On-line Learning Research Project for Mine Deputies Certificate of Competency

Final Report – May 2006

Project Authors

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Background

Research Project Question

> **"Can the Coal Deputies Course - Certificate IV in Underground Coal Mining be delivered to small and large numbers of geographically dispersed individuals in an online flexible delivery format?"**

Project Stakeholders / Organisations

Project Leader	NSW Minerals Council
Centennial Coal	Industry Representative / Support
Mines Rescue Services	Content Specialist
University of Newcastle	Instructional Design / On-line Learning Platform

Project Time Frame
February 2005 to February 2006

Stage 1	February 2005 to April 2005	- 3 Units
Stage 2A	May 2005 to August 2005	- 5 Units
Stage 2B	September 2005 to February 2006	- 6 Units

Project Drivers / Rationale
There is an imminent short fall in the skills vital to the functioning of underground coal mines in both NSW & Queensland. Deputies are a statutory position and there must be suitably qualified and experienced people in such positions in order for a company to continue meeting its legislative requirements. Given the challenges faced by the NSW coal industry e.g. geographical location, relatively small numbers of people in these positions, etc there has been a decline in the take up of the Deputies' Course in traditional face to face learning environments (e.g. TAFE). With technological developments in computing and particularly with the internet, flexible online delivery appeared to hold great potential to build the stock of skills and knowledge necessary to maintain adequately trained personnel in the Coal industry.

The first stage of the pilot program (3 Units of Competency) was not advertised and potential candidates were sought from Centennial, Newpac and Xstrata only, as these sites were in close proximity to the Newcastle Mines Rescue Station. This was seen as a logical way to progress towards a full, flexible Online Education Model with minimal face-to-face contact. Some 10 - 16 candidates were sought to participate in the pilot. On the no-commitment information morning on Saturday 22 January 2005, 35 mentors and potential candidates attended with just one weeks' notice. Numerous apologies were also received. During the preceding week, Murray Bird of MRS had taken many phone calls from other companies and contracting firms seeking

positions on the pilot program. This interest continued over subsequent weeks. Ultimately, only 17 candidates were accepted, 16 from industry and 1 from MRS.

Funding
Commitment from Health & Safety Trust Research Grants was obtained to the total amount of $154,000 with funding dependent on continuing delivery of satisfactory, expected project milestones and outcomes.

Milestones in the conduct of the Pilot February 2005 to April 2006

1. Establish a voluntary Project Management Committee (Kieren Turner - NSWMC, John Hempenstall – Centennial Coal, John Dugas - University of Newcastle). Project Committee to determine selection criteria for the course content "Resource Developer".

2. Select appropriate Resource Developer following tender process and interviews.

   Select 3 Units of competency for the Pilot, that is
   - MNCG1002A Implement and apply the risk management processes
   - MNCU1108A Apply and monitor the ventilation management plan
   - MNCU1153A Apply & monitor mine emergency preparedness & response systems

3. Review 3 Selected Units and available materials; identify resource gaps; evaluate suitability of materials for flexible on-line delivery, apply instructional design principles; re-packaged materials migrated to online 'Blackboard' learning platform; Print-based participant Study Guides for 3 Units prepared and printed; learner self-checks developed as part of Competency Units' theoretical and practical exercises.

4. Participant Workplace Mentors identified; Mentor's Workshops (2) conducted and supporting Mentors Guidelines Document developed with input from identified volunteer Mentors who were to support geographically dispersed learners.

5. Course commenced with 3 Pilot Units and 17 Candidates in February 2005. Mentors Online learning platform arranged by The University of Newcastle, checked for user friendliness, readied for external use; adjusted online components progressively during study of each Unit. Assessment of candidates carried out on the practical and theoretical components of the 3 competency Units.

6. Review of the 3 Pilot Units with input from the Participants and the course facilitators. Enthusiastic support received from participants requesting further support for continuation of studies to complete all competency Units of the Deputies' Certificate IV in Underground Mining Course. Report on the Pilot forwarded to the NSWMC, the Tenderer for the Course to the Health and Safety Trust. Further funds were requested and obtained from the Trust for the continuation of the Deputies Course for the Full Certificate.

7. Units 4 -14 inclusive prepared in format and method similar to Units 1 – 3. Learner Guides, Self-Checks, asynchronous discussion forums, private email system, electronic documents repository, electronic testing deployed as part of learning model and samples of electronic testing developed for assessment by lead instructors. Further enhancements such as Audio-Visual CD-ROMS (Voice and Slide images together) also developed and distributed for Unit 9, Mine Transport

Systems and Production Equipment. An additional enhancement developed and trialed was audiovisual streaming from the Course's Blackboard website via the software package 'iLecture'. iLecture allowed voice, PowerPoint slide images, photographs, and real objects to be digitized on a camera stand and presented to participants via the on-line learning platform (on their computer screen) at a time convenient to them. Material was re-run for revision in a more secure, password protected environment than that possible for CD-ROMS.

Other Achievements and Outcomes of the Programme

The total number of funded Units (14) were all delivered by a combination of face to face sessions, mentoring by mine site staff at the participants' workplaces and on-line participant and trainer interactions. The completed Units are indicated below.

#	Code	Competency Standard
1	MNCG1002A	Implement and apply the risk management processes
2	MNCU1108A	Apply and monitor the ventilation management plan
3	MNCU1153A	Apply and monitor mine emergency preparedness and response systems
4	MNCU1113A	Apply and monitor the gas management plan
5	MNCU1104A	Apply the spontaneous combustion management plan
6	MNCU1123A	Apply and monitor the outburst management plan
7	MNCU1133A	Apply and monitor the strata management plan
8	MNCU1118A	Apply and monitor the gas drainage management plan
9	MNCU1138A	Apply and monitor mine transport system and production equipment
10	MNCU1048A	Conduct shot-firing
11	MNCU1049A	Support shot-firing operations
12	MNCU1143A	Apply and monitor mine services and infrastructure systems
13		Legislation
14		Examination Technique

Drop out rates
Ten persons out of seventeen (17) original candidates completed all units and then attempted the Certificate IV Theory examinations. All who sat the examination passed.

Blackboard – "Hit Rates" on the Electronic Class Room / On-Line Learning Platform

Blackboard, the proprietary on-line learning platform utilized by this course has had an average monthly "hit rate" of 3,000 visits. The Discussion Area proved to be the most popular area. The visit rate has been generated by the original 17 candidates and a specialist trainer faculty of 19 persons.
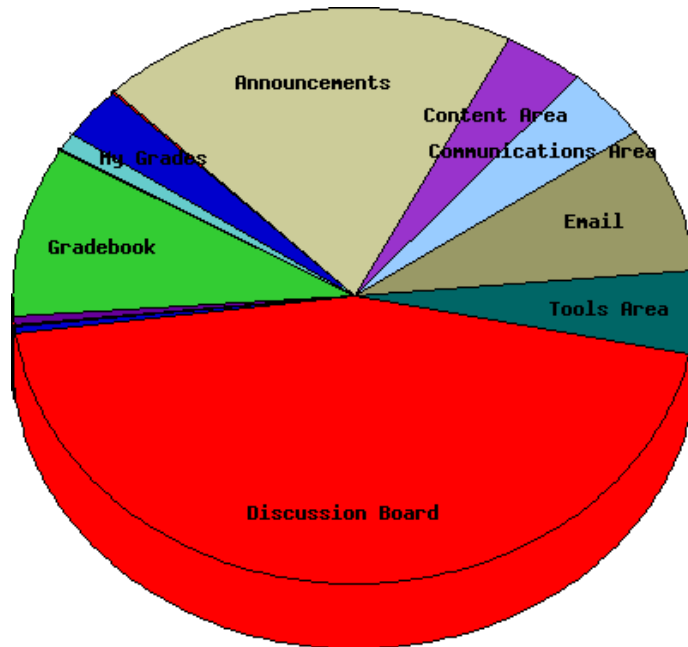
Evolution of the On-Line Classroom During Delivery of 14 Competence Units
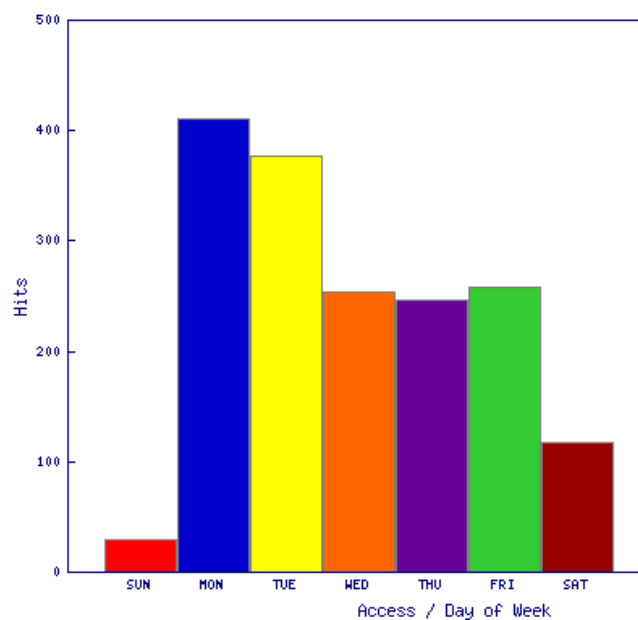The Mine Deputy Candidates on-line classroom has

- An Announcements section for notifications by trainers
- A Discussion Forum for each Competency Unit
- An email communication facility
- A Course Documents section with electronic copies of study materials
- A web links page connecting participants to useful web resources

Participants have used a mix of media and "learning channels" over the course of the programme. These have included a printed Participant Study Guide; Face to Face sessions once a month for 6 -7 hours; Field Trip (Gas Drainage); On-site Workplace Mentoring, Worksheets / Assessment Exercises Theoretical and Practical; On-Line interactive Discussion Forum; CD-ROM Audio Visual presentations, and On-Line Audiovisual trial presentations through the proprietary system known as "iLecture".
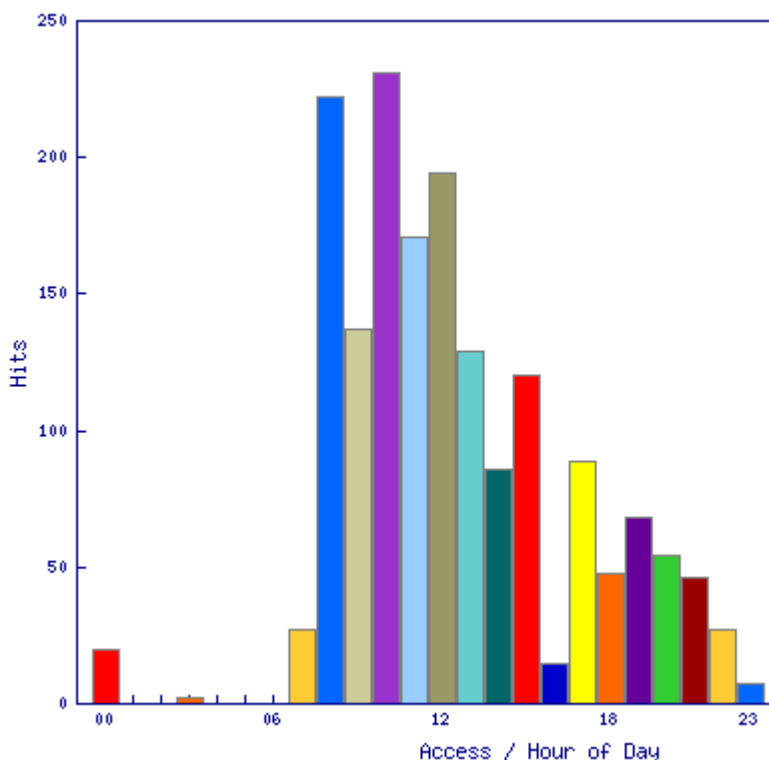
The Discussion Forum has had the heaviest use of all of the areas, some 45% of all usage, as indicated by the graph below.

Mondays and Tuesdays are the most popular Blackboard Access day for candidates.

Most of the work done in Blackboard takes place in the mornings, between 7am and 1 pm with a further spike between 5 – 6 pm.

Looking Forward - Towards a Hybrid On-Line / Flexible Delivery Model

The delivery of this course purely by on-line means presents a number of challenges. The preferred mode may have been face to face however given the geographical dispersion of candidates the assembly of a cost-effective cohort at a central training venue may not be possible for widely dispersed 'class' members. Some units also really need to have a specific type of mine site for necessary exemplification of a particular area of Mine Deputies required knowledge and expertise. Gas drainage is one example, and shot firing is another.

The way forward at this time appears to be a hybrid model whereby most units of the Deputies' Certificate IV in Underground Coal Mining can be done through participant printed workbooks and by on-line methods such as interactive discussion boards and trainer - participant interchanges, on-line quizzes and tests on knowledge content plus audio-visual presentations via the internet or CD / DVD format. All of these are not dependant on real-time attendance and the distance learning time-independent technologies were used by candidates in this course. There continues to be a key role for the suitably prepared and committed participants' mine-site mentor. Utilising a combination of all of the above with perhaps one, at most two candidate training residentials (for candidate start-up / orientation, gas drainage and shot-firing), **a flexibly delivered course with minimal face to face is achievable.** Programs conducted in this way have taken place in the other, earlier contexts. For example, the University of New England's rural studies programs that have "hands-on", practical components delivered during residential sessions. A purely on-line, no attendances course may be achievable with emerging video technologies. However, the additional learning gains and understandings achieved through a modest amount

of face to face as part of a flexible approach may prove to be, on balance, the better method.

Mid-Course Survey - Additional Value Added
Although not required as part of the funding conditions, a mid-course Participant Survey was conducted to determine the perceptions and level of satisfaction with the course to August 2005.

The rating for overall satisfaction with the course at that point was 89.20%.

Final or End of Course Survey – Yet further Value Added

Again, though not required as part of the funding conditions, an end - of - course Participant Survey was conducted to determine the perceptions and level of satisfaction with the entire course. Eight of the ten candidates finishing the course and attempting the examination completed the end of course survey sheet (a response rate of 80%). The overall satisfaction rating with the course was 77.5%. From the mid course survey the satisfaction rating for the on-site mentoring component was 65.8%. With some corrective action this score rose to 75%. Further gains are possible with perhaps greater stability in Mentor positions. Qualitative narrative comments from participants revealed that a strong commitment is necessary to 'stay the distance'.

Original candidate responses are available from both the mid-course and end of course surveys on request. Requests can be made to
john.dugas@newcastle.edu.au or mobile 0411-112072.

Discussion About the Pilot Programme

1. Discussion – Participants' mine site mentoring arrangements

The participants' theory and practical assessment tasks provided a sound framework for interactions between learner and mentor. Mentors were a critical part of the learning model developed for the pilot program. Mentors helped integrate the 'theory' with workplace reality on the ground or underground. Mentors were found to vary in quality, in time availability, and experience as a mentor. The enhanced delivery and success of the program was in part impacted by the level of preparation and the resources that were available to the mine-based mentor. Mentors were brought into the training venue for mentor development separate from the participants. A mentor's facilitated workshop conducted on two occasions agreed roles for the mentor in this training context. Mentors who were unable to attend had the agreed roles explained to them in one on one sessions and Mentor Guidance sheets were prepared and distributed to the mentors. Workplace demands and mobility of all staff, including Mentors required active management to maintain participant involvement with this aspect of the pilot program. Approximately one third of the mine-based Mentors were replaced by other Mentors during the delivery of the programme. This was driven by such factors as changes in Mentors' workplace commitments, shift changes and relocations amongst other matters. The turnover of Mentors was a source of disruption to the candidates and did lead to some candidates falling behind in their study schedules.

2. Discussion – Placement of Competency Unit Audiovisual Presentations either On-Line or on CD-ROM

The duplication of A/V Media onto CD-ROMS poses intellectual property / copyright issues as such media may be readily duplicated by unauthorized persons. At this time the alternative mode for any recorded AudioVisual Presentations to be delivered on demand to candidates is the use of the proprietary iLecture technology tool located inside the Blackboard learning platform. Although not a part of the original proposal that received funding, the University arranged at no cost to the project the deployment of iLecture technology. This was done as a 'proof of concept' exercise. After various trials with iLecture in the latter half of the program, confidence in the system was built to the point where iLecture has now been deployed in the next, current course. The University was pleased to be able to bring the latest in internet audio and image streaming learning technologies to the project. Much was learned from this experience by all parties. iLecture allows an audiovisual presentation to be made to the learner in the form of PowerPoint slides, real objects (eg gauges, hand tools, safety equipment and devices), diagrams and photographs. The PowerPoint slides can be "drawn on" during the A / V presentation to indicate areas for attention and the direction of flow or movement. In addition, ILecture also allows the placement of any object onto a "Visualiser", a camera that captures photographs, real objects, colour drawings etc and presents them on demand for learners in A/V presentations. The photograph or diagram can be drawn on with an ordinary texta pen and also have transparency overlays to allow the build-up of concepts. In the case of real objects, items like hand-sized coal samples for example, may be placed on the base of the Visualiser and captured by the digitizing camera. Pointers may be used to indicate areas of interest or matters for attention by the learner. The digitizer has a zoom lens. Material from PowerPoint slides as well as the Graphic Visualiser is recorded in full colour and accompanied by the Instructors voice explanation that presents to the learner on their own computer screen at a time convenient to them. Replays can be made as often as the learner wishes. Switching between the two sources of images (Visualiser or PowerPoint slides) for the Instructor whilst in the 'Record" mode is with a single button press. Recorded material is housed on one of the University's computer servers and is available within one hour of the recording taking place. The University has redundancy in its systems with five such facilities for recording iLectures.

Summary

This course and its mode of offering can fill a very evident gap in the spectrum of necessary skills and knowledge provision for the coal mining industry. In the view of the project leaders and participants the Pilot was a success. Ten candidates out of the original seventeen candidates completed all Units and attempted the examination. Ten out of ten candidates passed, a 100% success rate for this step of the assessment. Additionally, participants continue to express gratitude for the opportunity to undertake the program. Facilitators are enthused about the possibilities that are beginning to emerge as their understanding of the learning model grows.

The industry also has watched with great interest as it sees potential in a learning method that can help overcome evident skills / expertise shortages, not just in Deputies qualifications but also for other qualifications.

Finally, this matter continues to be of vital importance to the mining sector in light of significant pressures on safety in all industries. Meaningful training and development solutions have evolved through this project which continues to be of major industry and national importance. The project team wishes to express its gratitude to the Health and Safety Trust who had the confidence to fund the concept in the first instance. A second, self funding cohort of nineteen persons, using the technologies and expertise built up though this pilot initiative commenced in February 2006. This would not have been possible without the 'seeding' funds from the Trust.

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Newcastle, 30th May 2006