

Experiences with online continuing education for mining

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Abstract

EduMine employs an online self-learning and certification model to present ~60 courses representing ~850 hours of professional development in mining. Depending on the course, certification options include EduMine, CIM (Canadian Institute of Mining and Metallurgy) and UBC (University of British Columbia - Mining Engineering). At any one time, EduMine has ~250 students enrolled for learning and certification and another ~250 individuals accessing the courses for technical reference purposes ... feedback from students and individuals is strongly positive. The more recent concept of site licenses for mining operations is also proving popular. This presentation summarizes the learning, certification, authoring and content aspects of the EduMine model, and experiences and feedback from applying the model to a global audience.

Introduction

Online courses

EduMine has developed and presented online courses for mining from its campus website (www.edumine.com) since 2000. The campus currently presents 60 English language courses representing more than 850 professional development hours, in the following categories ...

- exploration, geology and reserves
- geotechnics and rock mechanics
- environment, health and safety
- mining methods and mine planning
- management, risk and financial
- mineralogy and mineral processing
- authoring and learning methods

Four of these courses are also available in Spanish.

Continuing education

EduMine is authorized by the IACET (International Association of Continuing Education and Training) as an approved provider of continuing education. CEUs (continuing education units) are awarded to students who successfully complete a course. These can be applied to professional licensing in states and provinces in the US and Canada that have an ongoing professional competency requirement.

Collaborative programs

EduMine works with the Canadian Institute of Mining, Metallurgy and Petroleum (CIM² (2005)) to present peer-reviewed courses from the CIM professional development program.

EduMine also collaborates with the University of British Columbia, Mining Engineering Department (UBC³ (2005)) to provide the online learning components of the UBC Mining Certificate Program.

An agreement in principle is in place with the Simon Fraser University (SFU) Strategic Learning Group to present online courses for the Certificate in Business Administration in Mining Program.

Audience

EduMine currently has close to 300 individual enrollments and 20 corporate enrollments (mine sites, corporations, institutions and universities). The EduMine campus currently receives 24,000 visitor sessions per month, an average of 700 per day.

The EduMine audience is global, much of it in isolated regions with variable communications. With the current HR crisis in the mining industry, most mining professionals have little time available for traveling or attending conventional courses. Approximately 50% of the EduMine audience is in North America and the other 50% is off-shore; EduMine certification has been taken by students from as far afield as Tanzania, Argentina and Mongolia.

Audience objectives for participating in EduMine courses include ...

- professional development (mostly in North America)
- career improvement
- cross-training
- corporate training programs (operating mines)
- teaching / learning (universities)
- technical reference

Learning model

EduMine courses are presented entirely online within a browser-compatible courseware template (Houlding⁴ (2001)). The courses are based on the self-learning model of distance education ... students learn ...

- from any convenient location with an Internet connection
- at a time that suits their work or recreation schedule
- at their own pace

When the learning objectives have been achieved, students register for certification and complete the course requirements. These comprise a series of reviews with randomly selected, multiple-choice questions. EduMine certification confirms that a student has achieved the stated learning objectives of a course.

Students continue to access the courses for reference purposes for as long as they remain enrolled.

Content model

Viewing session

The content model of an online course is defined by a division into parts, and a set of working sessions plus an interactive review session within each part. This structure is based on the concept of a "viewing session" as defined below.

The results of research into viewer habits on the Internet indicate that the average viewer will concentrate on detailed information presented on a computer screen for only 30 - 60 minutes without a break (Fleming¹, 1998). The content model is designed around this concept of a 30 - 60 minute viewing session; roughly equivalent to a lesson in a conventional classroom context. Within a session, the course content is presented at several information levels.

Multi-level presentation

The summary level presents the principle points of a session, providing the student with an overview of the material covered by the session (Figure 2 below); in effect, this is the equivalent of the lecturer's presentation in a conventional classroom context.

Figure 1: an example of text level presentation of course content.

Figure 2: an example of summary level presentation of course content.

The text level is a detailed presentation of the material covered by the session (Figure 1 above); the equivalent of course notes in a conventional classroom context. The student may either complete the summary level presentation, thereby obtaining an introduction to the material covered, then switch to the text level, or toggle freely between the summary and text level on a point by point basis.

Both summary and text level presentations are supported by figures, interactive examples, detailed definitions, reference tables, video clips and author references (Figure 3 below). All supporting materials are displayed only at the students request in order to minimize the bandwidth requirement. They are represented within the summary and text levels as thumbnail images or hypertext links.

Interactive reviews

The sessions within each part of a course are followed by an interactive review designed to test the student's knowledge of material presented in the preceding sessions. A review comprises randomly selected questions and multiple-choice responses. The student is allowed a one-click selection of each response and is immediately informed of the correctness or otherwise of the selection. Incorrect responses may not be corrected, but alternative responses to a question may still be selected. For incorrect responses, the student is directed to the relevant session for further study. The student's review "score" can be displayed at any time.

Courseware Template

Course content is displayed within a browser compatible courseware template that integrates navigation functionality and support tools with the content (Figure 4 below).

Navigation functionality is designed to be deliberately redundant so as to provide maximum flexibility and alternative options for the student to navigate within a course. Primary navigation functions include Next, Previous, Last Visited, Session Start, Summary/Text Level and direct links to other sessions within the current part of the course. A Course Map and a Course Contents window provide direct links to all other parts and sessions within the course. The template also makes provision for color-coded links within the course content for cross-referencing, author references, and links to reference tables and definitions.

Support tools integrated within the template include an intelligent search engine, a comprehensive mining and minerals dictionary, and a units converter to cater for international audiences.

The template has been parameterized to cater for different languages and can be switched from English to Spanish by simply changing a language variable.

Enrollment

Individual enrollment

Enrollment, for which students pay a monthly or annual fee, provides unrestricted access to all courses for learning or reference purposes. Students can participate in courses in their own time without any deadlines for completion. Enrolled students can register for certification in selected courses.

Enrollment also provides access to a reference library of more than 4000 technical papers in mining, a comprehensive database of mining events, and a catalog of interactive, online tools

Site enrollment option

EduMine's Site Enrollment policy caters to the specific requirements of a mining operation ...

- unrestricted, reference-only access for all site personnel for a low annual fee
- a corporate discount on all individual enrollments for certification purposes
- a learning program tailored to site objectives
- a campus page for program access and reporting

Some mines have allowed certification on demand for mine personnel; other mines have selected programs of EduMine courses for their personnel that meet mine objectives and needs.

For mining schools and university mining departments the site enrollment policy delivers a low-cost alternative to in-house development of teaching and learning resources for specialized mining topics.

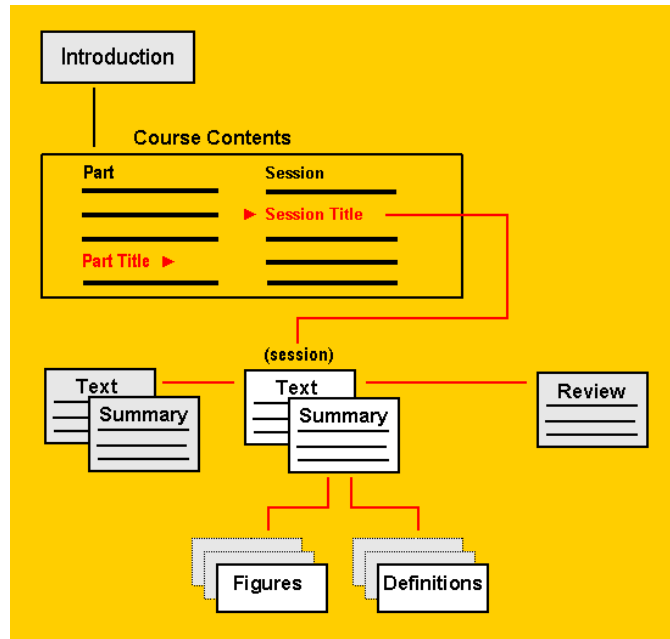


Figure 3: the structure of a course.

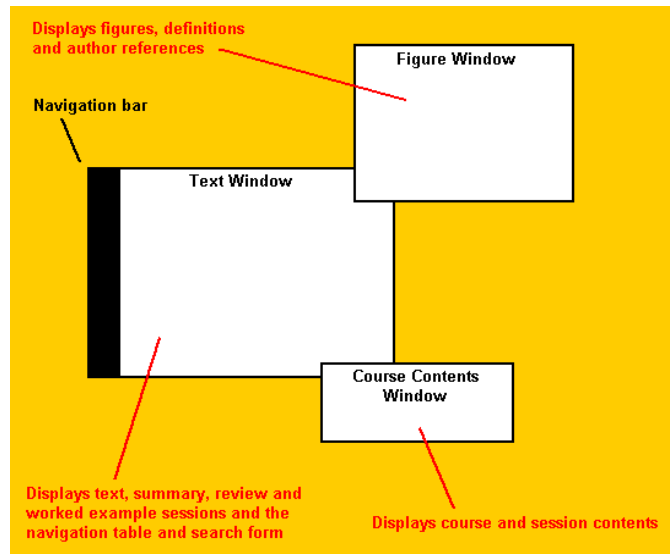


Figure 4: courseware template components

Options for Certification

EduMine certification

Certification requires registration for a specific course, payment of a course fee, and satisfactory completion of the interactive course reviews within a specified period (generally of the order of several weeks). The student's performance in the interactive reviews is monitored during this period via the courseware template and recorded in a database. From the student's perspective, the certification requirement is roughly equivalent to a conventional open-book examination. On

satisfactory completion, the student is awarded a certificate that confirms his/her achievement and records the awarded CEUs for professional competency requirements.

CIM certification

For qualifying courses (those from the CIM professional development program) students can optionally request CIM certification.

UBC mining certificate program

A unique program of courses has been developed through collaboration with the University of British Columbia, Mining Engineering Department⁸. EduMine provides the online learning component of each courses, while the classroom component is delivered on campus at UBC. This means that the learning component can be completed online in the students own time and schedule, while the classroom component is limited to an intensive two or three-day session on campus. Travel and accommodation expenses and time away from the job are all minimized. Completion of the online learning and classroom components of several such courses leads to a Certificate in Mining Studies from UBC.

SFU certificate in business administration

More recently, EduMine has reached agreement in principle with Simon Fraser University, Learning Strategies Group, to collaborate on development of online courses in business administration with a mining industry focus. These courses will form part of a Certificate in Business Administration program.

Authoring model

EduMine's success is dependent to a large degree on its ability to attract qualified authors who either have, or are prepared to develop, courses on appropriate topics. This ability is based on several factors, as follows.

- Author royalties are based on a percentage (up to 50%) of course revenues from student enrollment and certification. Because enrollment provides unrestricted access to all available courses, enrollment revenues are allocated in proportion to monitored student access to the courses; the more popular a course is, the greater its share of enrollment revenue.
- An online course has a potentially much larger audience than a conventional classroom / workshop course, with correspondingly greater opportunities for revenue generation and author recognition.
- EduMine provides support services to assist authors with development of course content in a format suitable for online presentation.

This authoring model, together with the content model and courseware template discussed earlier, provide a practical and affordable approach for development of online courses. The approach has allowed EduMine to develop a significant online resource of mining knowledge in a relatively short time-frame. As reported below, the results are highly-rated by the student audience.

Popularity of courses

The popularity of EduMine courses, measured in terms of percentage of total certifications in each category, are as follows. The second number reported is the number of courses available for certification in the category.

- geotechnics and rock mechanics (34%) (12)
- mineralogy and mineral processing (17%) (12)
- environment, health and safety (14%) (11)
- mining methods and mine planning (12%) (6)

- exploration, geology and reserves (11%) (8)
- management, risk and financial (10%) (7)

These results are likely influenced to some extent by the availability of courses over time, i.e. some courses have only become available relatively recently.

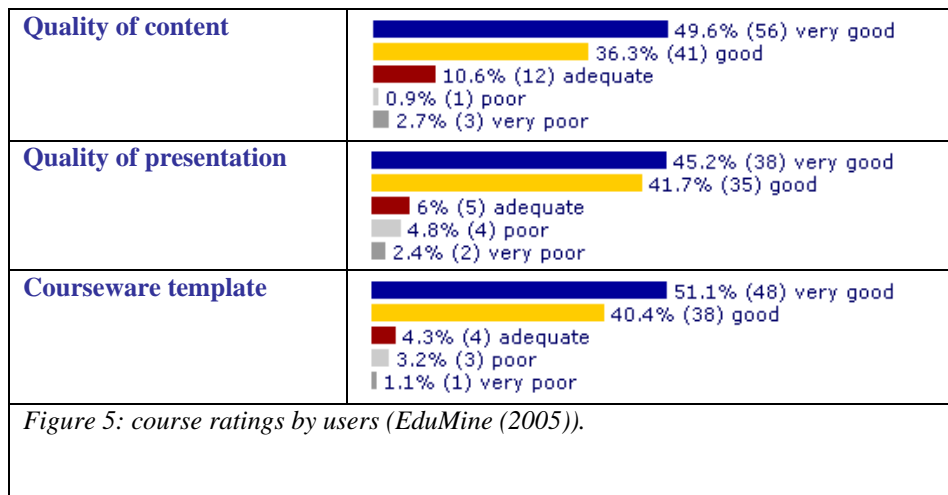
Student feedback - course ratings

Enrolled students have the option of rating courses they have reviewed online. Figure 5 (below) presents a sample of course ratings.

Quality of content ... requires students to rate the overall quality of content of the course in terms of its relevance to mining / geoscience technology, its accuracy and level of detail, and its completeness with respect to stated learning objectives.

Quality of presentation ... requires students to rate the overall quality of presentation of the course in terms of its structure, quality and style of writing, image and figure quality, and case studies and examples.

Courseware template ... requires students to rate the courseware template in terms of "ease of use", navigation efficiency, and general adequacy of available functionality.



Student feedback - survey on cross-training requirements

This survey was hosted on the EduMine website from November 30 2004 to December 12 2004. Statistical analysis of the results indicates that the surveyed opinions of the sampled population were representative of those of the actual EduMine audience at the time with 95% confidence.

Survey background

An ore deposit, a mine, a processing plant, waste facilities, infrastructure and personnel are all assets that must be managed collectively to maximize the long-term value of a mining venture. There is a growing trend towards establishing long-term asset management practices and procedures that have a profound effect on the profitability of a mining venture.

To be effective, asset managers require background knowledge in the disciplines involved ... geology, engineering, mineral processing, waste management, environmental engineering, business economics and socio-economics, in addition to management skills such as leadership and

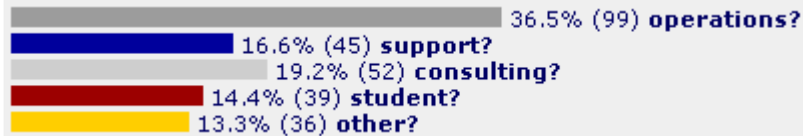
communication. Most of this knowledge must be acquired on the job through experience and cross-training.

The objectives of this short online survey were to solicit audience views on ...

- the disciplines and skill-sets that should be the focus of future cross-training;
- the optimum format for delivery of cross-training to the mine site and the industry at large.

Audience background

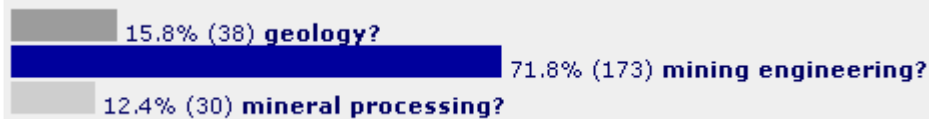
Question 1 of 7 ... Which of the following best describes your current situation in mining?
(Respondents: 271)



Comment: By far the largest audience component is from mining operations ... The student component is smaller than anticipated ... Otherwise the results are much as expected.

Best graduate level grounding

Question 2 of 7 ... In your opinion, which of the following disciplines provides the best graduate level grounding for today's manager of a mining complex?
(Respondents: 241)



Comment: mining engineering is the overwhelming choice ... However, a surprising 28% voted for something else!

Under-represented skills at the management level

Question 3 of 7 ... In your experience, which of the following disciplines or skill sets is least well represented at the present-day mine management level?
(Respondents: 228)

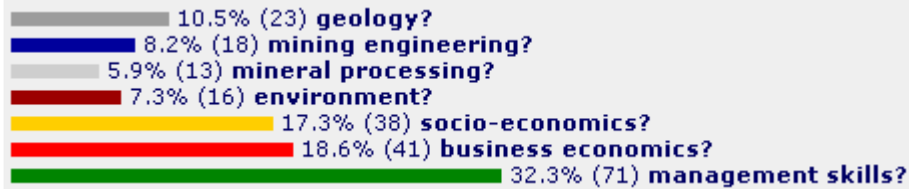


Comment: Most managers lack management skills! ... Perhaps there should be more emphasis on new EduMine courses in management, socio-economics, geology and environment ... And less emphasis on engineering courses.

Under-represented skills at the graduate level

Question 4 of 7 ... In your experience, which of the following disciplines or skill sets is most

lacking from the knowledge base of present-day mining graduates?
(Respondents: 220)



Comment: The results correlate to a limited degree with those of 3 above. Business economics should probably be included in the mix of desirable new courses.

Note that both these results and those of 3 above are somewhat at odds with the measured popularity of existing courses as reported earlier. However the latter are likely influenced to some degree by the availability, topics and quality of existing courses. The survey results actually show closer correlation with the scarcity of existing courses in certain categories.

Best learning model for cross-training

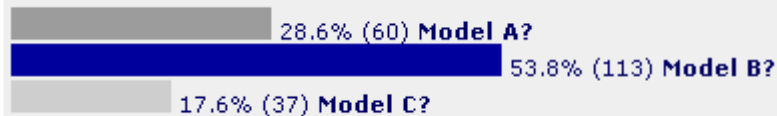
Question 5 of 7 ... In your opinion, which of the following learning models is most suited to practical cross-training of mine site personnel?

Model A: 1 - 2 week classroom courses requiring full-time attendance at a university campus.

Model B: a mix of online self-learning and short (1 - 3 day) on campus classroom courses, as represented by the UBC Certificate in Mining Studies.

Model C: online self-learning, as represented by EduMine courses.

(Respondents: 210)

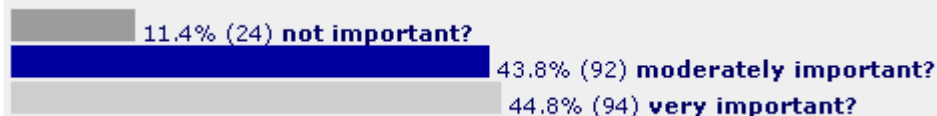


Comment: The results favour a mixed model, with strong support for the University of British Columbia - Certificate in Mining Studies model... And a large majority (71%) favour a model with a significant component of online internet learning. Predictably, if time were not a constraint (which it obviously is ... see 7 below) then university classroom courses would be preferable to online courses.

University accreditation

Question 6 of 7 ... When taking a cross-training course with a view to increasing your career prospects, how important is it to you to receive credit towards a university certificate or diploma for successfully completing the course?

(Respondents: 210)



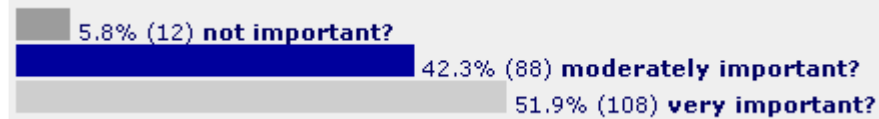
Comment: University accreditation and the concept of working towards a university certificate or diploma have significant appeal for almost 90% of the audience.

Minimizing time away from the job

Question 7 of 7 ... When taking a cross-training course with a view to increasing your career

prospects, how important is it in your current job position to minimize your time away from the job?

(Respondents: 208)



Comment: More than 90% of the audience believe that cross-training should minimize the requirement for time away from the job. This result is strong reinforcement for either a mixed or online learning model for cross-training (see 5 above).

Geographical distribution of the EduMine audience

The following distribution was determined from web statistics, independent of the survey, over a 30 day period coinciding with the survey.



Conclusions

The current learning model, content model and courseware template are highly-rated by the student audience. Development effort is currently focused on providing a mine with the ability to manage and report on customized online learning and certification programs, and to integrate these (for example) into onsite EIT (engineer in training) programs.

In the current overheated HR situation, students' first preference is for a combination of online learning with short, intensive classroom courses. The second preference is for online learning and certification that can be achieved from the mine site.

Some form of university accreditation, or credit towards future study, is an important consideration for online learning.

Both of these indicators support current collaboration with the University of British Columbia and Simon Fraser University in Vancouver. EduMine will continue to support both initiatives while looking for additional, complementary university partners.

Under-represented disciplines and skills in the mining workforce include (highest ranked first) ...

- management skills
- socio-economics
- geology
- business economics

EduMine is actively seeking authors for courses in these disciplines and skills.

Additional emphasis is being placed on language conversions of courses to satisfy the rapidly growing Spanish audience.

References

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4. Houlding, S., King, T., "An Internet Model for Continuing Education in Mining", Canadian Institute of Mining, Metallurgy and Petroleum, AGM, Vancouver, BC (2001)