

Benchmarks for Cultural Change in Engineering Education

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1.0 Introduction

1.1 Purpose

The benchmarks in section 2 of this document are a tool for assessing the inclusiveness of engineering courses and programs in Universities.

These benchmarks are intended for use by:

- *Engineers 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 for use 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.

This approach to evaluating inclusiveness is not prescriptive. It provides examples of good and poor levels of performance, but the focus is on outcomes. Many different strategies can be employed to create, implement and promote the outcome of an inclusive educational environment. Individual Universities remain free to design their own strategies, tailored to local conditions and priorities, to achieve these outcomes.

For accreditation purposes, there should be little additional burden on faculties to provide information or documentation over and above that which is already produced. This is because the performance indicators refer primarily to the existence (or non-existence) of documentation, policies, surveys, audits, systems etc, and to the views of students and staff.

Users who are familiar with the McKinnon Report on *Benchmarking in Universities* (2000) will recognise that a similar, but modified, approach to assessing performance has been employed in this document.

1.2 Document structure

Section 1 of this document provides introductory information including a discussion of the need for cultural change in the profession (at 1.3). Section 2.1 sets out how to use the benchmarks. Sections 2.2 – 2.5 contain the benchmarks.

The benchmarks are organised into four **areas**. Each area is split into a number of **elements**. Each area is crucial for the achievement of positive change towards a more inclusive educational environment.

These **areas** are:

- curriculum design (2.2.1 – 2.2.4),
- teaching and learning (2.3.1 – 2.3.4),
- staff (2.4.1 – 2.4.2), and
- systems and processes (2.5.1 – 2.5.3).

It should be noted that at times the benchmarks overlap these areas 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.**

Section 3 contains a bibliography and lists some available web resources.

1.3 The need for cultural change

Engineering schools in Australia have for many years provided a steady and reliable base for educating professional engineers of generally high quality. This effort has been focused predominantly at the undergraduate level and has been largely based on traditional male knowledge, interests and skills, where technological solutions dominate and their effects on people are little discussed, if at all. This has resulted in a culture in which many people, particularly women, feel uncomfortable and choose not to participate, to the detriment of the profession.

[Institution of Engineers Australia, *Changing the Culture: Engineering Education into the Future*, Report of the Review of Engineering Education, 1996 p.15]

In a forward-looking response to rapid social change on a global level, the Review of Engineering Education was commissioned by the Institution of Engineers Australia (now Engineers Australia, but formerly IEAust), the Academy of Technological Sciences and Engineering and the Australian Council of Engineering Deans to research and address the implications for the engineering profession. This extensive eighteen-month study concluded that there was a need for cultural change in the profession, beginning with engineering education itself:

We conclude 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. [ibid pp. 21-22]

In response to another recommendation of the Review, IE Aust developed a new accreditation system for engineering programs, contained in the *Manual for the Accreditation of Professional Engineering Programs*. The manual, and the policy and criteria within it, reflect the key recommendations of the review, and include a requirement 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 ... [Criteria for Accreditation, Educational Culture, 4.2.6]

The *National Women in Engineering Position Paper* was produced as part of the Review process. It recommended action by educational institutions in four areas:

- to support the development of an inclusive culture, including measures pertaining to staffing, professional development and organisational structures
- to improve the participation and success of women in engineering education
- to create inclusive educational programs that cater for the diverse range of interests, skills and abilities to enrich the future engineering profession and to
- develop strategies that promote and support an inclusive professional culture, including by creating and supporting inclusive engineering education.

Faculty and schools in different institutions have responded to this requirement in different ways in the six years since Engineers Australia first issued its Manual and Policy. Some embraced the challenge. Some failed to act in any meaningful way. Others wished to tackle the issue of inclusiveness, but were unsure of how to go about it or even where to start.

This uncertainty also posed a problem for Engineers Australia accreditation officials. How could inclusiveness be measured or tested? What indicated good or poor performance in this area?

This document has been produced as a response to this uncertainty.

Benchmarks for Cultural Change in Engineering Education has been produced under a project initiated by the University of Newcastle's Equity and Diversity Unit and funded by the Higher Education Equity Program of the federal Department of Education, Science and Training. The project was overseen by the University's Working Party on Women in Non-Traditional Areas of Study.

1.4 What is "inclusiveness"?

Engineers Australia's *Accreditation Manual*, the *Review of Engineering Education* and the *National Position Paper on Women in Engineering* refer to "gender-inclusiveness" specifically, but also to a broader notion of inclusiveness that values diversity on many levels such as gender, culture, background and experience.

The *Report of the Review of Engineering Education* describes an inclusive culture in the context of the engineering education system as one that "embraces diversity, nurtures the development of individuals and is strongly connected to the community" [Johnson, 1996, p.21].

The *National Position Paper on Women in Engineering* states that creating an inclusive culture requires "a change in the values represented in the organisational structures, cultural milieu and the curriculum so there is no longer a predominance of a unique teaching and learning style and pathway for professional and career development" [Roberts & Lewis, 1996, p.15].

Characteristics of an inclusive culture in engineering education include:

- the equal representation of men and women
- students, industry and the community are recognised as the stakeholders of engineering education
- interpersonal skills are fostered and developed through interactions between staff, students, industry and the community
- a diversity of skills, knowledge and backgrounds are valued at all levels of the educational process [Roberts & Lewis, 1996, p.15].

More specifically, a "gender-inclusive curriculum" is defined in *Gender in the Engineering Curriculum* as one that "avoids gender bias in both the content and the presentation of the curriculum". "Presentation" includes the way language is used, classroom interactions, teaching and assessment methods [Moxham & Roberts, 1995, p.1].

The benchmarks in section 2 include content issues at 2.1 (Curriculum Design), and presentation issues at 2.2 (Teaching and Learning). Also included are staff issues at 2.3 and systems and processes at 2.4.

2.0 Benchmarks

2.1 How to use the benchmarks

To assess performance against each benchmark:

1. Examine the **Principle** – this sets out the rationale for action and/or the problem to be addressed.
2. Review the examples provided of the different **Levels of performance**. These examples indicate the type of environment, strategies, actions or outcomes that distinguish poor performance (level 1) from adequate (level 3) and excellent (level 5) performance.
3. Look at the **Performance indicators** for examples of the type of evidence that could be reviewed to gauge the level of inclusiveness. Determine what sources of information exist, such as documentation, policies, surveys, audits, systems, surveys etc.
4. For further information, the **References** indicate the written sources used in determining the benchmarks. These will be useful to those seeking to develop their understanding of the issues to a deeper level.
5. Evaluate the performance of the course or program undergoing assessment using the **levels of performance** examples, the **performance indicators** and the **principle**.
6. Determine a performance rating from level 1 (poor) to level 5 (excellent).

2.2 Curriculum Design

2.2.1 Inclusive content

References: Moxham, S. & Roberts, P. (1995) pp. 2, 7-9; Harding (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 of performance:

Level 1	Level 3	Level 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 focus on technical detail only.	Problems acknowledge societal needs, and require some acknowledgement in the solution.	Problems are open-ended and focus on societal needs rather than on the technical details of one solution.
Strictly technical 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:

- the extent to which different learning preferences are addressed in curriculum content documentation
 - assessments by female and male students of faculty performance against the benchmark levels
 - assessments by female and male staff of faculty performance against the benchmark levels
-

2.2.2 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:

Engineers 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 of performance:

Level 1	Level 3	Level 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 policy and/or strategies exist requiring all courses to integrate technical and non-technical professional skills into content and assessment wherever possible.

Performance indicators:

- extent to which course and program curriculum documentation shows integration of teaching of technical and non-technical skills
- existence of a policy or strategy to promote integration
- the extent and success of implementation of any strategies
- students' assessments of faculty performance against the benchmark levels
- staff assessment of faculty performance against the benchmark levels

2.2.3 Assessment

References: Institution of Engineers, Australia (1999) *Manual for the Accreditation of Professional Engineering Programs*, "Generic Attributes of a Graduate", at 2.2.
National Position Paper for Women in Engineering (1996), Rec. 3(b)(12).

Principle:

Develop assessment approaches that value a range of skills, such as creativity, research, evaluation, technical knowledge, communication, writing, consultation and interpersonal skills.

Levels of performance:

Level 1	Level 3	Level 5
Assessment tasks concentrate on technical knowledge.	A range of assessment tasks are used which each assess a small range of skills	A number of assessment tasks, methods and criteria are used to test a broad range of skills.

Performance indicators:

- the existence in the curriculum of a range of assessment tasks, methods and criteria and documentation indicating what skills are assessed by each
- the existence in the curriculum of assessment tasks, methods and criteria that assess non-technical knowledge

2.2.4 “Informal” assumed knowledge

References: *National Position Paper for Women in Engineering* (1996), Rec. 3.
Moxham, S. & Roberts, P. (1995) p.3.

Principle:

"Informal" assumed knowledge refers to knowledge which is **not** formally taught in the school or university curriculum. This is distinct from the "formal" assumed knowledge standards which have replaced course prerequisites in many areas of education.

To:

- reflect the increasingly diverse range of backgrounds and educational experiences of students, and
- to increase enrolment, retention and success rates of a diverse range of students,

"informal" assumed knowledge should be avoided wherever possible in the early years of programs.

Assumptions that students have knowledge that is not explicitly taught in the school curriculum disadvantages students without that knowledge. Women are more likely than men to come to engineering without, for example, prior experience of engines, mechanics etc.

Levels of performance:

Level 1	Level 3	Level 5
At commencement of program, students are expected to have some degree of knowledge which is not formally taught in curricula of prerequisite courses (eg electrical components).	Curriculum content assumes no knowledge outside prerequisite curricula.	All required content is included in the curriculum and is structured to build on informal experiences with science that will be familiar to a diverse range of students. Eg household items and technology. To inform curriculum design, steps are taken to explore students' background knowledge. Students' satisfaction and success is monitored.

Performance indicators:

- the existence and use of systems to audit course curriculum for "informal" assumed knowledge
- the existence and use of systems to explore students' background knowledge, monitor student success and to effect curriculum content changes when indicated
- female and male students' assessments of faculty performance against the benchmark levels
- female and male staff assessments of faculty performance against the benchmark levels

2.3 Teaching and Learning

2.3.1 Inclusive teaching methods

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

Level 1	Level 3	Level 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' assessments of faculty performance against the benchmark levels
 - female and male staff members' assessments of faculty performance against the benchmark levels
 - existence of written strategies, policies, checklists, guidelines, training etc
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2.3.2 Classroom interaction

References: State and federal anti-discrimination legislation

Principle:

Staff must take active steps to prevent and eliminate discrimination and harassment in the teaching and learning environment.

Levels of performance:

Level 1	Level 3	Level 5
University has an anti-discrimination policy but this is not applied at the classroom level by individual teachers.	Some staff enforce University anti-discrimination policies in the classroom but approach is not consistent and not implemented on a faculty level.	University anti-discrimination policy is applied consistently by all staff. Inappropriate behaviour in the classroom is dealt with according to policy. Policy is regularly reinforced to staff and students by senior management.

Performance indicators:

- female and male students' assessments of faculty performance against the benchmark levels
- female and male staff members' assessments of faculty performance against the benchmark levels
- level of complaints made by students to faculty and University staff about discrimination, harassment, the use of inappropriate language and/or sexist behaviours and attitudes
- evidence of action taken in response to complaints such as implementation of new systems or policies
- evidence of inaction in response to complaints

2.3.3 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 laboratory equipment, machinery, computers and scientific apparatus and provide additional access where it is needed.

Levels of performance:

Level 1	Level 3	Level 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 and all tasks, including scribing, are shared. Use of equipment of any type is monitored by staff to ensure all students are participating actively.

Performance indicators:

- female and male students' assessments of faculty performance against the benchmark levels
- female and male staff members' assessments of faculty performance against the benchmark levels
- extent to which measures to assist relevant students are in place

2.3.4 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 of performance:

Level 1	Level 3	Level 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 systematic enforcement of university-wide policy at faculty or school level.	University policy on use of inclusive language exists 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' assessments of faculty performance against the benchmark levels
- female and male staff members' assessments of faculty performance against the benchmark levels

2.4 Staffing

2.4.1 Staff profile

References: *National Position Paper for Women in Engineering* (1996), Rec. 1(a).
Institution of Engineers, Australia (1999) *Manual for the Accreditation of Professional Engineering Programs*, at 4.1.3(a).
Johnson, P. (Chair) (1996) *Changing the Culture: Engineering Education into the Future*, Review Report, Rec. 11.

Principle:

A diverse staff profile in terms of:

- gender,
- culture,
- academic experience, and
- workplace experience

will contribute to the development of a more inclusive environment for staff and students by introducing different viewpoints, approaches and values.

Levels of performance:

Level 1	Level 3	Level 5
Female academic staff comprise less than 15% of total academic staff numbers.	Female academic staff comprise 15 - 20% total academic staff numbers.	Female academic staff comprise more than 30% of total academic staff numbers.
Academic staff from non-English speaking backgrounds comprise less than 20% of total academic staff numbers.	Academic staff from non-English speaking backgrounds comprise 20 – 25*% total academic staff numbers. *ABS figures show that 25% of the Australian workforce was born overseas (2001)	Academic staff from non-English speaking backgrounds comprise more than 30% of total academic staff numbers.
Industrially experienced academic staff comprise less than 20% of total academic staff numbers.	Industrially experienced academic staff comprise 25 - 30% total academic staff numbers.	Industrially experienced academic staff comprise more than 40% of total academic staff numbers.

Performance indicators:

- staff profile statistics broken down by level
-

2.4.2 Professional development

References: *National Position Paper for Women in Engineering* (1996), Rec. 1(b).
State and federal anti-discrimination legislation.

Principle:

Enable staff to implement inclusive curriculum and teaching by providing educational programs to create awareness of gender and cross-cultural issues, inclusive teaching and learning, and anti-discrimination legislation requirements.

Levels of performance:

Level 1	Level 3	Level 5
Professional development for staff on these issues is available on request subject to budgetary and other constraints.	University-wide professional development programs cover these issues. Faculty staff are encouraged to attend and budgetary provision is made annually towards this.	Faculty-based professional development program exists dealing specifically with these issues. All staff strongly encouraged to attend by senior management. Satisfactory completion of program is considered to indicate an understanding of equity and diversity issues for the purposes of selection, promotion etc.

Performance indicators:

- existence of relevant professional development programs
- staff participation figures

2.5 Systems and processes

2.5.1 Consistent implementation

Principle:

A systemic approach should be taken to the implementation of inclusive curriculum and teaching methods to ensure consistency throughout all programs and courses.

Levels of performance:

Level 1	Level 3	Level 5
Inclusive curriculum is left up to the individual staff member responsible for each course and/or program.	Information, guidelines or checklists on inclusive curriculum design and teaching methods are made available to staff and use is encouraged. Training in inclusive curriculum design and teaching is budgeted for and available at the commencement of each academic year.	Systemic approach is taken to ensure that inclusive curriculum and teaching is implemented consistently by all staff involved in teaching and/or program design and across all courses and programs. Eg a training policy and plan, structures and processes enabling staff to meet, discuss and exchange ideas, monitoring processes etc.

Performance indicators:

- the existence of systems and processes to ensure consistency
 - the extent to which curriculum documentation shows a consistent approach to inclusive teaching and curriculum across courses / programs
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2.5.2 Monitoring and evaluation

Principle:

Monitoring and evaluation of:

- the inclusiveness of curriculum content and teaching methods, and
- student experiences and views on the level of inclusiveness

are essential components of a systemic approach to implementing inclusive courses and programs.

Levels of performance:

Level 1	Level 3	Level 5
Monitoring or evaluation of curriculum content and teaching methods is left up to the individual staff member responsible for each course and/or program.	Monitoring and evaluation exists, but this does not specifically seek feedback from students on inclusiveness, gender and cross-cultural issues and experiences.	Systemic approach is taken to ensure that courses and programs are independently monitored and evaluated for inclusive curriculum and teaching methods. Changes are made where necessary.
Student experiences are not directly monitored or are monitored on a University-wide basis only.	Student experiences are surveyed at least annually by faculty or school at program and course levels.	Student views and experiences are regularly monitored and evaluated including specific attention to inclusiveness, gender and cross-cultural issues. Changes to courses, programs, systems and processes are made where necessary.

Performance indicators:

- existence of systems for monitoring the experiences of female and male students
- existence of systems for monitoring and evaluating curricula and implementing changes where necessary
- existence of monitoring and evaluation results and records

2.5.3 Staff diversity

References: McKinnon, Walker, Davis (2000) *Benchmarking: A Manual for Universities*, at 11.3.

Principle:

A diverse staff profile across all academic levels can only be successfully achieved by planning and implementing specific measures towards that goal.

Levels of performance:

Level 1	Level 3	Level 5
Goal of diversity exists but there is no faculty-specific plan to achieve a diverse academic staff profile.	At faculty level, recruitment and staffing policies are being developed and implemented progressively to increase diversity across academic levels.	Faculty policies and systems exist to increase diversity across academic levels. Progress is monitored, annual evaluations occur and problems are addressed.

Performance indicators:

- extent of diversity present across academic levels
- extent and direction of change in diversity over time
- existence of policies, systems, processes and evidence of the operation of these
- promotion rates for women academic staff

3.0 Bibliography and Web Resources

Bibliography

Burrowes, G. *Gender in an Engineering Classroom: Engineering Students' Perspectives*, (2001) unpub. Masters thesis

Copeland, J, & Lewis, S, (1998) *Working With Men To Change The Culture of Engineering Education*, Waves of Change Conference Paper
<http://www.adelaide.edu.au/equity/reports/archives/workingwith.html>

Goodell, J. (1998). "Increasing the enrolment, retention and success of female students in non-traditional areas: What strategies can we use to involve staff in developing a more gender- and culturally-inclusive educational environment?" in Black, B. and Stanley, N. (eds), *Teaching and Learning in Changing Times*, 120-124. Proceedings of the 7th Annual Teaching Learning Forum, University of Western Australia, February 1998. Perth: UWA. <http://lsn.curtin.edu.au/tlf/tlf1998/goodell.html>

Harding, S. (1994) *The Science Question in Feminism*, Cornell University Press, Ithaca

Institution of Engineers, Australia (1999) *Manual for the Accreditation of Professional Engineering Programs*, Institution of Engineers, Australia, Canberra

Johnson, P. (Chair) (1996) *Changing the Culture: Engineering Education into the Future, Review Report*, Institution of Engineers, Australia, Canberra

McKinnon, K, Walker, S & Davis, D. (2000) *Benchmarking: A Manual for Universities*, DETYA, Canberra

McLean, C, Lewis, S, Copeland, J, O'Neill, B & Lintern, S, (1997) "Masculinity and the Culture of Engineering" *Australasian Journal of Engineering Education*, Vol 7, No. 2, 1997
<http://www.adelaide.edu.au/equity/reports/archives/MascEng.html>

Moxham, S. & Roberts, P. (1995) *Gender in the Engineering Curriculum*, University of Melbourne, Swinburne University of Technology & University of Ballarat, Melbourne

Roberts, P. & Lewis, S. (1996) *National Position Paper for Women in Engineering for the Review of Engineering Education*, National Committee for Women in Engineering, Institution of Engineers, Australia, Canberra

WISSET Advisory Group, (1995) *Women in Science, Engineering and Technology Discussion Paper*, AGPS, Canberra

Wooller, J & Douglas, K. *Gendered Cultures in Science, Engineering and Technology at Central Queensland University: Do They Exist?* (2001) Gender Research Group Inaugural Conference
http://transformations.cqu.edu.au/research/gender/conferencepapers2001/pdfs/conference2001/wooller_douglas.pdf

Web resources

Engineers Australia

<http://www.ieaust.org.au/>

Flinders University Teaching for Learning Website

Inclusive Teaching <http://www.flinders.edu.au/teach/teach/inclusive.htm>

Includes resources from Flinders and other Universities such as strategies for inclusive teaching, assessment and curriculum design.

Human Rights and Equal Opportunity Commission: <http://www.humanrights.gov.au>

Extensive information on Australian anti-discrimination laws.

Southern Cross University

Inclusive curricula http://www.scu.edu.au/admin/equity/publications/inclusive_curricula/#

University of Adelaide Equity and Diversity Unit

Archive of Research Projects – Engineering: <http://www.adelaide.edu.au/equity/reports/archives/>

Contains a number of research papers examining engineering culture and issues of cultural change.

University of Melbourne

Cultural Diversity In Teaching & Learning: A Guide To Self-Audit For Good Practice

http://www.unimelb.edu.au/diversity/CD_T&Lguidelines.html

University of Newcastle Teaching and Learning

Inclusive Teaching <http://www.newcastle.edu.au/services/teaching-learning/guide-teaching/educ-resources/index.html#incl>

University of Southern Queensland

Working Definitions and Principles: Inclusive Language and Presentation

<http://www.usq.edu.au/equalopp/inclusive.html>

Inclusive Language And Presentation: Some Considerations For Teaching

<http://www.usq.edu.au/equalopp/Inclusiveness%20Brochure.html>

University of Western Australia

Teaching with Diversity Checklist <http://www.csd.uwa.edu.au/tl/99TDChecklist.htm>

Engineering Trends (US)

Love, N, Thole, K, Aref, K "Women Academic Leaders are Key to Transforming Engineering Colleges" (2004) Editorial <http://www.engtrends.com/Editorials/2004March/Default.asp>

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