Creating an Engineering Education Community of Practice within an Institutional Setting: A Blueprint for Action Research

Llewellyn Mann
Swinburne University of Technology, Melbourne, Australia
lmann@swin.edu.au

Rosemary L. Chang
Swinburne University of Technology, Melbourne, Australia
rchang@swin.edu.au

***Abstract**: Engaging with and developing academics' understanding and experience of the Scholarship of Teaching and Learning (SoTL), including educational research, is challenging. This is particularly the case in engineering and science, where engaging in and learning about SoTL represents a paradigm shift from most academics' training in basic research. However institutional pressure exists for academics to progress their teaching practices and improve student learning and engagement. Academics actively questioning and researching their own teaching practices can result in institutional change and improvement in these T&L practices. This change agenda toward SoTL was implemented through the use of an adult learning framework within an engineering and science faculty. This framework included a community of practice (CoP) perspective to inform group learning, as well as an adult learning perspective to inform individual learning. This paper uses an action research method to develop a blueprint, and investigate what conditions were required, for a change agenda toward SoTL.*

Introduction

Helping academics to engage with and change their own teaching practices is difficult. Some are hesitant to question their current practices, or lack the skills, time and confidence to investigate and evaluate the effectiveness of any changes. However, there is increasing pressure from institutions to improve student learning, engagement and retention. Further, teaching practices and performance are increasingly being linked to academics' performance reviews and promotion processes. Strategies to encourage academics to examine and develop their teaching practice involving edicts from upper management, or one-off professional development sessions may fail to achieve long-term change.

What is required is a strategy to help academics in the scholarship of learning and teaching; to learn how to improve their teaching and learning practices, and in general conduct education research and investigations, which are supportive and attuned to their particular learning needs as adult learners. For long-term change to occur, the focus needs to be on internal change that develops through learning rather than on superficial change that is imposed externally. Some attempts have been made to support academics to learn about, and then improve their practices, particularly using a community of practice framework (Green & Ruutz, 2008; McDonald & Star, 2008; McDonald *et al.,* 2008). However, these often have not been strategically aligned with institutional goals, and are commonly perceived as mere support mechanisms rather than full learning mechanisms.

The research questions were: How can universities facilitate this learning framework in order to undertake a larger change mandate? What could a learning blueprint to support academics in the scholarship of teaching and learning look like? What conditions and resourcing would aid in the implementation of this Blueprint in a local institutional context?

This paper reports on a Blueprint that was developed to support institutional change towards improved teaching and learning practices. The theoretical frameworks of the Scholarship of Teaching and Learning (SoTL), Communities of Practice (CoP), an Adult Learning Framework (ALF) and Reflection on Action (RoA) were used to develop the overall Blueprint. The Blueprint is made up of a learning framework (involving CoP, ALF & RoA), an action framework (activities and opportunities for learning based on the three aspects of SoTL), an interdisciplinary support team, and considerations of the local institutional context. An action research method was used to both iteratively develop the Blueprint, whilst also using it to actively support academics to learn about SoTL and engage with their own practices. A more detailed account of the iterative cycles undertaken is presented in (Chang & Mann, 2010). The conditions and resourcing required are also presented and discussed. Finally some recommendations for other academics wanting to use the Blueprint in their own institution are offered.

Theoretical Frameworks

Scholarship of Teaching and Learning

The Scholarship of Teaching and Learning (SoTL) has been proposed as a strategy for institutional change (Roxå *et al.,* 2007). By encouraging staff to reflect on their individual teaching practices in a scholarly way, a larger dialogue is opened up across the faculty to enable the questioning of current practices. While this can be beneficial, it may also have a negative effect on individuals' status and/or identity (e.g. detracting from their status as a basic researcher), if not managed in a positive way. To overcome this, Roxå *et al.* (2007) argue for, among other strategies, having a reward system for staff to undertake scholarly approaches, providing and facilitating specific research projects around teaching practice, and providing opportunities for scholarly dialogue with all staff across the faculty. They also promote utilising what they term consultants, who are individuals with knowledge and experience of SoTL who are able to support scholarly dialogue and activities, and provide staff new to SoTL someone to engage with.

The growing literature on SoTL indicates it comprises three related activities (which can encompass smaller, individual practitioner's action, up to larger education research projects) (Martin *et al.*, 1999):

- Engagement with the existing knowledge on teaching and learning
- Self-reflection on teaching and learning in ones' own discipline
- Public sharing of ideas about teaching and learning within the discipline

The self-reflection aspect also includes practitioner research, and as Sperling (2003, p593) proposes: "This new 'scholarship' encourages faculty to understand themselves both as practitioners who can utilize research to enhance practice and researchers who can contribute to their profession through significant practice-based research". This framework can help to understand the actions that academics can take in SoTL.

Communities of Practice

Communities of Practice (CoP) are "groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly" (Wenger, 1998). They have three essential elements: a domain of knowledge, a community of people, and a shared practice. The domain of knowledge represents the common ground on which members engage and learn. The domain contributes to the identity of the group, differentiating it from other groups that could exist. In the case of this paper, the domain of knowledge was the Scholarship of Teaching and Learning. The community of people are those who care about the domain of knowledge and who feel they have something both to contribute to, and to learn from, the engagement with the domain and with others. For this paper, the community of people was made up of academics in engineering and science. Finally, the shared practice evolves from the community of people engaging with and learning about the domain of knowledge. In this case, the shared practice had been developing from the inception of the community, and is discussed in more detail in a companion paper also presented at this conference (Chang & Mann, 2010).

Further, a set of seven principles, which were developed to aid in cultivating CoPs within institutions (Wenger, McDermott & Snyder, 2002), have been used to frame this paper. They are:

1. Design for evolution – communities of practice are organic and responsive to members' needs but can be guided in their evolution.
2. Open a dialogue between inside and outside perspectives – while most of the dialogue happens between community members around the domain of knowledge, it is important that there be a dialogue with outside perspectives, particularly with people in leadership positions within the specific institutional setting, to gain perspective, legitimacy and guidance.
3. Invite different levels of participation – different members of the community need to be able to have different levels of participation, from core drivers of activity to peripheral members, based on their availability and interest in the community's practices.
4. Develop both public and private community spaces – a balance needs to be maintained between the public spaces to engage with people outside the community and to disseminate the knowledge and practices being developed, and with the private spaces that enable the web of relationships that are the key that allows the community to thrive.
5. Focus on value – value is key to both member's participation and the existence of the community itself, as participation is mostly voluntary and communities often don't produce the same sorts of outcomes as other groups (such as research centres) within institutional settings to justify their existence. The value is in the learning of the individual members and changes to their practices, as well as in the systematic body of knowledge that is generated and published as the community evolves.
6. Combine familiarity and excitement – communities need to become places where familiarity creates a comfort level that allows members to be candid about their own practices and limitations and also to be open to learning, while at the same time maintaining a level of excitement that continually engages current and new members.
7. Create a rhythm for the community – when this rhythm is strong and regular, the community has a sense of engagement, movement and liveliness.

While this framework was core to the development of the Blueprint presented, there was still a question of whether or not a community of practice in education research could be created and sustained within the specific institutional setting considered and what conditions would be required.

Adult Learning Framework

Academics are adult learners and as such require an appropriate approach if they are to become effective learners: an approach that goes beyond the traditional methods often used at universities. Vella's (1994) twelve principles for effective adult learning were used as a framework to inform this different perspective. She asserts that adult learning is best achieved in dialogue with the learners, as adult learners have sufficient life experience to hold a dialogue with any teacher about any subject. This is particularly the case when helping academics to learn about the scholarship of learning and teaching, as all academics have at least learnt as students themselves, and most have first hand experiences of teaching and learning as students. It should be noted however that these past experiences could actually be a hindrance if they constrain and inhibit academics from further learning. Vella's principles are a way to begin, maintain and nurture dialogue, and are restated here:

1. Needs Assessment: participation of the learners in naming what is to be learnt
2. Safety in the environment and the process
3. A sound relationship between teacher and learner for learning development
4. Careful attention to the sequence of content and reinforcement
5. Praxis: action with reflection or learning by doing
6. Respect for learners as subjects of their own learning
7. Cognitive, affective and psychomotor aspects: ideas, feelings, actions
8. Immediacy of the learning
9. Clear roles and role development
10. Teamwork: using small groups
11. Engagement of the learners in what they are learning
12. Accountability: how do they know that they know?

These were core to the development of the Blueprint and provided an individual perspective to learning.

Reflection-on-Action

The final framework that was used linked the actions of academics in practice around SoTL with what they were learning both individually and collectively within the community. Reflection-on-action (Schön 1983; 1987) and Argyris's (1991) double–loop learning are both examples of linking action to learning, and learning to action. Reflection-on-action discussed in Schön's (1983) seminal book "The Reflective Practitioner" involves practitioners spending time reflecting on the actions they took; whether these actions resulted in the outcomes they wanted, and what could have been done differently to achieve better outcomes. Schön argues that this reflective single-loop learning is essential for practitioners to learn about their practices, which are often tacit and not easily described outside of the act of practice itself. It is also particularly effective when an error in practice is detected, and enables practitioners to point to ways of correcting that error in future practice. This idea was built on by the concept of double-loop learning, where not only the practice is reflected upon and improved, but also the practitioners themselves, their actions and their behaviours are open for scrutiny. The literature indicates that often the way the practitioners went about framing their own practice was the source of problems, particularly when failure occurs. Argyris (1991, p.100) argues:

> *...because many professionals are almost always successful at what they do, they rarely experience failure. And because they have rarely failed, they have never learnt how to learn from failure. So whenever their single-loop learning strategies go wrong, they become defensive, screen out criticism, and put the 'blame' on anyone and everyone but themselves. In short, their ability to learn shuts down precisely at the moment they need it the most…*

The reflection-on-action framework provides a means for academics to reflect on their actions, in both single- and double-loop ways, to then inform and frame the learning they undertake.

The Action Research Method

As the research question had an inherent practice aspect, a method was needed that would enable the co-evolution of the action in developing the community of learners, and the research study, while letting each inform the other. Action research was chosen as it is inherently situated within practice and undertaken by active agents in the process, rather than outside observers (Cherry, 1999). At its core it involves an interplay between action and reflection, with the researcher-practitioner undertaking changes to practice and then reflecting on the impact that those changes have had. This interplay has direct parallels with Schön's (1983; 1987) 'reflection-in-action' and 'reflection-on-action' particularly in the contexts of adult and professional learning. "As a method of investigation it asks that a plan, an idea or a theory be checked against action and experience, and that action be informed and enriched by theory, planning and ideas" (Cherry 1999, p.3)

The action research method has three distinct strands, Action, Knowledge and Learning, which are weaved together to form the practice (Cherry, 1999, p.4):

- The Action strand makes useful and noticeable changes to current practice. It is at times planned and guided, but can also be spontaneous and reactionary. It has the potential to challenge conventional paradigms and ways of doing things.
- The Knowledge strand adds to the wider body of knowledge about the people and processes under consideration. It both discovers a deeper understanding of what's out there, and creates something new. It can create new insights others can use to change their own practices.
- The Learning strand improves individual and the collective practice in order to undertake improved actions in the future. It also offers a self-reflective process to understand and improve the practice of the practitioners themselves and their unconscious acquisition of skills.

The process of undertaking action research is cyclic, involving planning, acting, observing and reflecting. Each cycle is self-contained and involves: planning the next stage of the intervention and research; enacting that plan in practice; observing the results and collecting data; and reflecting on the lessons learnt to plan for the next cycle. This cyclic process means that an action research project changes directions and actions as the project evolves and new insights are made. The data collected

included partitioner reflections, observations of activities and other interactions with group members and documents.

Action Research allows different research paradigms to be used based on the phenomena being investigated, the questions being asked, and the nature of the reliability, the validity and the generalisability required (Cherry, 1999). For the purposes of the research described here, a social constructivist epistemology was used, where individuals construct their own meaning through interactions with others and within a larger social context (Berger & Luckmann, 1966). This was also aligned with the research questions that were around the development of a Blueprint for learning about SoTL within a community of academics. Questions of validity revolved around the validity of the knowledge produced. In action research, this knowledge is discussed in terms of both the capacity to describe what is happening, and to explain it (Cherry, 1999). The Blueprint has been disseminated to members of the community for comment who were positive in the way it represented the learning environment they had experienced. The findings are generalisable to other contexts that have similar conditions and resourcing available.

Results

The results from the action research project were two-fold. Firstly, a "Learning & Action Blueprint" was developed, which describes the approach undertaken to help academics learn about the Scholarship of Teaching and Learning whilst they are updating and reviewing their practices (See Figure 1). Secondly, the conditions and resourcing required for the Learning & Action Blueprint to function in practice were identified.

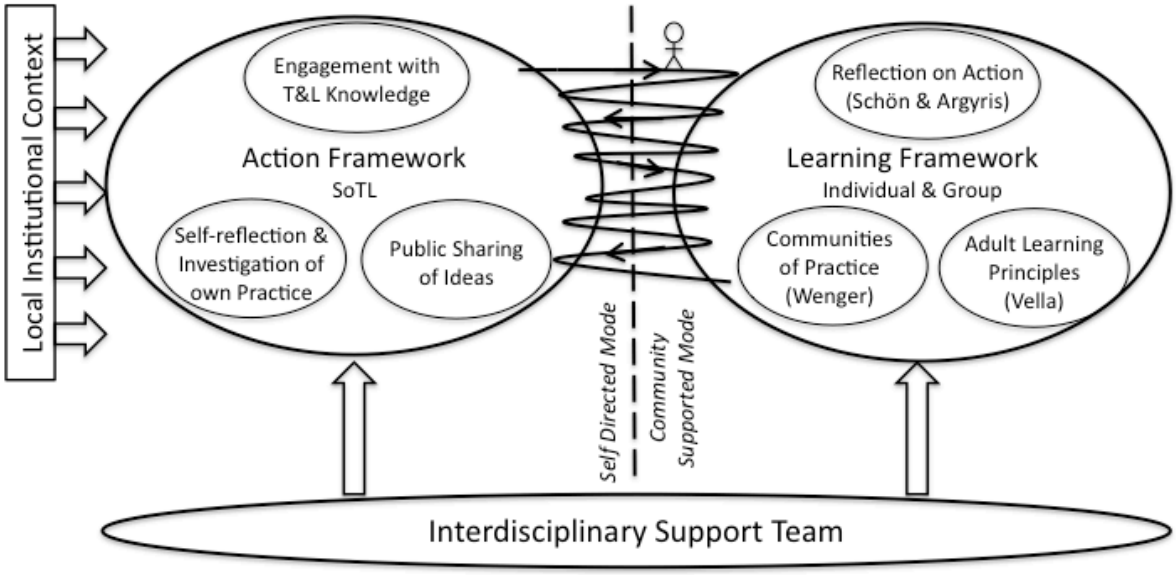

Figure 1: Learning & Action Blueprint

The Learning & Action Blueprint includes an action framework, a learning framework, an interdisciplinary support team and the local institutional context. This Blueprint sets up an environment for individuals or groups to learn about SoTL and develop their own teaching practices in two different modes, a self directed mode and a community supported mode. The action framework is in a self directed mode and includes the three identified components of SoTL, those of an engagement with teaching and learning knowledge, self-reflection and investigation of own practices, and the public sharing of ideas. The learning framework operated in a community supported mode, and is a combination of Communities of Practice, Adult Learning Principles and Reflection-on-Action. This combination not only informs the learning that takes place, but also creates a structure to plan for future learning to happen. It is important to note that this learning framework includes individuals learning both independently and together in a group. An individual's journey between the learning and action frameworks and vice versa is facilitated by reflection and planning, where individuals'

reflections on their actions-in-practice form the basis of learning events, and where reflections on what is being learnt feed into plans for changes to practice.

Both the learning and action frameworks are supported and facilitated by an interdisciplinary support team. An interdisciplinary support team is vital for the Blueprint to work, to both understand the practice of the individuals under consideration, as well as to plan and conduct learning experiences for them. In the active development of the Blueprint, this team was made up of two people (the authors) who worked together closely. One was an academic developer with a background in higher education and social science, while the other had backgrounds in engineering and physics but had experience in engineering education research. This team was able to understand the practice of the individuals within the group around engineering and science, while at the same time help to plan and conduct learning experiences that would benefit them.

The final aspect of the Learning & Action Blueprint is an understanding of the local institutional context and what affect that can have on the other elements. Institutional culture and structures, including the siloing of disciplines, institutional memory of what has happened or been tried before, constraints of time and resources of the individuals in the system, and the mandate and support for change all influence the learning and action activities in the Blueprint. Some of these are fixed and need to be accepted as they are, while others can be influenced and changed, particularly based on the practices of the individuals in question. For example, locating the group at the faculty level, outside of any specific discipline, starts to overcome the siloing of activities and encourages an awareness of practices within disciplines.

The Learning & Action Blueprint described above is applicable to most settings in academia to help academics learning about and changing their practices toward SoTL. However, some conditions and resourcing are required for the above framework to function in practice:

- Institutional and management support, particularly from the Dean and faculty management
- Funding for interdisciplinary support team positions and group activities
- Interdisciplinary support team – having people that work well together, that have a specific skill set, and that are able to engage with academics at all levels of experience with SoTL
- Finding a balance between externally imposed authority and direction vs group members autonomy in determining their involvement and directions – this balance will be context dependent
- Membership and involvement in any group that is voluntary and based on an individual's perceived value in taking part

Discussion

This research developed a Learning and Action Blueprint that helped to kick-start a change agenda towards the Scholarship of Teaching and Learning within an engineering and science faculty. It also identified the conditions and resourcing that were required in its development and initial operation. A more detailed account of the development of the community in which the Blueprint was developed is also presented at this conference (Chang & Mann, 2010). While the Blueprint has only been in use for a few months, its impact and success is already apparent. There are over twenty academics actively engaged in the community and attending regular activities. These people have stared to learn about SoTL and are able to converse with each other about issues from their own practice.

The evidence that the Action Framework of the Blueprint has been effective around the three SoTL dimensions of activity includes community members:

<u>Scholarship of Teaching and Learning</u>

- attending many different activities, including journal club, writing group, monthly active workshops termed 'conversations', and being actively engaged
- starting to engage with the education literature, both through structured fortnightly readings and based on their own interests
- beginning to question and change their teaching practices in a variety of ways
- undertaking new education research projects that would not have been otherwise occurred, particularly using funding opportunities provided by the community

- starting to disseminate findings from reflections and investigations of their own practice

The evidence that the Learning Framework of the Blueprint has been effective around the three learning frameworks includes:

Communities of practice

- A domain of knowledge around the scholarship of teaching and learning has been established as something that members want to learn about and feel they can contribute to
- A community of people has been brought together and is actively engaged while allowing different members to have different levels of participation
- Shared practices are being developed and disseminated among members of the community
- An open dialogue exists between the members of the community and outside perspectives, particularly those of the Dean and Deputy Dean, as well as other teaching and learning groups within the university
- A rhythm has been developed for the community of weekly activities cycling every five weeks around a larger active workshop. This has also contributed to feelings of familiarity within the community about the sorts of activities offered and what they feel comfortable with committing to

Adult learning principles

- Community members have had several opportunities to identify what they wish to learn more about, both in terms of improving their own practices and SoTL in general (Principle 1)
- A good relationship has been formed between community members and the interdisciplinary support team who plan and run the learning activities (Principle 3)
- Praxis has become a key feature of all learning activities, giving community members a chance to act and then reflect about what they have learnt from that action (Principle 5)
- The timeliness of what members are learning has been vital to the planning of activities so far, with most activities carefully sequenced (Principle 4) and resulting in immediate action (Principle 8) e.g. running a series of activities about how to write education conference papers leading up to deadlines for submissions

Reflection-on-practice

- Community members have been encouraged and supported to be reflective on their own practice and use that as a way to frame and inform what they are learning, while at the same time
- Reflect on the ways in which what they are learning can be implemented in their own practice, and planning accordingly

The Interdisciplinary Support Team has been vital for the success of the Blueprint and community so far. The team not only plans the activities of the community but also engages in individual support of members. The activities are purposefully planned to engage members, to help them reflect on their practice, and to learn about a variety of concepts around the Scholarship of Teaching and Learning. The team also facilitates these sessions to encourage equal participation from members.

The Blueprint at the moment, however, does not address issues of how to bring people into the learning community, nor does it clearly articulate the development of more comprehensive ways of understanding and undertaking SoTL by individuals or the community. These aspects will be incorporated in future improvements of the Blueprint.

Conclusion

This paper presents a Learning and Action Blueprint for helping academics learn about the Scholarship of Teaching and Learning and improve their practices. It also discusses the conditions and resourcing required in implementing the Blueprint in practice. The Blueprint is applicable to most university contexts in Australasia where a long-term change agenda towards SoTL needs to be implemented and supported. As the Blueprint is based on theoretical frameworks that consider individual adult learning, community learning and learning about and from practice, it is argued that the resulting changes to practice will be lasting. The paper also presents action research as a legitimate research method for undertaking engineering education research where the researcher is situated

within the practices being investigated. It is hoped that this paper will help other engineering academics reflect on their own experiences and help them to support similar communities in other faculties.

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