

Creating an Engineering Education Community of Practice within an Institutional Setting: Barriers and Enablers for Success in Practice

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***Abstract:** This paper reports on our journey to form a community of practice (CoP) for education research (or the scholarship of learning and teaching) within an Engineering Faculty and describes some of the enablers and potential barriers to success. Using adult learning principles, the authors introduced CoP activities including a program of weekly, scaffolded developmental activities, and additional supports such as periodic retreats and individual consultations. These activities and supports are described in detail for those who may seek to introduce a similar intervention. The use and strengths of an action research method is also described as a means to support both the action in practice and the generation of learning and knowledge through the research study.*

Background

This paper reports on the planning, launch and initial development of an engineering education community of practice (CoP) in an Australian Engineering Faculty. We begin with the story of how the CoP began.

Within our Faculty, the Associate Dean (Learning & Teaching) (ADLT) identified that by encouraging Scholarship of Teaching and Learning (SoTL) (Boyer, 1997), we could increase staff engagement with learning and teaching, and also raise the status of such activities. Implicitly, this was intended as a pathway to support teaching-only staff who wished to become research active. The ADLT consulted with the university's centralised leader in SoTL and the Dean, and then drafted a proposal to formalise an engineering and science education research (ESER) group with significant long-term funding from the Faculty. The proposal was subsequently approved with the ADLT becoming the group's leader.

The purpose of the research group was to strengthen student learning by:

1. Improving staff capability in SoTL;
2. Increasing educational research outcomes (such as publications and successful grant applications); and
3. Consolidate existing education projects and related activities.

The initial funding for the group is for three years and the budget includes a full-time group co-ordinator position, professional development activities in SoTL, seeding grants for education research and scholarship projects, and outreach to secondary schools. A full-time co-ordinator (second author) was appointed to work closely with the existing academic developer (first author) who was appointed part-time, and the research group was launched.

Theoretical Frameworks that Supported our Practice

In our initial discussions about the research group (involving the authors and the group's leader), we identified a number of theoretical frameworks and conceptual approaches that we wanted to act as guiding principles for our practice:

- Using a community of practice (CoP) framework (Wenger, 1998) to inform the creation and operation of the research group

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- Situating our activities with academic staff within an Adult Learning approach (Vella, 1994)
- Relating to the body of literature on SoTL (Boyer, 1997)
- Being as inclusive as possible by allowing all interested members from the university community to be involved where possible (such as sessional staff, research students, staff from other faculties, learning support staff etc)

For a detailed discussion of the theoretical considerations, see Mann & Chang (2010).

What did drawing on a CoP framework, an Adult Learning approach and SoTL mean in practice? The CoP framework provided a social learning environment where members could participate in joint, equal conversations, and could also engage in their own learning journey with support.

Following an Adult Learning approach, we accepted that all staff held existing knowledge and skills from their experiences in basic research (and more broadly), and therefore framed discussions in ways to connect their existing knowledge with new knowledge. We negotiated the balance of treating group members as both colleagues and adult learners. Overall, we saw our role as building and facilitating learning experiences to enable group members to engage with, and learn about, SoTL.

This led to an ongoing conversation in our practice as to what constitutes SoTL. While there is no consensus on a definition of SoTL (Kreber, 2002), it is generally understood to involve scholarly inquiry or reflection into one's teaching practice, based on engagement with the literature, and including publication of that inquiry (Kalish and Stockley, 2009). For example, while this may include projects that test the effectiveness of teaching practices, SoTL can also include inquiry that aims to describe and understand learning and teaching phenomena, and can extend theory and lead to the development of conceptual frameworks (Hutchings and Shulman, 1999). In this vein, in our practice we position SoTL as representing a continuum of inquiry that ranges from testing the effectiveness of individual practice to broader research questions that potentially involve multiple collaborators.

Method: Action Research

We chose action research as the method to guide both the intervention (forming the research group) and this research study because it supports the dual aims of bringing about change in an organisation and increasing knowledge (Cherry, 1999). The intervention is conceived as a project that will span at least three years. We were investigating the research question: How can a CoP be planned and implemented to improve staff capability in SoTL? What are the barriers and enablers for success?

Action Research Cycles

Action research projects involve cycles of activity that are often described in terms of plan-act-observe-reflect. Each cycle is self-contained and comprises: planning the next stage of the intervention and research; enacting that plan; observing the results and collecting data; and reflecting on the lessons learnt to plan for the next cycle. In this way, a benefit of an Action Research method is that it allowed us to be responsive to specific events and emergent themes in our practice (Cherry, 1999). In many ways, the cycles of action research are similar to an iterative design process in Engineering. In addition, action research cycles have in-built evaluation, in that our observations and reflections as researchers have an explicit aim to judge whether the current actions are bringing about the intended changes. Evidence of our success is embedded in the ongoing evaluation of the reflective phase of each cycle.

Four Cycles

The initial four cycles are described below in terms of the aim and plan, the action undertaken, and observations and reflections. At the time of writing this paper, we were within the fourth cycle of action research for the development of this education research group. The length of each cycle was determined by the aims and activities within a given cycle and so the duration of cycles varied.

| Cycle 1 | Cycle 2 | Cycle 3 | Cycle 4 |
|---------|---------|----------|-------------|
| 1 week | 3 weeks | 12 weeks | In progress |

Figure 1: Duration of Action Research Cycles

Cycle One

Cycle one spanned the first week of the group's formal existence. In this cycle our aim was to gain consensus on the direction of the group and set our bearings as action researchers. Specifically, our plan was to engage with stakeholders—via discussion, initial documentation and a formal meeting. We met with key stakeholders, such as the group's steering committee members, to establish the lay of the land, which helped us to confirm what currently existed and what might be done. It was useful to encapsulate these discussions on paper, so a planning document was drafted to: (1) capture the steering committee's perceptions of group directions, and (2) establish a common language for directions and activities.

During this cycle, we shared our observations (which lead into reflections and plans for cycle three) through dialogue, which we then documented. Our observations in the first cycle centred around issues such as organisational culture, group dynamics, and orienting ourselves to the Faculty as we were both relatively new employees at the university. Our reflections also focused on making connections between our observations in practice and our understandings of adult learning, a CoP and SoTL.

During the first cycle of activity, the Vice Chancellor (VC) of our university launched a blog. The VC's first blog entry proposed a centre for research into higher education. While the VC's proposal was developed independently from plans for our Faculty's education research group, the blog entry had the effect of validating the research group activities, and in doing so bolstered our mandate to act.

Cycle Two

In the second cycle of action (three weeks' duration), our aim was to engage with the community—both potential research group members and the broader university community. This was to build the momentum for the research group. Our actions involved establishing relationships with key support staff, such as the liaison librarian and director of the educational multimedia unit. Our formal event was to hold the first meeting of the research group's core members—who either held leadership roles in education and SoTL in the faculty or university, or were currently active in education research. This meeting was intended to receive feedback on the research group's proposed direction and planning documentation, and to further establish a shared language within the group.

At the beginning of cycle two we launched weekly ESER group meetings. Our meetings provided a program of scaffolded, developmental SoTL activities. The first meeting involved a structured conversation and collection of members' needs analysis. The weekly meetings were then designed to provide a systematic and sustained needs-driven program to induct staff into SoTL. This was in line with the need for immediacy of learning from the Adult Learning principles that guided our actions. The research group has been meeting for one hour, each Tuesday at lunch time. Attendance has been voluntary and based on members' availability and interest. This is aligned with the voluntary nature of communities of practice. As a consequence, some members attended weekly while others dropped in and out. Meetings typically have had 8-12 staff attending drawn from approximately 25 members.

The program of weekly meetings began with a structured conversation (once every five weeks), followed by journal club and writing group meetings (alternating twice to cover the subsequent four weeks). In the sixth week we returned the structured conversation. Journal club involved critical discussion of an education research paper, while writing group involved a focused writing activity. We aimed to structure the sessions sequentially, building towards a goal such as drafting an abstract and then a full paper. To this end, example session topics covered in the structured conversations and writing group include: the how-to's of education research and scholarship; describing the context of a learning and teaching activity; elements of an abstract; giving and receiving feedback on an abstract; and writing your method section.

In each weekly meeting we provided members with a worksheet, which we'd designed to structure the session, provide a tool for engagement and also create a physical record of learning. A key design feature in worksheets was ample white space for members to enter their observations and notes. We developed a general format for all weekly sessions:

- Describing the aims for the session and, where appropriate, conceptual introductions;
- Small group discussions to develop conceptual understanding, coupled with members recording their learning from discussions in the worksheet;

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- Whole group discussion to develop consensus and enable members to further record learning in their worksheets;
- Individual application of learning (where appropriate); and
- Closing with members writing their personal action to follow-up after the meeting.

Based on Adult Learning principles, we strived to provide sessions that were: active; allowed members to share and incorporate previous knowledge and experience; created a shared language for SoTL through dialogue; and gave members a focus to continue activity beyond the meeting, rather than the meeting being an end in itself.

Our observations in cycle two centred further on staff engagement, language and group dynamics—such as the metaphors and tenor of language, along with the assumptions and broader paradigmatic orientations that they implied. Our reflections included potential avenues for future action, bearing in mind the variation of paradigmatic orientations we observed. A further question in our minds at this point involved the potential for a tension to arise between the research group and the community of practice, despite the large overlapping. This was because the research group was externally imposed following institutional needs, whereas a community of practice often forms organically without reference to external requirements. In terms of practice, our concern was: at what point might our intervention to form the research group actually interfere with individuals' and community's natural development in education research? And following that, how might we best avoid such an unintended outcome? Rather than arriving at concrete answers at this point, these questions helped us to shape our plans and actions, and to focus our observations.

Cycle Three

In our third cycle of activity (twelve weeks duration), our reflections to date guided us towards planning action with an inward-looking focus. This was aimed at inducting the fledgling research group members into the inter-disciplinary norms of SoTL. In conceptualising the group's development, we found Tuckman's (1965) classic sequence of group development—forming/storming/norming/performing/mourning—instructive, even where the purpose of the research group varied from Tuckman's groups. Our plan continuing weekly activities, supporting project development, and just-in-time assistance.

In addition to continuing the weekly program of activities, in this cycle we created an application form for seed funding project grants (which was carefully designed to elicit a research question, plan and outcomes) and solicited applications to support SoTL research projects. Seed funding grants were open to research group members as well as faculty staff who had not attended research group activities to date. We required potential applicants to send a brief expression of interest via email, which allowed us to have individual consultations to advise on the shape and content of seed funding applications. In addition, we provided just-in-time assistance such as consulting on human research ethics applications

A further plan during this third cycle of activity involved consolidating the group's formal identity within the institutional setting by drafting detailed documentation of the research group's aims, objectives, and key performance indicators. This documentation was then circulated to ensure accountability and to seek approval from senior leadership (which was granted from within the Faculty).

Cycle Four

At the time of writing, we are currently in the third week of our fourth cycle of activity and expect this cycle will continue for two weeks. Based on our reflections and planning to the end of cycle three, the aims of the fourth cycle include consolidating, and gearing up for activities with an outward looking focus. In terms of consolidating, our action has been to check our bearings by conducting a second needs analysis with group members. This was done by email and in a structured conversation. Our two main questions were: Have the activities to date been useful? Are there additional activities or supports that you would like us to provide in SoTL? The main responses we received were to continue with what we were doing, but also to allow more variation in activities to support individual investigations of members' practices (outside funded projects) and to start members' current research activity.

In terms of gearing-up for an outward-looking focus, we concentrated our actions on preparing for three activities: (1) paper presentations at this conference, (2) hosting a 1-day research retreat, and (3) hosting a regional network meeting of engineering education academics. To prepare conference papers, four members of the research group presented draft papers to journal club meetings for critical feedback. In

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terms of process, the draft was circulated to be read before the meeting, and the meeting was an opportunity for members to suggest points for improvement. Some members also provided authors with marked-up versions of manuscripts. Each meeting was dedicated to one paper and discussions took almost the full hour allotted, with authors indicating that the feedback was beneficial. In the case of this paper (and Mann & Chang, 2010), the writing group feedback doubled as a source of member checking.

In this cycle we also began preparing for a 1-day research retreat, which was to be the first major group activity. The retreat was intended to raise the research group's profile within the university by involving colleagues from beyond the engineering faculty. The retreat involved introducing academic staff to education research by forming cross-disciplinary teams to analyse a common data set. The results of their analysis, as well as their reflections on their learning journeys will be written up by the teams to be published in a scholarly book. In addition, we began to plan and liaise with colleagues from local universities to host a regional network meeting of engineering education academics. In rounding off the fourth cycle, many of the observations and reflections generated in this cycle have been captured in this paper and its companion paper (Mann & Chang, 2010).

Reflections on Enablers and Barriers

Using an Action Research method has allowed us to reflect on the context, conditions and resources that have enabled our activities with the research group—in addition to potential barriers. On reflection, some of the major enablers included (but were not limited to): supportive conditions and resources, staff needs and interests, appropriately skilled support staff, and access to useful conceptual frameworks.

One of the major conditions that has allowed us to progress is active leadership support, which has included endorsement from the Vice Chancellor via email, support and encouragement from the faculty Dean through email and attending research group major functions, and active involvement of the ADLT who is also leader of the group. Amongst these, the key condition has been the ADLT working with the Dean to secure funding for the full-time co-ordinator's role and associated group activities.

Other environmental conditions that have enabled the group's formation and development include a faculty culture that affords a focus on scholarly teaching (as a complement to basic research), which in turn legitimises activity in SoTL. In addition, there is our observation that a number of staff have attended all research group activities and accessed all opportunities for support (such as just-in-time consultations), which speaks of a need.

An additional enabler has been the interdisciplinary team of two staff co-ordinating the research group (the authors), who have expertise and skills in SoTL, education research, coordinating groups and adult learning, and the academic staff who have been attracted to become group members through active attendance. Drawing on an Adult Learning approach within a CoP, the rich diversity of experience that members possess has been a valuable asset for SoTL discussions, critical feedback on draft papers and so on. Beyond experience and knowledge, group members have shown a generous and co-operative spirit in research group activities, which has been an invaluable, positive contribution.

We have observed a benefit in the way that our roles of group co-ordinator and academic developer are structured in the faculty but outside a specific department or school, which has allowed our relationships with academic staff to be uncomplicated by tribal and disciplinary boundaries. Likewise, we have benefited from a freedom and agency to decide on the direction and implementation of research group activities, rather than being tasked with a highly prescriptive "recipe" of activity to follow. As a final word on enabling factors, we have reflected earlier in this paper on the strengths and benefits of the combined conceptual framework of CoP, an Adult Learning approach and Action Research.

The barriers we encountered have included organisational memory of similar, past initiatives failing, which caused some hesitancy. In this case, we consciously spoke in ways to manage people's expectations, and adopted strategies that aimed to mitigate previous negative outcomes. In addition, we encountered the misconception that SoTL is a "soft" research option requiring little effort or rigour. This was characterised by an assumption that SoTL involves simply describing one's practice with no requirement to engage with relevant literature, learning theories, and critical reflection or research method. When faced with this attitude in talking to individuals, we injected examples of rigour and complexity into our descriptions; and in interactions with the research group, illustrated rigorous SoTL

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through example papers in the journal club. A further barrier or complication is the university's institutional drive to publish in journals with national rankings in only A* or A levels. This is an ongoing issue in which we are balancing institutional requirements with the fora that are appropriate for dissemination of a given project. However, in the balance at this point in the intervention, our ongoing evaluation suggests that the enabling factors outnumber the barriers to success.

Conclusion and Future Directions

This paper has reported on the actions in practice, and the enablers and barriers to success in forming a CoP for education research within an Engineering Faculty. We observed that leadership support, appropriate resourcing and staff interest form key enablers, and that organisational memory, misconceptions of SoTL and an institutional drive towards prescribe outlets for dissemination form potential barriers, although these have not outnumbered the enabling factors for success. We intend to continue with the research group as an intervention in SoTL, based on repeated assessment of staff need. Our plan is also to continue with the research project, where we would like to introduce two additions to the method: (1) recording our (the authors') reflective dialogues as a data source of co-inquiry; and (2) augmenting our dialogue and reflection by following the action research tradition of seconding a "critical friend" (Kember, 2000). In this continuing inquiry, we hope to rise to the challenge of casting a wide net in SoTL, which was set by Hutchings and Shulman (1999, p.15):

... the scholarship of teaching can also make a place for "what" questions—questions in which the task is not to "prove" but to describe and understand an important phenomenon more fully: What does it look like when a student begins to think with a concept rather than simply about it?... There must be a place, too, for questions that allow for more theory-building forms of inquiry, and for the development of new conceptual frameworks.

Indeed, if the scholarship of teaching is to advance as a field, there must be inquiry into the process of inquiry itself.

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