Enabling collaboration: Staff perceptions of a national mining engineering collaboration

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Abstract: *Mining Education Australia (MEA) is a consortium of three of the major mining schools in Australia and provides a unified third and fourth year curriculum for the mining engineering degree for 90% of Australia's mining engineers. This paper provides an overview of MEA, outlines suggestions for successful collaborations from the literature and describes the collaborative strategies and processes implemented to support the MEA initiative. The paper reports on staff perceptions of the success or otherwise of these strategies and processes in supporting a cross-institutional collaboration.*

Introduction

MEA is a consortium of the mining schools of the University of New South Wales, Curtin University of Technology's West Australian School of Mines (WASM) based at Kalgoorlie and the University of Queensland. It is an initiative of the Minerals Tertiary Education Council (MTEC), part of the Minerals Council of Australia (MCA) and came about as an outcome of the downturn in mining and, therefore, mining education in the early 2000's, an event that saw a decline in the demand for mining engineers and the closure of mining schools worldwide. Consequently mining engineering education in Australia faces several challenges including:

- Now only 4 Australian universities offering comprehensive 4-year degree programs in mining engineering
- Student graduations in mining engineering have declined from nearly 180 in 2000 to less than 115 for 2006
- The number of academics teaching mining engineering continues to decline, and the median age of those that remain is increasing, and
- The number of PhDs completed has been low and static for many years; there is effectively no internal capacity to renew the academic cohort.

MEA is an ambitious project bringing together staff and students from three widely distributed universities with proud records in teaching mining engineering. Inspite of a dramatic upturn in student numbers fuelled by the current minerals boom, staff numbers remain low. The reality of the current situation leaves little alternative other than cross-institutional collaborations if Australian universities are to continue to provide education for mining professionals in Australia.

However, the real potential of the MEA initiative lies in being able to realise the full educational promise of a truly collaborative teaching and learning environment where academic staff are shared across institutions; alternative and innovative delivery and learning methods are implemented; and there is a greatly expanded collaborative student experience between each participating node,

including potential for remote site located students to also engage with the Program. Significant opportunities exist, particularly in the 4th year courses and electives, for real and effective innovation and collaboration in teaching and learning activities.

Research on enabling collaboration in higher education

Generally collaborations in higher education are seen as providing significant benefits in terms of shared expertise and improved learning opportunities and outcomes for students (Strieter & Blalock 2006: Kezar, 2005, Keats, 2003). Collaborations are increasingly being seen as ways of ensuring diversity in course offerings and to ensure that certain disciplines can continue to offer courses viably (Kezar, 2005). This aspect in particular is a priority in Australia where significant government funding is being made available to support collaborative ventures (e.g. Carrick, 2007, CASR, 2007). However, there is very little research on ways to enable collaboration for higher education and indeed over 50% of attempts at collaboration in higher education fail (Kezar, 2005). As Kezar notes, institutions:

"are generally not structured to support collaborative approaches to learning research and organisational functioning. Departmental silos, bureaucratic/hierarchical, administrative units, unions and other rigid structures act as barriers to cross-divisional work and partnerships... Within this environment collaborative ventures struggle to emerge and be sustained" (Kezar, 2005, p.833).

Kezar (2005) further notes that most research on collaboration has focused on the motivation for the collaboration and its outcomes with little attention given to processes. Where processes have been examined the researchers tend '*to miss the systemic elements of the organization that need to be changed in order to make collaboration successful*' (Kezar, 2005, p.834).

However there are shared understandings about what contributes to successful collaborations. Kezar (2005) identifies three key stages for building successful collaborations. These are *building commitment*, which involves developing agreement on the need for the collaboration; *commitment,* which involves leadership from senior managers and *sustaining,* which includes the development of the structures that support the collaboration. These phases are reliant on eight essential elements including mission; integrating structures; campus networks; rewards; a sense of priority from people in senior positions; external pressure; values and learning.

Strieter and Blalock (2006) outline a 10 step process to successful collaborations:
- Step 1: Clearly define the problem: *need for journey*.
- Step 2: Identify core partners to develop the program: *travel companions*
- Step 3: Develop a common vision of the project to increase feelings of shared ownership: *the ideal journey*
- Step 4: Ensure that everyone has a voice and is treated respectfully: travel etiquette
- Step 5: Clearly define program and collaboration goals: *destination*
- Step 6: Define process and plan of work: *chart route and define travel modes*
- Step 7: Establish and nurture trusting working relationships between collaborators: *ensure travellers' confidence*
- Step 8: Provide benefits to members and align reward structure with collaborative goals: *frequent travel points*
- Step 9: Evaluate program and collaboration to provide evidence of outcomes and impact: *check course*
- Step 10: Use evaluation results modify, expand, and/or drop the collaboration in order to maximize success and/or sustainability as required by program mission: *alter course as needed*.

While Keats (2003) had a specialized focus in this work which focuses on collaboration to develop open-sourceware, there are similarities in the factors that he identified as critical to enable successful collaborations with those identified by Kezar (2005) and Strieter & Blalock (2006) including:
- Effective communication is crucial
- Form collaborative virtual teams with a variety of skills and skill levels
- Trust is a key element of success
- Gatekeeper plays a vital role in quality management

- Peer review is a powerful means of quality assurance
- User feedback is essential
- Development is a cyclical process.

Teaching and learning models for collaboration

There is little available information in the literature about models of collaboration Pauwels (2007) outlines four models of collaboration for language teaching which take a blended learning approach. These are:

- A cooperative blended model which involves a combination of face-to-face teaching supported by online activities;
- a cooperative city based model which is essentially a face-to-face model which requires staff or students to travel to either the home or host institutions and utilises cross institutional enrolment arrangements;
- blended online and immersion model which combines an online component along with a residential school component for intensive immersion; and
- A blended online and in-country immersion.

Draper (1998) in discussing the MANTCHI (MAN-based Tutoring in Computer-Human Interaction) project referred to reciprocal collaborative teaching. In this approach all of the four sites involved developed materials and all of the four sites delivered materials from the other sites that they had no role in preparing.

The MEA model of collaboration

MEA favours a single course structure model which supports face-to-face teaching in the individual institutions with opportunities to share expertise across universities using technologies such as learning management systems (LMS), videoconferencing, podcasting and conferencing software such as Breeze. In this approach materials are co-developed by representatives of all participating universities. There are some similarities with Pauwell's (2007) cooperative model, although the parallel teaching in partner universities and the collaborative authoring of materials are significant differences.

Strategies to enable collaboration

MEA are very cognisant of the issues related to developing successful educational collaborations (e.g. Kezar, 2005) and the importance of addressing theses issues proactively rather than reactively as suggested by Kezar (2005). In particular, great importance has been placed on developing and sustaining communication processes between all parties (e.g. Keats, 2003).

In accordance with the principles of successful collaborations (e.g. Kezar, 2005 and Strieter & Blalock, 2006) several strategies to enable and support collaboration in MEA have been implemented. These include:

- a joint venture agreement between the three universities
- rotating leadership
- twice yearly workshops
- curriculum development input from an educational consultant
- program leaders committee
- collaborative course team sessions
- Investigation of tools for cross university collaboration
- investigation and implementation of tools for cross university teaching,
- investigation of tools and processes for cross university student collaborative assessment, moderation and evaluation processes.

Joint venture agreement

The joint venture agreement was a critical process in developing an understanding about shared Intellectual property (IP) and income across the project. It was an important change management strategy and until this was completed, the process of getting MEA underway was stalled. In particular, staff were concerned about the sharing of materials in the absence of a signed agreement (e.g. steps 1 & 2, Strieter and Blalock, 2006; *building commitment, commitment*, Kezar 2005).

Rotating leadership

The director of MEA is the head of school of one of the partner universities and rotates amongst the three institutions on a three year term basis. Currently this position is held by UNSW. In order to avoid all leadership being focused in one institution the head of the program leaders committee is held by another partner, currently UQ, also for a three-year term (e.g. *commitment*, Kezar 2005).

Twice-yearly whole of program meetings

Twice yearly all staff of MEA come together for three day workshops. This workshop has been held in Sydney and Brisbane and will also be held in Kalgoorlie in 2007. This workshop enables all participants to discuss different aspects of the project, participate in staff development workshops, assess the progress of the project, deal with any issues that might be impeding the project and build an understanding of the common goals and values of MEA. This workshop is a major change management strategy (e.g. steps 3, 4, 5, 6, 7, 9, 10 Streiter and Blalock: *sustaining*, Kezar, 2005).

Input from an educational consultant

It was recognised that a venture such as MEA would require a different approach to that used for teaching in the individual universities. It was decided to employ an educational consultant half-time to provide curriculum design advice and to support and assist in capacity building. The educational consultant participates in all course team meetings, is a member of the programme leaders committee and has a significant role in the twice-yearly workshops (e.g. *sustaining*, Kezar, 2005).

Program leaders committee

The program leaders committee (PLC) consists of a representative of each partner university and the educational consultant. The PLC has a critical role in supporting MEA in their own institutions and providing ongoing collaborative impetus to the project. The program leaders take a lead role in developing generic assessment criteria, moderation processes and policies relating to assessment and teaching and learning practices (e.g. steps 3, 4, 5, 6, 7, 9 & 10, Strieter and Blalock; *sustaining*, Kezar, 2005).

Collaborative course team meetings

The development of a common curriculum across three institutions poses particular challenges, in particular issues of agreement on the content of the course, methods of delivery and the teaching, learning and assessment approaches. The collaborative course team sessions allow for discussion of the course and the opportunity to explore a range of options in relation to content, delivery, teaching, learning and assessment strategies. These meetings support the development of a common curriculum as well as common understandings and values in relation to the courses (e.g. steps 3, 6, 7, 9, 10, Strieter and Blalock: *sustaining*, Kezar, 2005).

Investigation of tools for cross university collaboration

Cross institutional teaching on a regular basis is an uncommon activity in most universities and issues emerge in relation to the practicalities of such ventures. Of particular interest to MEA is the ability to enable secure automatic cross-institutional enrolment considered a key aspect of the collaboration. MEA is currently exploring the notion of federated identities (for more information see http://en.wikipedia.org/wiki/Federated_identity) and tools that might enable such activities. Issues relating to timetabling across the three universities for cross institutional teaching also need to be explored (e.g. *commitment*, Kezar, 2005).

Investigation of collaborative teaching and learning tools

The ability for staff to teach across institutions and for inter-university student projects is seen as a major benefit of MEA. Currently all universities are using different Learning Management Systems which makes collaborative teaching and learning activities difficult.   Purchase of a single enterprise solution is considered too expensive for the relatively small numbers of students in MEA. Consequently MEA is now trialing Moodle (www.moodle.org) for its ability to support cross institutional teaching and learning activities. MEA is also exploring the Moodle data bases to address resource management issues.

The notion of using collaborative teaching and learning tools such as podcasting, videoconferencing and collaborative conferencing packages such as Breeze was explored in 2006 with positive outcomes from staff. However infrastructure issues within the partner universities have impeded implementation in this area. All institutions will have access to the same lecture recording system from mid-2007. Work is also being conducted to bring videoconferencing spaces up to a similar standard to support small group teaching and student interaction across the three institutions. Trials of conferencing software such as Breeze (http://www.adobe.com/products/acrobatconnectpro/) and Elluminate Live (www.elluminate.com) are continuing (e.g. *commitment*, Kezar 2005).

Collaborative assessment, moderation and evaluation processes.

The notion of collaborative assessment criteria was introduced at a twice-yearly gathering in 2006 with some discussion of assessment rubrics and the development of assessment criteria. It was decided to develop standard criteria for projects, group work, presentations and assignments, with the ability to adapt for specific circumstances within the individual course. It was also recognised that in some cases course teams would need to develop criteria for specific assessment items not covered by the generic tools. This work was largely carried out by the program leaders committee with feedback from other staff.

A moderation process was developed by the programme leaders committee. It was decided that a sample of individual and group assessment items in three of the courses would be reviewed against the standardised assessment criteria developed for each assessment item. An individual assignment, a group assignment and an individual examination made up this process (e.g. step 6, Streiter and Blalock; 2006, *commitment,* Kezar 2007).

Gathering Staff Perceptions

As Kezar (2005) suggests, the issues of processes of collaboration in higher education need to be better understood to ensure a higher success rate of such ventures. This evaluation focused on staff perceptions of the MEA processes of collaboration. All staff across the partner universities were invited to partake in this anonymous survey which was conducted toward the end of the first semester of the first year of the new MEA curriculum delivery. The survey was delivered to 25 staff and consisted of a questionnaire developed to capture the staff perceptions and feedback across a range of collaboration activities. There were a total of 18 'rigid' questions which required a response of Strongly Agree (SA), Agree (A), Neutral (N), Disagree (D) and Strongly Disagree (SD). These questions are listed in Table 1 (with the question numbers to the left of the table). In broad categories, the 'rigid' questions tried to capture perceptions in the areas of collaboration, administrative support, communication and teaching and learning support the areas covered by the collaborative strategies implemented by MEA.

In addition to the 'rigid' questions, the staff were afforded the opportunity to provide additional feedback through the use of 4 'open-ended' questions. These were:
1.   What aspects of MEA support collaboration?
2.   What aspects of MEA inhibit collaboration?
3.   The best features of MEA are?
4.   MEA could be improved by?

Analysis and Discussion of Staff Feedback

There were a total of 21 responses to the 'rigid' questions. Questions 7, 13 and 17 were deliberately phrased to have a negative connotation, while the remaining questions were phrased with a positive connotation. The responses were summarised into experiences which are perceived to be positive (by combining the Strongly Agree and Agree responses), uncertain (corresponding to the neutral responses) or not positive (by combining responses from the Disagree and Strongly Disagree responses). These were then ranked from most positive to least positive (which is the order from top-to-bottom of Table 1). Recalling that questions 7, 13 and 17 where phrased negatively, their responses are accordingly inverted when ranked in Table 1.

Table 1: MEA staff evaluation 'rigid' questions ranked from most positive to least positive (with corresponding question numbers to the left)

10	The sharing of expertise across the program enhances learning opportunities for students
6	MEA has developed a culture of collaboration
9	Cross university teaching is a collaborative opportunity provided by MEA
11	The role of the educational consultant facilitates collaborative curriculum design
18	Course evaluation feedback supports continuous improvement and quality assurance processes
2	The course team meetings are successful in supporting collaborative curriculum design processes
5	The program leaders have an important role in supporting collaboration across the three partners
14	Standardised assessment criteria provides a framework for consistent and defensible marking
3	The common assessment and moderation processes are an essential part of ensuring standards in MEA
1	The six monthly workshops are effective in supporting collaboration in MEA
4	The MEA courses are successful in achieving the intended aims of MEA
16	The use of information technologies (e.g. podcasting, breeze etc) will support cross-university teaching and learning activities
12	MEA has implemented effective change management processes
17	Course team communication inhibits course development processes
13	MEA processes limit academic independence
15	Student feedback affirms the MEA process
8	Admin processes support collaboration across the three partners
7	Stakeholders have difficulty influencing MEA processes

From Table 1 it is clear that the in most cases the MEA collaboration experiences are overwhelmingly viewed as positive at this stage of the MEA programme. Specific observations are:

- Staff experiences with the roles of the programme leaders and educational consultant are significantly positive (reflected in responses to questions 5 and 11);
- Collaboration between staff through the sharing of expertise in the development of the curriculum has been a positive experience (reflected in responses to questions 1, 2, 6, 9 and 17);
- The use of common assessments and moderation are positive enablers to ensure a standardised and successful MEA programme (reflected in responses to questions 3 and 14);
- The courses constituting the MEA programme to date are viewed as successful to the goals of the programme, although the balance of responses could indicate that some respondents believe improvements could be made (reflected in responses to question 4);
- MEA staff believe that technology will play an important role in the future of MEA (reflected in responses to question 16);
- The change management processes have largely been viewed as positive, although more could have been done in this regard (reflected in responses to question 12); and

- Staff are highly positive about course feedback, but do not necessarily believe that this student feedback mechanism is a measure of success of the MEA programme (reflected in responses to questions 15 and 18).

This positive feedback recognises the importance of structures to support collaboration as outlined in Kezar's (2005) sustaining phase. The MEA approach can also be seen as consistent with steps three, five, six and seven of Strieter and Bablock's (2006) approach.

Some areas where experiences have been viewed as uncertain or not positive are:

- Staff are uncertain of the effectiveness of the administrative support in enabling collaboration which may be a consequence of this function being housed at one of the partner university's at this stage (as reflected in responses to question 8);
- It appears that not all the staff are clear on who the stakeholders of MEA are and some staff do not view as positive stakeholder influence in MEA processes (reflected in responses to question 7); and
- The majority of staff have a clear position on the influence MEA has over academic independence but most staff believe that the MEA processes do not limit them in this regard.

There were a total of 18 responses to the 'open-ended' questions from the same pool of staff who contributed to the 'rigid' question as part of the questionnaire. These responses are captured using common and unique identifiers across all responses and are summarised in Table 2.

Table 2: Responses to the 'open-ended' questions

What aspects of MEA support collaboration?	What aspects of MEA inhibit collaboration?
Common course development Common course delivery mechanisms at all partner universities Future student exchanges between the partner universities All-staff workshops Goodwill of academics at the partner universities in sharing expertise and resources Staff are mostly and easily accessible through telephone or e-mail to discuss delivery and other issues	Staff changes and turnover High individual workloads Physical distances between the partner universities Facilitating the change in teaching approaches Technology is not fully utilised Synchronising delivery of material at the partner universities Some staff set in their old ways in terms of teaching styles Balancing the rollout of the new curriculum with existing workload
The best features of MEA are?	**MEA could be improved by?**
Collaboration for achieving common tasks Relationship building with staff from the partner universities High standard of course material Standardised assessment for all courses across all the partner universities Potential to improve academic standards at the partner universities Peer review opportunities A national standard in mining engineering education	Developing further industry partnerships (such as the use of guest lecturers) More flexibility in course delivery mechanisms Increasing the effectiveness of the Programme Leaders Committee Develop and implement policies and standards to derive full collaborative benefit (such as quality control of course materials) Constant review of course materials and content Implementing an integrated, single data management system accessible by all MEA staff Staff exchanges between the partner universities

The 'open-ended' responses confirm and explain the responses captured through the 'rigid' questionnaire in supporting the experiences on collaboration within MEA.

Conclusions

The strategies put in place by MEA to enable collaboration are clearly seen by staff as largely effective in establishing and maintaining this collaboration. The responses to the MEA staff evaluation confirm that the staff are committed to collaboration and that their experiences with collaboration have

been positive. It appears as if this experience enthuses most staff in that they believe the MEA programme can be improved. However some important issues have also been highlighted including the need to ensure stakeholders have adequate opportunity to put their views forward (Strieter and Blalock, 2006).

Capturing these experiences provides valuable insight into collaborative strategies that are working well and strategies which require further consideration. Consistent with Streiter and Blalock's (2006) approach the survey has provided evidence of outcomes (step 9) and the opportunity to modify the collaboration as needed (step 10). Feedback from the survey has been incorporated into the next MEA twice-yearly workshop to enable a proactive approach to maintaining the collaboration (Kezar, 2005).

Fundamentally these experiences should (hopefully) translate into a positive student learning experience. It is anticipated that understanding staff views on the collaboration will help to ensure the sustainability of MEA in line with Kezar's view (2005) on sustaining commitment which requires integrating learning from the collaboration, thus ensuring the long term success of MEA.

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