Hidden barriers to academic staff engaging in Engineering Education Research

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Abstract: At Swinburne University of Technology, the Faculty of Engineering and Industrial Sciences (FEIS) has charged the Engineering and Science Education Research (ESER) group with facilitating change to increase the level of engineering education research within FEIS. This paper reports on the first of a two-stage project, with the research question: How can the barriers to academic staff undertaking engineering education research be usefully conceived and framed to assist academics (and those supporting them) to overcome those barriers? Data was collected using critical reflection and dialogue in reference to the literature. Our findings suggest that barriers can at times be tacit, murky and unnamed—effectively hidden. This paper argues that to support staff to engage in education research and scholarship there is a need to understand and address not only institutional barriers, but also underlying, hidden barriers. This paper proposes an approach to such barriers and describes future research.

Context

Assisting engineering academics to learn how to undertake education research based on their own teaching practice is challenging. At Swinburne University of Technology, the Faculty of Engineering and Industrial Sciences (FEIS), which has approximately 100 academic staff, has charged the Engineering and Science Education Research (ESER) group with facilitating change to: (a) help academic staff develop scholarly approaches to their teaching practices, and (b) increase the level of engineering and science education research within FEIS. To this end, ESER is a traditional research group, but with the added responsibility of providing professional development in education research and in the scholarship of teaching and learning (SoTL) (Mann & Chang 2010; Chang & Mann 2010). Specifically, ESER activities are intended to strengthen teaching practices and hence, improve the student experience. Its activities focus on disseminating good practice within
the Faculty and beyond, as well as broadly supporting the conduct and publication of education research.

While many academic staff may be committed to good teaching, without investigating innovative teaching practices there may be a temptation for academics to reproduce the traditional teaching practices that they were exposed to as students. In addition, the increasing complexities of teaching, together with a lack of support for engineering education research and scholarship at some institutions might seem insurmountable challenges to some academic staff. These challenges may lead a proportion of academic staff to conclude that the more fruitful path in research involves focusing on basic research.

Our work in the area of supporting academics to engage in education research and scholarship has caused us to reflect on the potential barriers to this activity. Some of these 'institutional' barriers are described in terms of a lack of time, lack of institutional support and development, lack of funding, or lack of perceived value, to name but a few (Brodie et al 2011; Haigh et al 2011; McKinney 2002; Wankat et al 2002). However, through reflection on our intensive work in this area, we have come to believe that there are further underlying barriers, which are more murky and tacit than espoused barriers. These 'hidden' barriers, often unacknowledged and therefore unnamed, represent further hindrances to academics' undertaking education research. For example, these may include low confidence in one's research abilities particularly in a new field, reluctance to relinquish control even if only for a short time, and concern over opening one's teaching strategies to external critique. Therefore, we contend that to support staff to engage in education research and scholarship there is a need to understand and address, not only institutional barriers, but also these hidden barriers. Further, we are also interested in additional investigations to see if the same barriers exist to academics who are reluctant to incorporate proven teaching techniques into their teaching practices. At some institutions, it has been argued that participation in engineering education research is the only effective way to motivate engineering academics to adopt new teaching techniques. This paper represents our progress to date and lays the groundwork for future empirical investigations.

Theoretical Frameworks

The project is supported by a number of theoretical frameworks including the Scholarship of Teaching and Learning (SoTL) (Boyer 1990) and critical reflection (Brookfield 1995; Schön 1983). While there is debate around the definition of SoTL, the theoretical literature in this area generally points to three characteristics: (1) inquiry into one's teaching practice, while (2) engaging with the literature, and then (3) publishing that inquiry (Kalish and Stockley, 2009). In tandem with this, the literature around critical reflection, which provides frameworks to uncover influences, assumptions and tacit understandings (Brookfield 1995) assisted our reflections on hidden barriers.
Methodology

This paper reports on a project that explores the following research question:

*How can the barriers to academic staff undertaking engineering education research be usefully conceived and framed to assist academics (and those supporting them) to overcome those barriers?*

The project is being conducted in two stages. In this first stage, the authors generated data through critical reflections, mutual dialogue and engagement with literature. Specifically, the authors first used mutual dialogue to follow Race’s (2006) method of generating prompts for reflection (arising out of the research question). The authors then generated written critical reflections (Brookfield 1995; Schön 1983) individually. These reflections were then analysed along with literature to develop a way of conceiving and framing barriers.

Stage two of this project will involve a survey of academic staff perceptions and motivations towards engineering education research. The draft survey (adapted from Haigh et. al. 2011) investigates issues including: personal pre-conditions such as attitudes and existing workload; institutional incentives and disincentives including work culture and values; apparent competition with discipline-based research; and resourcing, such as professional development and education research training, grant money, and support to develop publications. Stage two will also include interviews with selected faculty members, which will explore issues that point to underlying barriers.

Findings

From the analysis of stage one described above, a number of barriers were identified. Importantly, our reflections uncovered that in addition to institutional barriers, further murky and tacit barriers to engaging in education research can lie hidden beneath the surface. Here we report on both institutional and hidden barriers.

Institutional Barriers

In our reflections, we considered that it is not uncommon for academic staff to describe that they don’t have the time to do education research on top of everything else, particularly their basic research and teaching responsibilities. We have also observed a concern that they lack the necessary support to develop their skills in education research or the funding required in starting projects. Further, in our experience, staff have argued in the past that their Faculty or University does not value engineering education research as opposed to their traditional discipline research. While such barriers do exist, it is possible to reduce them. It was found that the activities and support provided by the ESER group reduced these institutional barriers (Chang & Mann, 2010). By providing funding and time allowance to undertake engineering education research projects and an extensive suite of developmental activities, we have found that the institutional barriers for some staff have been lowered to the point that they have started to undertake education research projects. Significant support from Faculty leadership has also...
contributed to altering the barrier of that education research is perceived to hold lesser value. However there still remains a group of academics may like to undertake education research, but who are being held back by other barriers.

**Hidden Barriers**

Generally most academic staff care about teaching and care about their students. So why don't more academics engage with education research and scholarship? One reason may be that they don't see the need for education research. Most academics were themselves very capable students in the (sometimes) distant past. These capable students clearly succeeded in their studies to the point where they then went on to successful careers in academia. Because they succeeded in an education system where they were taught in a traditional manner that was centered on the one-way transfer of information (lecturer to student), academics are often under the misconception that good information transfer equates to good learning and teaching. This misconception can be articulated as follows: if the lecture notes are prepared in a logical, thoughtful, coherent and thorough manner and if these notes are delivered via a set of clear and fluent lectures then good learning should occur. If good learning does not occur then the students must be at fault! To reinforce this misconception, academics often gravitate towards setting predictable exams that, for various reasons, encourage shallow learning and recipe-based problem solving. Some students can often perform very well in these exams yet exhibit very poor understanding of key concepts. In essence, they achieve acceptable results in the course by learning how to perform in the exam rather than developing a deep understanding of the key concepts. And if occasionally, performance is under par, there is always a renormalization process to help restore normality. So pass rates are at an acceptable standard, student feedback is generally OK and the academic progresses with their career happy that the lectures they deliver year in and year out are effective. In such a framework, academics often feel that they are extremely effective teachers, and that they do not need to do any research on their learning and teaching (L&T) methods, and that they do not need to be exposed to any new L&T strategies and innovations.

Another barrier centers on “academic memory”. After a few years of teaching, academics often forget about how long they spent as a novice in their first university appointment preparing a one-hour lecture for the first time, or how long they spent struggling with a particular concept or idea. Once they have all these ideas clearly explained in their notes (a process that can take considerable time) they can often forget how long they spent struggling over this preparation. As they deliver these lectures year after year and as they become more comfortable with the lecture material and delivery, they assume that students should be able to absorb all these ideas and concepts in real time during the lecture. Again, the conflict with academic memory and the results of education research can result in resistance from academics who genuinely and honestly do not understand why students should be having difficulties.

Another issue has to do with the academics’ comfort level. Academics invest a lot of their time and energy in becoming experts in their field, and this also extends to their teaching. Much of the education research data suggest that good learning can occur when academics
make the transformation from lecturers to facilitators. This transformation requires academics to relinquish their authority as the ‘sage on the stage’ and instead transfer a level of control to the students by becoming the ‘guide on the side’ (King, 1993). So the academic’s perception of their role as the expert can limit their ability to be receptive to engaging with education research, which often suggests a very different role. The comfort level also extends to research. Academics generally have spent considerable time and effort in developing expertise in a research discipline. To partition their research to include education research, an area where they probably feel like a novice with a poor grasp of the discipline can be very daunting.

A further comfort level centers on the emotional management required to negotiate ones’ way through the process of education research – from conceptualizing a learning and teaching intervention and drafting an ethics application, to running the intervention and collecting evidence, through to writing and publication. As those attending this conference can attest, this process can be variously frustrating, exciting, tedious, confidence-sapping and exhilarating. In a case where one might find some of these emotional experiences confronting, one might choose not to proceed.

Another barrier centers on the use of an academic’s personal time. For many staff, the immediate goal is to improve their teaching so students learn better. All their energies may be focused on developing and implementing a new L&T strategy or innovation, and doing education research to test the efficacy intervention may be of secondary importance or not important at all. Often staff that make a commitment to concentrate on their teaching rather than research do so because of philosophical, personal, family or lifestyle reasons. It is very hard to convince these staff that the extra work to quantify their teaching innovation into education research is worth the effort. This is also true of ‘teaching and research’ staff who again find it difficult to find the time to convert good teaching into good education research when they have a heavy teaching and discipline research load.

The last barrier has to do with the nature of education research itself. Most academics in engineering or the physical sciences are used to dealing with problems and issues that are deterministic in nature. Although the problems themselves may be complex, there is a sense that a solution can always be found given enough resources and information. Education research usually deals with changing the perceptions of groups of students in an environment which has many uncontrolled variables. This can often be frustrating and unsatisfying for many engineers. Education research may appear to be an emerging, rather than established field to academics new to the area, which again can be unsatisfying for academics who are used to doing discipline research.

**Discussion & Recommendations**

Universities benefit from encouraging academic staff to undertake engineering education research to strengthen student experience. However, various barriers exist. Some are institutional, which can be reduced through support, funding and development activities.
Others are hidden barriers, which can also be reduced by targeted, strategic support activities.

We have observed, through our own practice supporting staff to engage with and develop skills in engineering education research, that an extended program of activities (as opposed to stand-alone workshops, for example) provides staff with opportunities over time to unearth hidden barriers. While workshops have their place, it is through use of a support group, or a community of practice (such as the ESER group), that individuals are able to quietly unearth their hidden barriers, through dialogue with others and also by observing colleagues who are positive role models for overcoming similar barriers. It is through an extended and holistic approach, such as a support group, that hidden barriers may be addressed. Therefore, it is our recommendation that strategic planning to support staff to develop in engineering education research consider extended, holistic strategies to address hidden barriers.

Our future research in this project will augment this initial stage by surveying and interviewing academic staff on their perceptions and motivations towards engineering education, which will explore issues that point to underlying barriers.

References


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