Benchmarking for gender inclusiveness

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Introduction

The low rate of women's participation in non-traditional disciplines such as engineering and information technology is an issue currently facing higher education institutions and workplaces in Australia.

Recruiting and retaining women university students in areas of study that are non-traditional has been a problem in Australia for many years. Various initiatives and interventions have been trialled since the 1980s, with limited success. Initially, strategies focussed on increasing the recruitment and retention rates of female students and included initiatives such as the establishment of Women in Engineering/Science/IT Project Officer positions and committees in many Australian universities, and the development of peer group networks and mentoring programs. More recently, efforts have focussed on effecting cultural change in universities by developing inclusive curricula.

What are the participation rates? In 2001 women comprised 15.3% of undergraduate engineering enrolments in Australian universities and 25.9% of undergraduate Information Technology students (DEST Selected Higher Education Statistics: Students). In my own University, however, the proportion of women undergraduate students in engineering is significantly lower. Despite the establishment for six years of a dedicated position in our (then) Faculty of Engineering to encourage female school leavers into an engineering degree, the proportion of women studying this discipline at the University of Newcastle increased by only 1.7% in those six years, from 10.1% in 1996 to 11.8% in 2001 (University of Newcastle Statistics Handbook).

Employment statistics in Australia in 2001 show that only 18.7% of professional staff working in engineering, science and building are women (Australian Bureau of Statistics).

Many studies have demonstrated that the 'masculine' culture that still prevails in professions and academic disciplines considered non-traditional for women's participation exerts a strongly inhibiting influence.

How is this masculine culture exhibited? According to Roberts and Lewis (1996, p.10), the curriculum and learning styles, and cultural milieu of the engineering education model in many universities reflect this masculine culture. Examples of such curriculum and learning styles include a need for control over problems, an emphasis on facts and right answers to problems, a tendency to attach more importance on answers or outcomes rather than process, and a lack of recognition of different learning styles. The limitations of the cultural milieu in which women might struggle include: neglect of interpersonal and communication skills, an over emphasis on individual work by students that promotes a highly competitive rather than collaborative environment, and gender harassment.

The authors argue that such styles and milieu are equally evident in the workplace, where they are exhibited by, for example, autocratic management styles, a need for control, a lack of

effective communication skills, gender harassment (exacerbated by racism), and lack of recognition of preferred working styles.

Copeland and Lewis (1998, p.3) identified both social and educational aspects of a masculine student culture in engineering faculties. The social aspects include group behaviour which is centred around joking and trivialising comments including sexist and sexualised behaviours. The educational aspects include a pressure on students to pass exams at the expense of engaging in deep learning; and a content driven curriculum focused on technical concerns at the expense of the broader social, human, environmental and ethical contexts of engineering decisions.

A deficit model focussing on women has thus prevailed. Implicit in this has been the assumption that women students need to adapt to the 'masculine' culture. While much of women's experience elsewhere includes an awareness of their difference in a masculine culture, in engineering, these differences are often seen as a deficit rather than valued for the enrichment they can offer the culture (Roberts and Lewis 1996, p.8). On the other hand, attracting and retaining women in disciplines considered non-traditional is more likely to succeed if the courses are inclusive and gender friendly. This in turn relies on a faculty culture which embraces equity and diversity values, that is, a culture which is inclusive.

So, what is meant by an 'inclusive or gender friendly' curriculum? According to Roberts and Lewis (1996, p.2),

> curriculum approaches need to acknowledge and foster the individual needs of students and the differences inherent in men['s] and women's socialisation in Australia, and to place both gender and race as central social constructs of curriculum organisation in tertiary engineering education.

Moxham and Roberts (1995, p.1) describe a gender inclusive curriculum as one that avoids gender bias in both the content and the presentation of the curriculum. These authors describe principles that can assist in creating a gender-friendly systemic approach to curriculum design, and to teaching and learning styles. Their findings have been embraced by writers of the Institution of Engineers Australia's accreditation documentation. The issue for the Institution (now retitled Engineering Australia) is about effective implementation of those principles. It was, as it turned out, this task that the project was to focus on.

Negotiations with professional associations

Three professional associations with a role in course accreditation were approached – Engineering Australia (Eng Aust), the Australian Computing Society (ACS) and the Australian Institute of Building (AIB). This phase of the project aimed to examine and compare the accreditation processes of the three bodies for curricula guidelines and assessment procedures that demonstrate evidence of an inclusive and gender-friendly focus.

The three professional associations take quite different approaches to the process of accreditation. The ACS and the AIB adopt very narrow views of the process and their roles within it, emphasising course content and course outcomes respectively. In contrast, the Eng

Aust takes a broad approach to the accreditation process which encompasses examination not only of content and outcomes, but also of the teaching and learning environment and the educational culture.

Eng Aust's approach reflects the fact that this body has been considering the issue of engineering education for nearly a decade. Its current accreditation policy arose from the comprehensive Review of Engineering Education which reported in 1996. The Review recommended fundamental changes to the culture and processes of engineering education, including the development of a new course accreditation system based around the educational, cultural and other professional needs identified in the Review Report.

The National Women in Engineering position paper (Roberts and Lewis, 1996), which was a submission to the Review of Engineering Education, examined gender issues in engineering education and in the profession generally. The Review Report reflected many of the recommendations in the women's position paper, concluding that

> ….an inclusive culture in the engineering education system that embraces diversity, nurtures the development of individuals and is strongly connected to the community, is needed to attract a wider range of students. All parties responsible for engineering education must reappraise their roles in transforming the engineering profession by providing our future engineers with experiences to help form values, attitudes and behaviours that are characteristic of an inclusive and socially aware profession. (Review Report p.22)

Recommendation 1.2 of the Review specifically mentioned the need to address the gender imbalance and to increase diversity. As well, it underlined the importance of recognising and valuing the alternative outlooks and experiences brought to engineering by women and students from more diverse backgrounds.

Eng Aust has a comprehensive Policy on Accreditation which states that the aims of the accreditation process include promoting "best practice" (Section 2.1) and "stimulating innovation and diversity" (Section 3.3). That is, Eng Aust aims to use the accreditation process to promote change in the way engineering education is delivered.

In its criteria for accreditation (Section 4), Eng Aust's Manual for the Accreditation of Professional Engineering Programs states that:

> ... The curriculum and the pervading culture must be gender inclusive. There should be active programs to promote the objectives set out in the National Women in Engineering position paper (Section 4.2.6).

The inclusion of this criterion clearly signals Eng Aust's commitment to gender inclusiveness. It was a crucial first step in the process of change.

However, at present, interpretation of this criterion varies widely between universities. The National Women in Engineering position paper is a thirty page document, now six years old,

which is not likely to be used as a reference document on a regular basis by curriculum developers. As such, neither accreditation officials from Eng Aust nor academic staff in engineering faculties have a convenient reference source to determine what the 'gender inclusiveness' criterion means in practical terms. Some further guidance on the 'gender inclusiveness' criterion could be a timely addition to the Accreditation Manual. This could comprise a checklist or set of guidelines which provides practical steps for promoting a gender inclusive educational culture.

Such a resource could be, it seemed, be produced for Eng Aust under the University of Newcastle project. Accreditation officials in Eng Aust welcomed the possibility.

Unlike the Eng Aust procedures, the accreditation processes of the ACS and the AIB do not explicitly mention the need for gender inclusiveness in the delivery of the programs.

In fact, whereas Eng Aust's criteria examine broader factors such as the educational culture ("The Board will look for evidence of a dynamic, innovative and outward-looking intellectual climate in the engineering school" (Eng Aust Manual 4.2.6)), the ACS requirements focus on concrete issues such as the coverage of the "core body of knowledge" in the program, together with infrastructure requirements such as staff, facilities, accommodation and library holdings. The ACS guidelines do not mention issues of educational culture or gender at all.

The Australian Institute of Building Procedures for Accreditation of courses are based on the competencies graduates require for professional entry to the building industry. Universities have a high degree of latitude in how they demonstrate compliance with this requirement (3.3). Like the ACS Guidelines, the AIB Procedures contain no reference to gender issues and do not require any information to be provided on the educational culture etc.

Neither the ACS nor the AIB accreditation policies seek to have staff members role model the attributes of a professional in the field, unlike Eng Aust policy which states that "[s]taff should actively role model the generic engineering attributes and should be continually aware of their responsibility to do so" (Section 4.2.6).

An analysis of the accreditation policies and procedures of the three associations shows that Eng Aust is way ahead of both the AIB and ACS on gender inclusiveness. The ACS and AIB are starting from a much lower base. They have not had the debate about the future of the profession, or accepted the need for diversity. But further, unlike Eng Aust, neither organisation appears to view the accreditation process as an agent for cultural change.

Refocussing

These findings prompted a rethink of the project's focus. How could we convince the ACS and AIB to use accreditation policy to encourage cultural change when they have no history of using the process in that way? It meant that we needed to deal with them quite differently from Eng Aust. As a first step, we needed to convince them that it is possible to use accreditation policies to encourage change, and that there is a need for the equity measures we are promoting.

On the other hand, discussions with Eng Aust were encouraging, with their accreditation officials acknowledging that guidance on interpreting the gender inclusiveness requirement in Eng Aust's policy would be welcomed by accreditation officials, deans, and academic staff who are struggling to understand what their responsibilities are in this regard in a practical sense.

The following observation of Roberts and Lewis (1996, p.29), provided added impetus for focussing on collaboration with Eng Aust.

> Many women have felt voiceless in engineering lobbying through a perception that the issues concerning the unequal participation by women and men are poorly understood by many men. These issues need to be given higher priority so that the present opportunities to achieve understanding and change are not lost.

The project seemed to offer a valuable means of lobbying on behalf of women to effect curriculum change. It was with this in mind that we approached Eng Aust for their continued support of the project.

Initially the intended outcomes of the project were: a set of guidelines for academic staff to use in assessing the inclusiveness and gender-friendliness of programs considered non-traditional for women within universities; and an implementation plan for including assessment of gender-friendliness within the accreditation processes of professional accrediting bodies. In recognising that support from the ACS and AIB required a different approach, the focus for the project was narrowed to embrace only Eng Aust and the discipline of engineering. In the longer term, the product will be 'translated' for use in other disciplines considered non-traditional for women, and for use as a broader cultural change agent.

Options for consideration

Having determined to narrow the task to engineering, the focus of the project inevitably shifted. We were dealing now with executives of Eng Aust who had already included a requirement for inclusiveness and gender-friendliness in their accreditation criteria. Our task – and one they endorsed strongly – was to prepare a document that assisted academics to meet that requirement by offering them guidance on: (i) how to achieve inclusiveness and gender-friendliness, and (ii) how to assess their success.

A range of options was considered.

Firstly, draft 'inclusiveness and diversity checklist' was developed for three universal elements of engineering programs in universities. For each of these elements - curriculum design, teaching and learning issues, and staffing - a principle/objective, a set of possible strategies for implementing that principle/achieving that objective, and a series of questions (a checklist) for measuring success in implementing the principle/achieving the objective, were developed.

Secondly, we considered providing a single module on issues pertinent to inclusiveness such as "Skills for the Workplace" separate from mainstream technical engineering subjects; or, alternatively, continuing our effort to devise a way of integrating treatment and assessment of 'inclusiveness' by requiring academic staff to assess communication/interpersonal skills and other skills in their assessment of group work projects, mainstream courses etc.

The National Women in Engineering position paper favours integration of communication skills within all subjects in the engineering curriculum, given the need to communicate within a professional work context. However, this approach has not been widely adopted, and in some instances adoption of this approach has been within a shallow learning context. Engineering Australia supports this approach but is uncertain how it can operate in practice within an educational learning environment.

Benchmarking

After rejecting the above options, the benchmarking approach was considered. Benchmarking has been widely adopted in Australian universities since the publication of *Benchmarking: A manual for Australian universities* (McKinnon et al, 2000). It categorises aspects of university performance that allow comparison between institutions. Benchmarks are provided for each category to illustrate level 1 (poor performance), level 3 (medium) and level 5 (excellent). Institutions must 'self-assess' performance against each category.

Aspects of this approach considered useful for the project include the following:

- It is not prescriptive and yet still provides examples of good and poor performance against which to compare a university's own performance over time
- It allows for self-assessment
- An 'accreditation assessment' component can be incorporated
- The model allows for integration of both the 'broad global' approach and the 'narrow checklist' approach, for example, the former indicates level 5 performance and the latter level 1
- With this format, it is possible to use the same document for both academic staff and accreditation officials.

Using the benchmarks

The benchmarks are intended for use by:

- Engineering Australia program accreditation officials - to facilitate their assessment of the degree of inclusiveness of courses and programs
- academic staff responsible for program or course curriculum design and/or teaching - to inform their understanding of inclusive practices in curriculum design, in the classroom and in interactions with students, and as a self-assessment tool
- senior faculty/school management - to assess faculty/school performance and to determine areas that need improvement for the purposes of strategic planning

- University equity and diversity staff - to assist the completion of internal and external reporting requirements on equal opportunity for women.

The benchmarks cover four areas crucial for the achievement of positive change towards a more inclusive educational environment.

Benchmarks were developed in the following areas:	
Curriculum Design	◆ Inclusive content ◆ Non-technical professional skills ◆ Assessment ◆ Assumed knowledge
Teaching and Learning	◆ Inclusive teaching methods ◆ Classroom interaction ◆ Labs and equipment use ◆ Language and images
Staffing	◆ Staff profile ◆ Professional development
Systems and Processes	◆ Consistent implementation ◆ Monitoring and evaluation ◆ Staff diversity

The parameters of some selected benchmarks are outlined in the appendix. Although they are organised into areas, it should be noted that these overlap in places in terms of intent, outcome or strategy. This reflects the complex and inter-connected nature of inclusiveness issues and effectively illustrates a central point - that the goal of increased inclusiveness and diversity can only be achieved by a systemic approach at faculty/school level.

Where to from here

The draft Benchmarking report was presented to the Women in Engineering (WIE) group and separately to a meeting of Engineering Deans and Assistant Deans in Melbourne on 2 October 2003. The WIE group is sponsoring the report for adoption as policy through incorporation into the Accreditation Manual at the December meeting of the Engineering Australia Accreditation Board. An implementation strategy is being developed. A pilot implementation program is planned in several universities, including my own, in 2004.

Conclusion

The National Position Paper for Women in Engineering (1996) outlines a vision for engineering values in 2010. That vision includes an engineering culture that values people and embraces diversity, emphasises interpersonal and communication skills, and advocates and implements female-friendly practices (Roberts and Lewis, 1996, p.15).

The vision outlines transformed values of the engineering profession which include, inter alia, recognising other ways of knowing, particularly masculine and feminine perspectives;

embracing diversity and displaying sensitivity to difference in gender, culture and customs; being socially and environmentally responsible; valuing communication skills such as conflict resolution and team dynamics; and advocating and implementing family friendly workplaces (Roberts and Lewis, 1996, p.15). The National Position Paper is explicit about the need for such a transformed culture to be modelled within engineering education through the development and delivery of educational programs.

The strategic repositioning project outlined in this paper aims to engender changes to the content and style of study programs, and to the attitudes of staff and students. The end result will hopefully be an Australia-wide cultural shift within faculties in non-traditional areas that will allow them both to attract and retain more women students. In the much longer term, the goal is an increase in the participation of women as academic staff in disciplines considered non-traditional for women in Australian universities.

References

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Ruth Jost, a consultant with Equity Fundamentals, was engaged to undertake the project. The options and the benchmarks outlined in the paper were developed by Ruth Jost in consultation with the Working Party and others.

APPENDIX – Selected Benchmarks

1.0 Benchmarks

1.1 Curriculum Design

1.1.1 Inclusive content

References: Moxham,S. & Roberts, P. (1995) pp. 2, 7 - 9; Harding, S. (1994). *National Position Paper for Women in Engineering* (1996) Recommendation 3.

Principle:
The learning preferences of both female and male students should be considered in the selection and presentation of content. For example, female students may be more engaged by:

- theory presented in an applied context that includes the social value of technology
- content that uses examples of applications relevant to their experiences and includes examination of women's interests and achievements
- problems and tasks aimed at determining societal needs and finding the best solution, rather than those that focus only on the technical details of one possible solution
- a multi-disciplinary approach that considers the impact of technology on women from a social science and humanities perspective.

Of course, many male students will also prefer and benefit from this approach to curriculum, while some female students will continue to prefer a more traditional approach.

Levels:

1	2	3	4	5
Theory is taught largely in isolation.		Theory is presented in terms of specific problems which have originated in reality (industry), but have been reduced to a model for ease of presentation.		Theory is presented in applied context and social effects are considered and debated wherever possible.
Women's interests, experiences and achievements are not represented, are represented negatively, or are represented in a token way.		Acknowledges women's interests and includes women's experiences.		Women's interests, experiences and achievements are fully integrated into the curriculum.
Problems usually require		Problems acknowledge		Problems are open-ended and

focus on technical detail only.		societal needs, and require some acknowledgement in the solution.		focus on societal needs rather than on the technical details of one solution.
Strictly engineering-based approach.		Includes awareness raising material and uses content from other disciplines, but this is not necessarily integrated with the rest of the content.		Approach is multi-disciplinary.

Performance indicators:

- Curriculum content documentation
- Assessment of faculty performance against the benchmark levels by female and male students
- Assessment of faculty performance against the benchmark levels by female and male staff

1.1.2 Non-technical professional skills

References: Institution of Engineers, Australia (1999) *Manual for the Accreditation of Professional Engineering Programs*, at 2.2;.). *National Position Paper for Women in Engineering* (1996), Recommendation 3(a)(1).

Principle:
Engineering Australia's Generic Attributes of a Graduate include a number of non-technical abilities:

- ability to communicate effectively, not only with engineers but also with the community at large
- ability to function effectively as an individual and in multi-disciplinary and multi-cultural teams, with the capacity to be a leader or manager as well as an effective team member
- understanding of the social, cultural, global and environmental responsibilities of the professional engineer, and the need for sustainable development
- understanding of professional and ethical responsibilities and commitment to them

Integrating the teaching and use of non-technical abilities such as communication, consultation, team work, management, ethical, research, and evaluation skills into the curriculum contributes to a more inclusive environment by exposing students to, and requiring them to operate in accordance with, community and workplace priorities, standards and expectations.

Levels:

1	2	3	4	5
Programs usually include one course that covers some non-technical skills and professional responsibilities, but these elements comprise a small percentage of class content time and overall assessment.		Some courses integrate technical and non-technical professional skills into content and assessment but this is up to the individual staff-member responsible for the course/program.		Specific faculty policy exists requiring all courses to integrate technical and non-technical professional skills into content and assessment wherever possible.

Performance indicators:

- Course and program curriculum documentation
- Existence of policy and extent of implementation of strategies
- Female and male students' assessment of faculty performance against the benchmark levels
- Female and male staff's assessment of faculty performance against the benchmark levels

1.2 Teaching and Learning

1.2.1 Inclusive teaching methods

References: Moxham,S. & Roberts, P. (1995) pp. 3-6.
National Position Paper for Women in Engineering (1996) Recommendation 3(b)11.

Principle:
In line with good teaching practices, inclusive teaching requires a change in emphasis from the content to the process of teaching including:

- creating a co-operative and safe learning environment to encourage students to share ideas, form theories, explore concepts and work collaboratively in teams
- providing a supportive environment where students feel comfortable discussing their current beliefs, incomplete or incorrect ideas and theories.

Levels:

1	2	3	4	5
Creating a co-operative and supportive learning environment is not a faculty/school priority although individual staff may endeavour to do so.		The faculty/school encourages staff to facilitate a co-operative learning environment. Information, guidelines or checklists are available to assist staff. Student experiences are monitored.		Specific policies and/or strategies exist at faculty/school level requiring staff to facilitate a co-operative learning environment. Training and resources are provided for staff. Success is monitored and evaluated.

Performance indicators:

- Female and male students' assessment of faculty performance against the benchmark levels
- Female and male staff members' assessment of faculty performance against the benchmark levels
- Existence of written strategies, policies, checklists, guidelines, training etc

1.2.2 Laboratories and equipment use

References: Moxham, S & Roberts, P. (1995) pp. 4 - 6

Principle:
Students bring different experiences and levels of confidence to practical, hands-on situations. Ensure all students gain equal access to lab equipment, machinery, computers and scientific apparatus and provide additional access where it is needed.

Levels:

1	2	3	4	5
Students are assumed to be competent in the use of equipment, machinery, apparatus, computers etc		Students receive a basic introduction to equipment, apparatus etc relevant to the course.		Further assistance is offered for all students who want to build skills or confidence, such as additional familiarisation sessions. Practical sessions are organised to ensure all students are active participants. Use of equipment of any type is monitored by staff to ensure all students are participating actively.

Performance indicators:

- Female and male students' assessment of faculty performance against the benchmark levels
- Female and male staff members' assessment of faculty performance against the benchmark levels

1.2.3 Language and images

References: Moxham, S. & Roberts, P. (1995) pp.1-3.

Principle:
The use of images, language, humour and non-verbal language which demeans or stereotypes women and/or men or particular cultures may constitute discrimination and/or harassment. Ensure that classroom interactions with and between students are professional.

Levels:

1	2	3	4	5
University-wide policy may exist on inclusive language, but there is no consistent approach to issue from staff. Inappropriate language is used in classrooms, assignments and staff meetings by teachers and students.		Staff are aware they should use inclusive language and images but actual usage depends largely on the preference of the individual staff-member. There is no policy at faculty/school level, nor enforcement of any university-wide policy at faculty or school level.		Written policy on use of inclusive language exists at faculty level for staff and students. Dean regularly refers to and reinforces policy with staff and students. Staff take responsibility for stopping inappropriate interactions or comments in the classroom and challenge inappropriate language from colleagues. Regular evaluations of student experiences are carried out. Results are publicised and acted upon.

Performance indicators:

- Female and male students' assessment of faculty performance against the benchmark levels
- Female and male staff members' assessment of faculty performance against the benchmark levels