This paper describes the process of developing a structured induction program for postgraduate research students. The program curriculum attempts to make explicit elements of research and professional cultures in the field of Mechanical Engineering, and to foster the skills and knowledge needed by students to participate in them. Initial findings from surveys of students and staff reveal that the program has succeeded in improving students’ research communication and general progression through candidature. They also suggest that students appear to be showing less initiative in their approach to research, a finding that has particular relevance to the Engineering profession.

Increasing postgraduate student numbers, increasing demands on supervisors, the introduction of the Research Training Scheme (RTS) and an emphasis on quality in postgraduate education created the impetus to provide an induction program for postgraduate research students in our university department. The aim of the Program is to set postgraduate research students off on the best start possible and equip them for their research candidature and beyond. To do so, consideration of the characteristics of generic capabilities attainment led to the conclusion that

- mere exposure to a discipline culture is not enough for most students to become fully participating members
- explicit fostering of capabilities in the discipline culture is needed, and
- an effective fostering process will strengthen transference to other contexts.

These characteristics were identified intuitively by departmental academics and are supported in the literature, notwithstanding the obvious success of some centrally located research training programs offered with general Arts or Science foci (for example, Cooper and Juniper, 2002). Deem and Brehony (2002), in their exploration of the experiences of Social Science research students in two universities, described problems students and supervisors have engaging with the ‘research training cultures’ that are positioned ‘outside’ the discipline and that are perceived as taking students away from their research activities. Bowden et al. (2004) view graduate attributes as necessarily being a blend of discipline knowledge and generic capabilities, and that ‘The notion of generic capabilities has little meaning until it is elaborated within the context of a discipline’.

One difficulty in devising a program that prepares students to be fully participating members of their research communities lies in determining the cultural characteristics – what Becher (1984, cited in Silver 2003) described as ‘the shared values, norms and assumptions’
of community members in respect to their discipline knowledge and associated activities. In a field like Engineering, these characteristics are determined as much by the profession, through its professional bodies, as by the larger academic and research cultures in the university. However, characterisation of the professional culture of Engineering is not straightforward; Tansley (1996) describes it as ‘identified with, but not identifiable ’ (p.12) and suggested that at best the culture is revealed though desirable attributes possessed by graduates and practitioners. It is from this standpoint that Engineering academics can begin to identify what is needed in terms of generic capabilities in the postgraduate students and begin to devise a suitable curriculum for their development. An important advantage of this contextualised professional and discipline informed approach is that it attempts to nurture authentic, specific, cultural characteristics, thus avoiding what Kogan (1999) refers to as the ‘intellectual polyfiller’ use of the term ‘culture’ often found in attempts to imbue managerial processes with a vague notion of shared affect and bonhomie.

The Program described in this paper was devised by academic Engineering staff, based on their intuitive sense of the appropriate generic skills and attributes needed by their postgraduates and their experiences as practicing Engineers, academics and researchers. The professional attributes of Engineers identified by IEAust (2000) confirm that the Program curriculum is highly appropriate in terms of developing many of the generic skills identified by the profession as desirable. It is also recognised that not all of the attributes, such as leadership ability, are directly addressed in the program.

The academic attributes listed in Figure 1 are identified as desirable undergraduate attributes by the School. In addition to these attributes, the postgraduate attributes emphasise a higher level of technical competence and leadership in all areas as well as the ability to conduct innovative and creative original research.

Figure 1
Professional/Discipline/Research cultural attributes

<table>
<thead>
<tr>
<th>Discipline knowledge</th>
<th>Generic capabilities (skills and attributes)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Professional attributes (IEAust)</td>
</tr>
<tr>
<td></td>
<td>Technically competent  diligent</td>
</tr>
<tr>
<td></td>
<td>innovative responsible ethical socially aware</td>
</tr>
<tr>
<td>Knowledgeable of Engineering Fundamentals</td>
<td>Effective communicator</td>
</tr>
<tr>
<td>Problem solving ability</td>
<td>Teamworker</td>
</tr>
<tr>
<td>Use systems approach to design and operationalise performance</td>
<td>Leadership ability</td>
</tr>
<tr>
<td></td>
<td>Socially, culturally, globally, environmentally aware</td>
</tr>
<tr>
<td></td>
<td>Ethical, responsible</td>
</tr>
<tr>
<td></td>
<td>Lifelong learner</td>
</tr>
</tbody>
</table>

The Structured Induction Program is compulsory for beginning postgraduate students and is run over two to three weeks. The following program of workshops presented in the department by academic and technical staff from within the research discipline:
- Departmental computing
- Postgraduate administration
- Intro to Solid Edge
- Thesis typesetting
- Scientific skills
- Project planning and your thesis
- Presenting a departmental seminar
- Student perspectives
- OH&S
- Supervisor / student expectations survey

The following workshops are presented by university staff from outside the department:
- Reviewing literature and identifying the research gap  - Barr Smith library
- Commercialising your research  - Writing a research proposal

This allows for the use of centrally located staff with expertise in areas such as writing, information literacy and commercialisation and intellectual property issues.

As well as these formal workshops, students attend weekly postgraduate seminars as well as those given by visiting lecturers, and regular end of week social get togethers in the department. Postgraduate students in most Engineering schools share group offices and have many opportunities to discuss their projects and exchange ideas. Most students have frequent informal contact with their supervisors and other departmental staff. All of this contributes significantly to the collegial atmosphere of the School.

Since the aim of the Induction Program is to equip our postgraduate students for their candidature and subsequent professional lives, we sought feedback from both students and supervisors on any changes to students’ attributes since the inception of the Program. Overall, students were very positive about the effectiveness of the Program in preparing them to engage in the activities associated with their candidature. In particular they identified drafting a thesis outline, seminar presentation skills and all the writing workshops as particularly useful or relevant.

Feedback was also elicited after the writing workshops concerning the extent to which students felt the workshops assisted the timely completion of research and the extent to which issues covered in the workshops were relevant to their future careers. Figure 2 indicates that over 90% of students felt that the workshops would contribute in some way to both these outcomes, with over 30% believing the skills acquired would contribute to a high degree.

Figure 2
Student response to questions To what extent will the workshop assist in the timely completion of your research project? and To what extent were the issues covered in this course relevant to your future career?

![Figure 2](image_url)

Experienced supervisors were then surveyed about their perceptions of change in postgraduate candidates since the Induction Program had been expanded to include a focus on students' spoken and written research communication skills. In 2001, modules were added on writing a research proposal, writing a thesis, and writing a journal article for publication. Since 2000, a module on presenting a departmental seminar has been included. Prior to this the Induction Program was primarily focussed on discipline specific All supervisors that responded had supervised at least 3 students, 60% had supervised 6 or more students, with 40% having supervised more than 10 students. Five of the eight sufficiently experienced supervisors in the department responded.

In the survey the supervisors were asked a series of questions relating to the various modules of the Induction Program. In general there was agreement among the respondents that the Induction program had achieved its goals. For example, 100% of respondents agreed...
with the statement 'Early candidature students now write about their research in a more informed and appropriate way'. Of interest are the statements that the supervisors did not agree with. Only 20% of respondents agreed that 'Thesis drafts are easier to work with', 20% disagreed, 40% indicated no change, and 20% could not comment.

To the statement 'Students show more initiative early in their projects', 40% of respondents agreed, 20% disagreed, and 40% indicated no change. 100% of respondents indicated that there had been no change with regard to 'Students make better use of Library resources'.

When asked 'What attributes of research candidates need to be improved to make them good research candidates?', the supervisor responses indicated that they felt that the students needed to: adopt a more critical use of the literature; improve their skills in time management and setting and achieving project goals; and improve their research communication skills.

From an analysis of the survey results, one could conclude that thesis drafts will never be easy to deal with. This is not so much an indication that further work is needed in this area, more that reviewing thesis drafts is a considerable task for the majority of supervisors surveyed.

The survey responses indicate that the emphasis on timely completion and establishing research topic early, resulting from the introduction of the RTS, has resulted in postgraduate students showing less initiative early in candidature, and placing more dependence on their supervisor. The postgraduate students are also seen to undertake much less exploration of literature to identify a potential research gap.

Conclusions

The results from the work described in this paper indicate that that both students and supervisors recognise the need for both discipline specific and generic capabilities development. In addition the staffing of modules or workshops for the generic skills development is crucial to students' perceptions of the relevance and importance of the workshops. Similarly, conducting the modules within the discipline is important because it demonstrates to the students that the discipline values the generic skills that are being developed.

It appears that the emphasis on timely completions for postgraduate research degrees has resulted in students showing less initiative early in candidature and are less likely to explore the literature to identify a research gap, and will place more dependance on their supervisor to determine a suitable area for research. This characteristic suggests a desire to follow a safe, unadventurous approach which is not conducive to innovative practice, a principal tenet within the professional culture. This is an area of potential concern.

References


