buses were contracted from Minnesota Coaches, based out of Duluth. The buses arrived as scheduled for both days, though one bus broke down just as it arrived on Wednesday morning. Waiting for a replacement bus resulted in a 45-minute departure delay. Given the steady rain on Wednesday morning, this was not a big problem. The drivers were courteous and willing to head where directed, despite much of the time being spent in taconite mine pits.

Pre-Workshop Set-up - Monday, June 20

A group of 5 people (Miller, M. Patelke, Heine, Cota, Theriault) gathered at the NRRI on Monday morning pack up two NRRI pick-ups and a trailer donated by the Precambrian Research Center. Arriving at the MRCTC around 1PM, this group, along with Cheryl Sill, transferred material to the resource room. There, the group worked to pack 76 teacher resource boxes (handouts, posters, maps, mineral hardness kits, pen magnets, hand lenses, ...) and to fill the workshop binders with short course handouts. Some instructors arrived later in the afternoon to check out their classrooms.

Workshop Day 1 - Tuesday, June 21

The first day of the workshop had a full schedule of activities as shown in Appendix B. Participants began gathering at 7 AM in the Commons area, where they picked up their binders, name tags, and took in a continental breakfast. The day ended around 8PM with a picnic dinner and tour of the Minnesota Museum of Mining.

After a greeting and brief overview of the workshop by J. Miller, Trent Janezich and Roy Smith presented a keynote address about battling the human resource drain on the Range with new initiatives among Mesabi Range colleges to train workers in mining-related vocations. A centerpiece of this initiative is the development of a 4-year applied mining engineering program.

Participants then dispersed to one of four different one-hour short courses on topics of the geology of MN, groundwater, compass training, and mineral identification. After a snack break, another session of four geology courses included instruction on the rock cycle, uses of stream table, the biogeology of the Soudan Mine, and the Roadside Geology of MN. A lunch buffet was served and then participants returned to two more session of short courses related to mineral resources in the afternoon. The first afternoon session offered courses on the mining sequence, environmental permitting, uses of minerals, careers in geotechnical engineering, and heavy equipment simulator training offered at MRCTC. The late afternoon session courses included instruction on the metal potential of northern MN, mineland reclamation, the Gulf oil spill, and aggregate resources.

For each course, participants were asked in the survey (Appendix C) why they choose the short course topic. They were also asked to rank the degree to which they agree (strongly agree, agree, neutral, disagree, strongly disagree) with the following statements:

- the course imparted relevant geoscience content
- the course provide content that could be applied to the classroom
- the instructor was prepared, knowledgeable, and engaging

Scoring the degree of agreement on a scale of 4 (strongly agree) to 0 (strongly disagree), a “GPA” score can be calculated for each statement for each course (Tables 1-3). Viewed in this way, statements 1 and 2 on relevant content and applicability to the classroom (Tables 1 & 2) averaged B+. Participant’s views on the quality of the instructors (Table 3) averaged a score of A-.

Table 1. The short course imparted relevant geoscience content.

	Course A	Course B	Course C	Course D
Session 1	MN Geol Story Miller 3.66	Groundwater Alexander 3.10	Compass Sill 3.25	Mineral ID Nelson 3.50
Session 2	Rock Cycle Price 3.44	Stream Table Rosok 3.67	Soudan Alexander 3.64	Roadside Geol Ojakangas 3.71
Session 3	Mining Sequence Price 3.63	Env. Permitting Blair/Gruhn 3.27	Use of Minerals Reid 3.17	Geotech Careers Carranza-Torres 2.88
Session 4	Metal Potential Hudak 3.50	Mineland Reclam. Eger 3.36	Oil: Source-Spill Moosavi 3.40	Aggregate Kostka 3.57
Session 3E	Simulator Training Parker 2.86	Average “GPA”: 3.39 (B+)		

Table 2. The short course provided content that I could apply to my classroom.

	Course A	Course B	Course C	Course D
Session 1	MN Geol Story Miller 3.59	Groundwater Alexander 2.85	Compass Sill 3.71	Mineral ID Nelson 3.56
Session 2	Rock Cycle Price 3.44	Stream Table Rosok 3.78	Soudan Alexander 3.14	Roadside Geol Ojakangas 3.45
Session 3	Mining Sequence Price 3.50	Env. Permitting Blair/Gruhn 3.00	Use of Minerals Reid 3.17	Geotech Careers Carranza-Torres 2.13
Session 4	Metal Potential Hudak 3.00	Mineland Reclam. Eger 3.27	Oil: Source-Spill Moosavi 3.30	Aggregate Kostka 3.00
Session 3E	Simulator Training Parker 2.71	Average “GPA”: 3.21 (B+)		

Table 3. The instructor was prepared, knowledgeable, and engaging.

	Course A	Course B	Course C	Course D
Session 1	MN Geol Story Miller 3.79	Groundwater Alexander 2.65	Compass Sill 3.88	Mineral ID Nelson 3.69
Session 2	Rock Cycle Price 3.44	Stream Table Rosok 3.78	Soudan Alexander 3.45	Roadside Geol Ojakangas 3.77
Session 3	Mining Sequence Price 3.63	Env. Permitting Blair/Gruhn 3.45	Use of Minerals Reid 3.28	Geotech Careers Carranza-Torres 3.25
Session 4	Metal Potential Hudak 3.82	Mineland Reclam. Eger 3.64	Oil: Source-Spill Moosavi 3.40	Aggregate Kostka 3.71
Session 3E	Simulator Training Parker 3.86	Average "GPA": 3.59 (A-)		

Participants were also asked to make general comments on the short courses (Appendix C). These rankings and additional comments have been delivered to the individual instructors, which they can use to improve their presentations should they chose to offer them again.

Following the afternoon short course sessions and a snack break, participants were asked to fill out the first parts of the evaluation surveys and then proceed to the resource room to pick up their box of teacher resources. In addition to a variety of lesson plan ideas, posters, fliers and magazines, items of note included a geologic map of the Mesabi Range (donated by the Mesabi Range Geological Society), a mineral hardness kit (donated by the AIPG), and a pen magnet and hand lens (donated by the MCMRE). A survey of participants' satisfaction with the resources, filled out the next day, indicated significant approval (Appendix C). Participants also provided many other ideas for resources that might be offered in the future.

Participants re-gathered in the commons area at 4PM for a brief Powerpoint presentation on the geology and mineral resources of the central Mesabi Range by J. Miller. This overview served to provide an introduction to the upcoming field trips. This presentation and copies of all other Powerpoints shown during the short courses have been posted on the web.

<http://www.d.umn.edu/prc/MMEW/index.html>

About two-thirds of the workshop participants drove from Eveleth to Chisholm in the evening to attend a picnic and tour of the Minnesota Museum of Mining, despite rainy and cool weather. Survey replies indicate that the participants enjoyed the event, in particular, the knowledgeable volunteer tour guides and the food provided by Paul's Market.

Workshop Day 2 - Wednesday, June 22

The objectives of this field trip day was to 1) visit the tailings basin and processing facilities at the old LTV taconite mine now owned by PolyMet, 2) view some of the mineralized drill core from the NorthMet deposit, 3) visit several geological sites within the former LTV mine area, and 4) visit railroad cuts of the Wetlegs Cu-Ni prospect. The trip leaders were Rich Patelke and Mark Severson, with

assistance from Marsha Patelke, John Heine, Jim Miller, Avery Cota, and Stephanie Theriault. John, Avery, and Stephanie followed the buses in pick-up trucks, which were to be used in case someone became injured and need to be transported from the site.

The rain, which began Tuesday evening, persisted throughout the first field trip day and was particularly heavy in the morning. Moreover, the start of the trip was delayed by 45 minutes because one of the two buses broke down as it arrived. The poor weather and late start prompted us to modify the trip schedule from the original plan of separating the group into two with one doing PolyMet, then the field stops, and the other group doing the opposite. Instead, we kept the whole group together throughout the day, showing the PolyMet facilities first, having lunch indoors while looking at core, and then venturing outdoors for geology stops after the rain had subsided and become intermittent.

The late start, poor weather, and large size of the group made for a less than ideal day in the field. The consolidation of the group made it very difficult for everyone in the group to hear (we mistakenly neglected to bring megaphones) and it slowed down a lot of the stops. The late start and slower pace of the trip resulted in several planned stops having to be dropped. Rankings of the field trip on the evaluation survey (Appendix C) were generally favorable and included many enthusiastic comments about the geology observed. However, a significant number of participants expressed discontent with how the trip was managed, its slow pace, and the inability to hear the leaders. Several people commented on the lack of discussion about environmental concerns. Despite the many challenges of the day (including the fact that Rich Patelke was in considerable discomfort from advanced cancer), most people seemed to roll with it and enjoyed the trip.

On the trip back to MRCTC, participants were asked to fill out the evaluation surveys on the field trip day and the museum visit the night before. The buses returned to campus at 5:30, about a half hour after scheduled. Participants were on their own for dinner, with no evening activities planned.

Workshop Day 3 - Thursday, June 23

The objectives of this field trip day were to 1) visit Idea Drilling's facilities, 2) tour into UTacs working east pit, 3) view a noon-hour mine blast, and 4) tour UTac's processing plant at Forbes. Brian McCabe and Ron Burns led the tour of the Idea Drilling operations. Jeff Price and Peter Jongewaard led the tour through the UTac pit. The group, which was composed of about 60 participants, was split into two. One group visited Idea and the UTac pit while the other went on a tour of the processing plant. We reconverged at noon at the UTac pit to have lunch and to view the blast – a big hit with the participants. In the afternoon, the groups switched field areas.

Although intermittent rain and overcast conditions persisted into the second field trip day, the field stops were all manageable and conducted as planned. Evaluation survey responses were very positive and complimentary. Not surprising, the mine blast was the highlight of the day. The buses returned to the MRCTC between 3 and 4 PM.

Volunteers helped pack up the vehicles and all returned to NRRRI by 5:30.

Continuing Education and College Credits

All workshop attendees were given a certificate of participation, which stated the total contact hours for the workshop - 18 (20, if attended the Mining Museum). These certificates can be used by teachers to receive continuing education credits for the teaching licenses.

In addition, 15 participants signed up for 2 college credits from UMD. To qualify for the credits, teachers must submit a lesson plan that links into material that they learned from the workshop. The deadline for submitting the lesson plan is September 9th.

Comments from the evaluation survey indicated that teachers appreciate the option to acquire college credits for the workshop. One participant made the good point that the course number should be changed or the course title be renamed each year to reflect the fact that each workshop has a unique curriculum. Keeping the same course number and name (EDUC 5570 – Exemplary Models for Science Education) limit the applicability of the credits to lane change requests for the teachers.

Budget

Total expenses for the 2011 MMEW were \$14,840, which is approximately \$4000 below anticipated costs (see Appendix D for financial summary). The main savings were realized by lower than anticipated costs for printing (\$1,352 est., \$945 actual), food (\$6,228 est., \$6,050 actual), supplies (\$1,850 est., \$996 actual), and teacher expense reimbursements (\$3,170 est., \$1,490 actual). This last expense item was significantly under budget because only eight of the total 30 instructor and volunteers requested reimbursement – a testament to the volunteer spirit engendered by this endeavor. The only expense underestimated was for transportation. Use of NRRRI trucks and Marsha Patelke's personal vehicle for use as transport and chase vehicles cost \$577 compared to the \$500 budgeted.

Future Workshops

The evaluation survey also asked participants about factors that would affect their attendance at future MMEW meetings. Here are some of the highlights of the survey:

- 1) When asked to identify two important factors in choosing a workshop location, 45% of respondents chose "interesting geology" and 24% chose "involvement of local expertise". Local mining activity and affordable accommodations were each chosen by 11% of the participants.
- 2) When asked what part of the state to hold a future MMEW, 25% chose SE Minnesota, 20% chose SW Minnesota, and 18% chose Duluth/North Shore. The Twin Cities and St. Cloud were chosen by 5% and 3%, respectively.
- 3) When asked if late June was an acceptable time for the workshop, over 90% of respondents agreed or strongly agreed. Asking to identify the ideal time slot for them, 45% indicated late June, about 25% preferred early to late July, 5% said late July, and 7% preferred the original early August. 20% had no preference.
- 4) Over 80% of participants agreed or strongly agreed with statements that a one-day short course and two-day field trip structure to the workshop was appropriate and that a college campus is an ideal location for the workshops. Many additional comments requested an extra short course or field trip day be added to the workshop.
- 5) 68% of respondents strongly agreed that a \$40 registration fee is reasonable and most indicated that their schools did not contribute to the cost of their attendance.
- 6) Travel and lodging costs were cited as factors in their decision to attend by about half the participants. Yet, 63% of attendees said they would drive over 4 hours to attend the workshop. Although almost two-thirds of participants stayed in motels, which they found largely affordable, over a quarter said that they would prefer to stay in low cost dorm rooms.

- 7) In asking how participants prefer to be notified about the workshop, 70% said email and 19% Said being notified by the MN Earth Science Teachers Association listserve. Only 2% requested being notified by email. Several teachers recommended that we contact science coordinators at the school district level.

Summary

With the assistance of dedicated and talented group of instructors, field trip leaders and meeting assistants, the 2011 MMEW was a success on many levels. Still, thanks to teacher not being shy about voicing their opinions, we learned about many things that we can do better going forward. In no particular order of importance, these include:

- Provide more time than one hour per short course class for at least some of the topics.
- Provide a healthier breakfast (fruit, yogurt, oatmeal, ...).
- Bring a bullhorn/speaker on the field trips.
- Be explicit about schedules, expectations, and hazards before departing the bus on field trips.
- Practice better time management during the field trips
- Contact teachers early and often about the workshop.
- Have website ready for teachers to download pictures during and soon after the meeting.
- Get Powerpoint presentation up on the web soon after meeting.
- Address environmental issues during the field trip, where appropriate.
- Develop better connections with the big guy about the weather.
- Don't make the workshop much bigger than 80.
- Create opportunities for teachers to share curriculum ideas that work for them.
- More bathroom breaks on the field trip
- Bring hand-wipes
- Don't put lettuce on sandwiches!

Respectfully submitted,



Jim Miller
2011 MMEW Chair

Attachments:

- A. Participants, Instructors and Volunteers
- B. Workshop Schedule
- C. Results of Evaluation Survey
- D. Financial Summary