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IMPLEMENTING GRADUATE ATTRIBUTES

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At the completion of this fact sheet you will be:

- familiar with the concept of graduate attributes
- introduced to a process of implementing graduate attributes into courses

Most universities in Australia now have explicit learning outcomes. These are a group of general statements that describe what a student will be able to do as a result of a set of learning experiences and they are sometimes referred to as graduate attributes or generic skills. The learning outcomes derive from the aspirations and abilities of the learners, from the nature of the discipline, from the institutional mission, from professional requirements, and finally, from the needs of society. [Notes from the 24th Annual Workshop on Assessment-as-Learning, 19-23 June 2000, Alverno College Institute, Milwaukee, Wisconsin]. The outcomes should shape everything about the curriculum: assessment, delivery, support, credentialing, and program evaluation.

INTUTUTION OF ENGINEERS AUSTRALIA – GRADUATE ATTRIBUTES

Professional bodies such as the Institution of Engineers Australia (IEAust) are increasingly laying more emphasis on graduate attributes as outcome measures. As of 2002, undergraduate degree courses in engineering will be required to show that they are measuring such outcomes in order to get accreditation from IEAust. The Institution's attributes are as follows:

- ability to apply knowledge of basic science and engineering fundamentals;
- ability to communicate effectively, not only with engineers, but also with the community at large;
- in-depth technical competence in at least one engineering discipline;
- ability to undertake problem identification, formulation and solution;
- ability to utilise a systems approach to design and operational performance;
- ability to function effectively as an individual and in multi-disciplinary and multi-cultural teams, with the capacity to be a team leader or manager as well as an effective team member;
- understanding of the social, cultural, global and environmental responsibilities of the professional engineer, and for the need for sustainable development;
- understanding of the principles of sustainable design and development;
- understanding of and commitment to professional and ethical responsibilities;
- expectation and capacity to undertake life-long learning.

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GOVERNMENT'S PERSPECTIVE

DETYA explain the recent emphasis on graduate attributes thus: "a move toward a mass rather than an elite system, economic restructuring as a result of rapid, converging technological change, a public policy environment which pursues quality assurance and educational reform through accountability for university teaching and a globalised, knowledge-based economy that emphasises the links between education and economic competitiveness for both individuals and nations have all played a part in the increased focus on higher education as preparation for employability." While engineering has always been a degree focussed very largely on employability, changes in the organisation of the world of work and a recognition that professional engineers are very likely to spend much of their careers in non-technical work, has brought attention to the achievement of the non-technical attributes.

In a 1992 report to the National Board of Employment, Education and Training called *Skills required of graduates: one test of quality in Australian higher education* the sum total of the findings was as follows: "communication and social skills are the key skills requested by employers of both new and experienced graduates. Generally, new graduates are considered to be lacking in these skills, and they are considered to have limited ability to apply their academic learning to the workplace." No one doubts the ability of engineering faculties to impart the technical and scientific knowledge and skills that are the basis of the discipline. However, their capacity to develop the other attributes of a graduate are less certain. The following plan suggests one way that academic staff and curriculum developers can build due attention to the non-technical into their teaching and assessment in ways that will meet the needs of IEAust, benefit the students and not require inordinate expansion of the curriculum.

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A PROCESS FOR IMPLEMENTING GRADUATE ATTRIBUTES

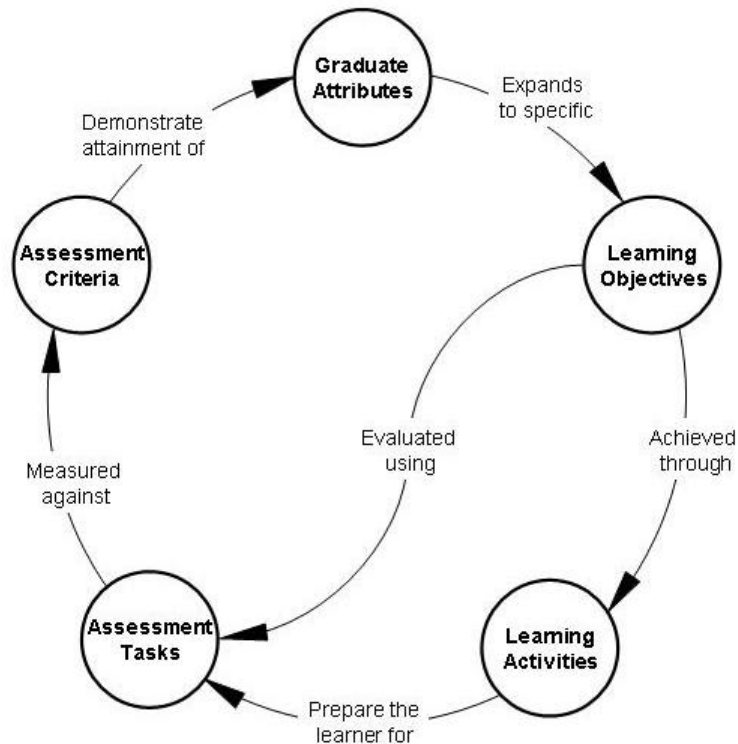


Figure 1: A Process for Implementing Graduate Attributes

Figure 1 shows graphically a generalised process for implementing graduate attributes into courses and programs. Starting with a list of desired *graduate attributes*, such as those developed by IEAust, it is possible to expand the appropriate graduate attribute(s) for a course to a set of specific *learning objectives*. In turn these objectives can be achieved by designing a series of student focused *learning activities*. These activities prepare the learner for a series of *assessment tasks* which can be measured against a set of *assessment criteria* and standards. These assessment criteria can be used to show that a student has developed particular aspects of the desired *graduate attributes* in a course. The summation of the *assessment criteria* over a program should show that all of the *graduate attributes* have been acquired and assessed, such a method is a useful tool for demonstrating the necessary outputs for accreditation of programs.

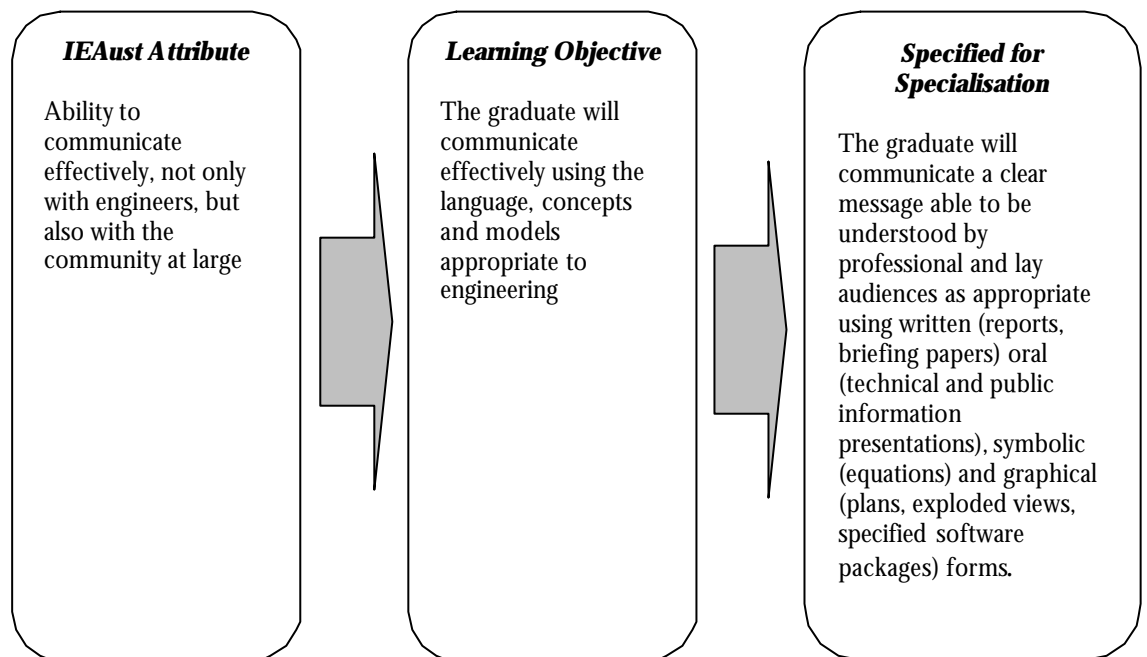
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Expanding Graduate Attributes to Specific Learning Objectives

Whether one looks at a given University's list of attributes, or those quoted above from IEAust, one sees a rather vague and idealised description of the perfect graduate. This is in part because the exact nature of, say, communication skills, will vary, at least in emphasis, from specialisation to specialisation within engineering. Some will need more graphical communication skills than others, while in some areas the ability to communicate plans to a lay public may be the primary requirement.

For this reason, the attributes need to be specified more exactly for each degree/program and they need to be expressed in the form of indicators - behavioural characteristics that can be observed and assessed. The following table illustrates this principle using the attribute of communication:



It is important to note that this list is hypothetical and its importance lies in the fact that it embodies the principle of:

Thinking through what each attribute means for graduates of a given program.

Note also that this is done at the whole degree level, It is not the case that every subject or course needs to address every attribute, but together they should address all the attributes. This calls for a degree of co-ordination across a degree program.

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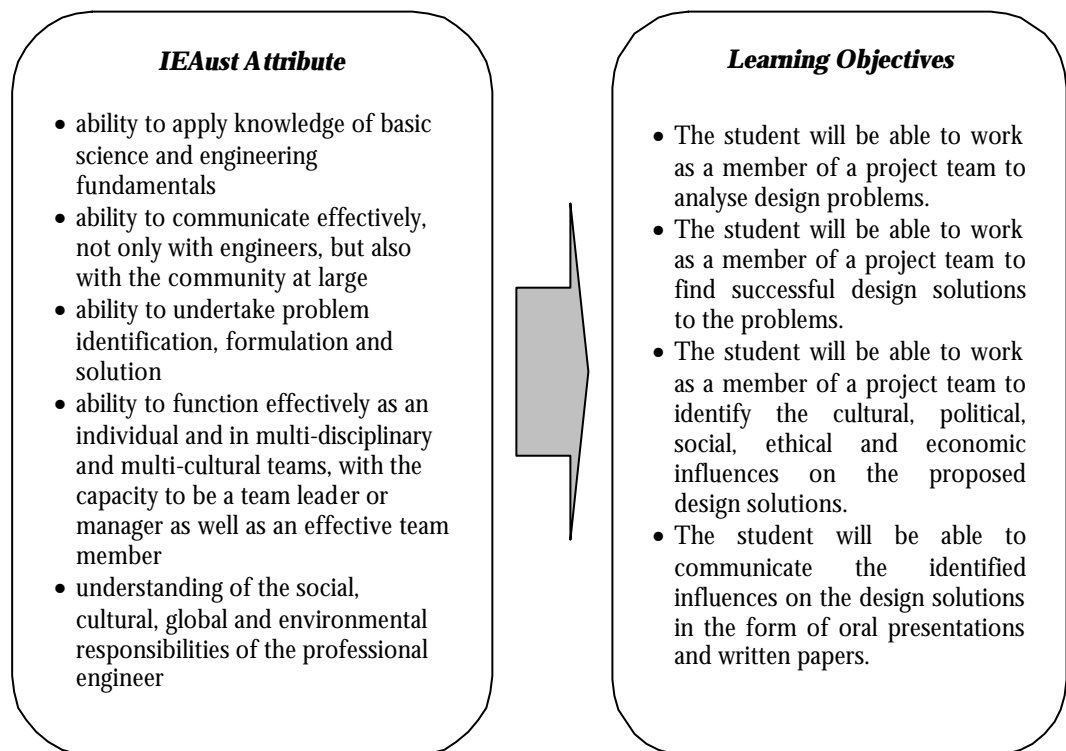
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Achieving Learning Objectives through Learning Activities

We now move to consider learning objectives pedagogy (learning processes or activities) and assessment in particular courses. The objectives will have the following characteristics:

- They should be more specific than the attributes
- They should be something that can be observed
- They should fit a range of situations
- Together they should give a picture of the attributes

Typically, attributes will be developed across several courses through a program. This process should be incremental with learning being developed progressively with ideas, methods and tools being reinforced.



We now have to consider what learning tasks the student will be set to allow them to acquire the skills that will let them meet the objectives. Here there doesn't need to be a one-to-one correspondence between objectives and tasks.

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Learning Objectives

- The student will be able to work as a member of a project team to analyse design problems.
- The student will be able to work as a member of a project team to find successful design solutions to the problems.
- The student will be able to work as a member of a project team to identify the cultural, political, social, ethical and economic influences on the proposed design solutions.
- The student will be able to communicate the identified influences on the design solutions in the form of oral presentations and written papers.



Learning Activities

- Work in Problem Based Learning teams to define and analyse the design problems underlying a complex situation.
- Students will work in teams to devise a solution that shows awareness of the social and civic issues as well as the professional and ethical ones.
- Undertake research on a range of topics to substantiate the planned solution.
- Participate in structured oral presentations of various kinds and evaluate the performance of others in such situations.

Note that the Problem Based Learning pedagogy is used here as a way of ensuring that students are given the opportunity to define the problem instead of just being told what the problem is and asked to "solve for x".

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Linking Assessment Tasks to Learning Activities

Assessment is easily generated from learning activities in that assessment tasks should involve a performance of the skills and knowledge referred to in the course objectives. It is recommended that you state the activities separately because it gives you the opportunity to think about how you can arrange them in the course of the semester.

Learning Objective

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Assessment Tasks

- Group tender document.
- Oral communication either as debate, report presentation or media interview.
- Professional journal/workbook
- Critical incident analysis

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Assessment Criteria

Assessment criteria can now be specified which measure how well the student meets the various learning objectives of the course (and therefore of IEAust attributes) and relate logically to the learning activities students have carried out.

Good assessment criteria should have the following characteristics:

- They should be sufficient to enable an assessor to judge the presence or absence of the ability in a student.
- They should allow for levels of development in a student's ability.
- They should be clear enough to enable a learner to imagine a performance that would demonstrate the ability.
- They should provide a picture of the ability in action.
- They should include qualitative dimensions of performance.
- They should not be directions, steps, tasks or formal requirements. [Alverno Workshop]

There are many ways of laying out assessment criteria and the example below is a closely controlled form in the description of the criteria and in the specification of levels of achievement. It could be rewritten to be more specific as to content for a particular course. Other examples can be found in many manuals of tertiary teaching.

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Example - Oral Presentations (20% max)

In professional life it is important to be able to articulate one's ideas and explain one's procedures orally in a number of settings and to various audiences. The basic principles of good oral communication remain the same, however, no matter the setting or audience, and these principles are reflected in the criteria below.

Connects with audience through EFFECTIVE DELIVERY: adequate volume and voice projection, clear articulation, vocal variety, use of gestures/body language, appropriate verbal expression, eye contact and expression of interest in audience and topic, good use of media where appropriate.	
/5	5 Speaks with a refined repertory of effective techniques 4 Speaks consistently with elements of effective delivery 3 Speaks with most elements of effective delivery 2 Speaks with some elements of effective delivery 0 Fails to use elements of effective delivery
Connects with audience through PURPOSEFUL STRUCTURE: gives audience sense of focus and purpose, uses introduction/development/conclusion, main point clear, major/minor connections indicated.	
/5	5 Maintains a refined sense of structure in relation to academic frameworks and interests of audience 4 Without digression from focus of the speech, consistently articulates relationships between point of development 3 Establishes and maintains focus on a clear purpose, providing transitions to clarify relationships between most points of development 2 Presents a message with recognisable introduction, development and conclusion 0 Rambling and disjointed speech with no clear focus and purpose
Connects with audience through SUPPORT FOR A POSITION OR DEVELOPMENT OF AN IDEA.	
/5	5 Uses development of appropriate length and variety and of sufficient interest to convince audience of worth of message 3 Uses development appropriate to audience and purpose to clarify message 2 Supports most generalizations with examples and/or evidence meaningful to audience 1 Shows ability to use examples and/or evidence meaningful to audience 0 States position without using clarifying examples/evidence or uses examples/evidence inappropriate to audience
Connects with audience through APPROPRIATE CONTENT.	
/5	5 Articulates applications, syntheses and/or evaluations of frameworks/theories, citing valid sources where appropriate 4 Identifies key elements that indicate understanding of theories/frameworks 3 Demonstrates appropriate application of ideas 2 Articulates accurate representation of ideas 0 Talks without really saying anything

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Summary

- Most universities in Australia now have explicit learning outcomes which are a group of general statements that describe what a student will be able to do as a result of a set of learning experiences and they are sometimes referred to as graduate attributes or generic skills.
- A process for implementing graduate attributes into courses and across programs was discussed. This process has five stages, expanding the graduate attributes to form specific learning objectives, achieving these learning objectives through a series of student focused learning activities which in turn prepare the student for the assessment tasks. These assessment tasks are measured against a set of assessment criteria. These criteria can be used to demonstrate the attainment of the graduate attributes.

References

Review of Engineering Education Steering Committee, 1996. ***Changing the culture: engineering education into the future***, Barton, Institution of Engineers. (Call Number: T167 .C52 1996)