Direct Assessment of Graduate Attributes and Programme Learning Outcomes in Engineering Education: Practice in UK and Irish Universities

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Programme Learning Outcomes

For

Level 8 Bachelors (Hons.) Degree

Level 9 Taught Masters degree

Research Degrees of Masters & Doctorate

Learning Outcome 1

Knowledge – Breadth : BSc (Hons)

An understanding

of the theory, concepts and methods pertaining to a field (or fields) of learning

Learning Outcome 1

Knowledge – Breadth : MSc

A systematic understanding of knowledge, at, or informed by, the forefront of a field of learning

Learning Outcome 1

Knowledge – Breadth : PhD

A systematic acquisition and understanding of a substantial body of knowledge which is at the forefront of a field of learning

Learning Outcome 2

Knowledge – Kind : BSc(Hons)

Detailed knowledge and understanding in one or more specialised areas, some of it at the current boundaries of the field(s).

Learning Outcome 2

Knowledge – Kind : Taught MSc

A critical awareness of current problems and/or new insights, generally informed by the forefront of a field of learning

Learning Outcome 2
Knowledge – Kind : PhD

The creation and interpretation of new knowledge, through original research, or other advanced scholarship, of a quality to satisfy review by peers

Learning Outcome 3

Know-how & Skill – Range : BSc (Hons)

Demonstrate mastery of a complex and specialised area of skills and tools; use and modify advanced skills and tools to conduct closely guided research, professional or advanced technical activity.

Learning Outcome 3

Know-how & Skill – Range : Taught MSc

Demonstrate a range of standard and specialised research or equivalent tools and techniques of enquiry

Learning Outcome 3

Know-how & Skill – Range : PhD

Demonstrate a significant range of the principal skills, techniques, tools, practices and/or materials which are associated with a field of learning; develop new skills, techniques, tools, practices and/or materials

Learning Outcome 4

Know-how & Skill – Selectivity : BSc (Hons)

Exercise appropriate judgement in a number of complex planning, design, technical and/or management functions related to products, services, operations or processes, including resourcing.

Learning Outcome 4

Know-how & Skill – Selectivity : Taught MSc

Select from complex and advanced skills across a field of learning; develop new skills to a high level, including novel and emerging techniques

Learning Outcome 4

Know-how & Skill – Selectivity : PhD

Respond to abstract problems that expand and redefine existing procedural knowledge

Learning Outcome 5

Competence – Context : BSc (Hons)

Use advanced skills to conduct research, or advanced technical or professional activity, accepting accountability for all related decision making; transfer and apply diagnostic and creative skills in a range of contexts.

Learning Outcome 5

Competence – Context : Taught MSc

Act in a wide and often unpredictable variety of professional levels and ill defined contexts

Learning Outcome 5

Competence – Context : PhD

Exercise personal responsibility and largely autonomous initiative in complex and unpredictable situations, in professional or equivalent contexts

Learning Outcome 6

Competence – Role : BSc (Hons)

Act effectively under guidance in a peer relationship with qualified practitioners; lead multiple, complex and heterogeneous groups

Learning Outcome 6

Competence – Role: Taught MSc

Take significant responsibility for the work of individuals and groups; lead and initiate activity

Learning Outcome 6
Competence – Role : PhD

- Communicate results of research and innovation to peers; engage in critical dialogue;
- lead and originate complex social processes

Learning Outcome 7

Competence – Learning to Learn : BSc

Learn to act in variable and unfamiliar learning contexts; learn to manage learning tasks independently, professionally and ethically.

Learning Outcome 7

Competence – Learning to Learn : MSc

Learn to self-evaluate and take responsibility for continuing academic/professional development

Learning Outcome 7

Competence – Learning to Learn : PhD

Learn to critique the broader implications of applying knowledge to particular contexts

Learning Outcome 8

Competence – Insight : BSc (Hons)

Express a comprehensive, internalised, personal world view manifesting solidarity with others

Learning Outcome 8

Competence – Insight : Taught MSc

Scrutinise and reflect on social norms and relationships and act to change them

Learning Outcome 8

Competence – Insight : PhD

Scrutinise and reflect on social norms and relationships and lead action to change them

University Graduate Attributes

Creative and Enterprising

Students are encouraged to be innovative in their approach to problem-solving.

Graduates will be adaptable and willing to pursue new ideas.

Committed to Continuous Learning

- Universities should promote inquiry, reflection and evaluation.
- Graduates will have learned that knowledge is not fixed or static, and that insights and skills can always be improved and developed.

Solution-Oriented

- Universities need to emphasise the importance of concentrating on solutions rather than problems.
- Graduates need to be adept at effectively applying knowledge to issues encountered in the workplace and in society.

Effective Communicators

- Universities should motivate students to appreciate the importance of communication.
- Graduates will be able to draw on appropriate skills to negotiate effectively, collaborate, and influence others.

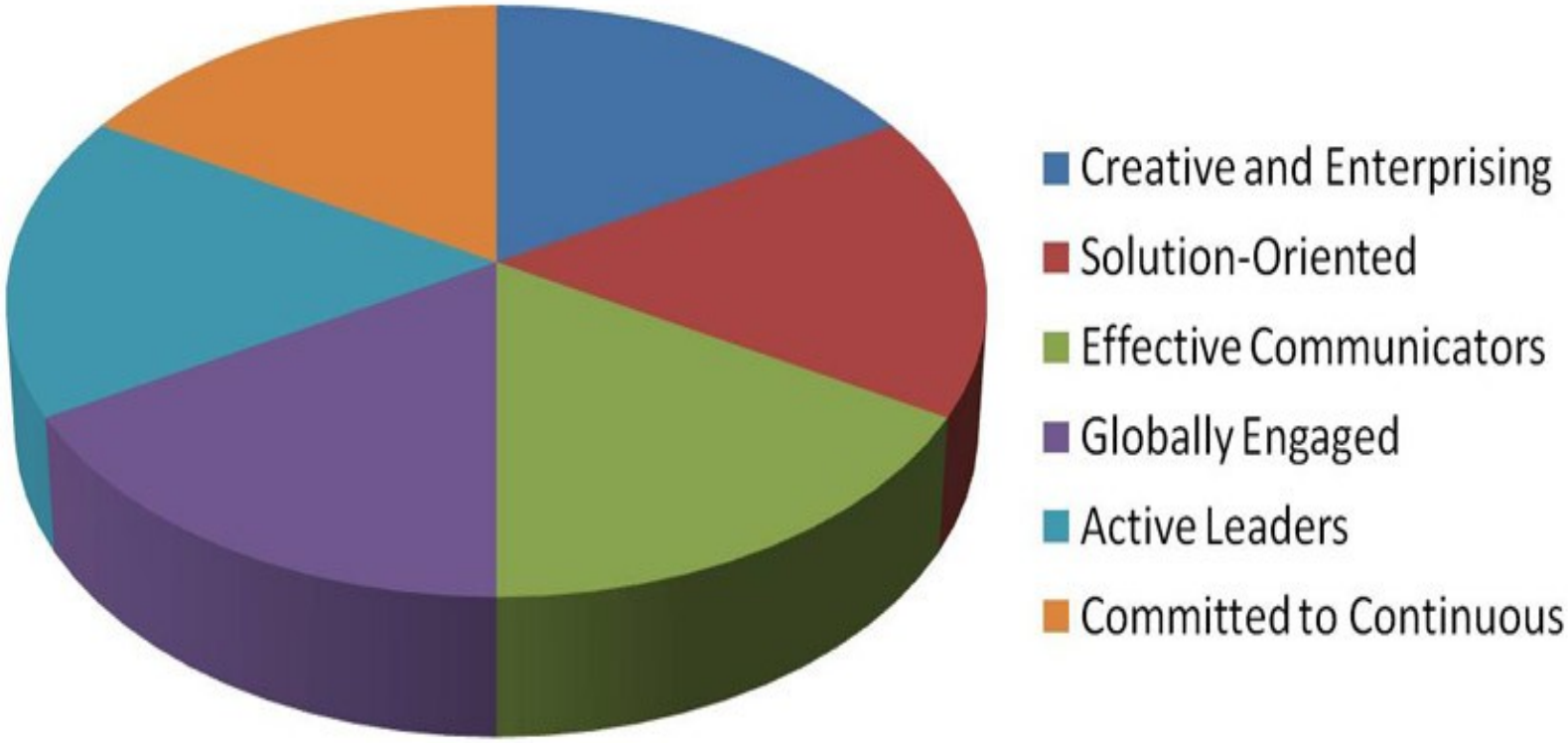
Globally Engaged

- Universities need to encourage students to be locally and globally aware, value tolerance and cultural diversity, and be committed to civic engagement.
- Graduates will understand the importance of engaging with their communities in an ethically responsible manner.

Active Leaders

- Universities should focuse strongly on the development of leadership skills.
- Graduates will appreciate that it is their personal responsibility to take the initiative and to affect change for the better in every walk of life.

DCU Graduate Attributes



Industry Perspective

Being flexible (80%) and a good communicator (76%) are considered to be 'very important' attributes for a graduate to have.

Getting work experience during their level degree (71%) and being mentored by people working in business (61%) are perceived to be the most effective means of developing these attributes in students.

Why Use Leaning Outcomes

All Educational Institutions have educational objectives for each of their Programmes.

The concept of LO is nothing new but defining these in some form of nationally (and possibly internationally) accepted standard by the appropriate Education Authorities/Professional Bodies can ensure

Why Use Learning Outcomes

Learning Outcomes standardise teaching and assessment practices across national boundaries in the following way:

- it encourages learning by students
- it provides feedback on learning and teaching to both the learner and the teacher
- it documents competency and skill development
- it allows learners to be graded or ranked
- it validates certification and licence procedures for professional practice
- it allows benchmarks to be established for standards.

Assessment of Learning

- 1. Assessment should motivate students to learn.
- 2. Assessment must be consistent with the objectives of the course and what is taught and learnt.

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- 3. Variety in types of assessment allows a range of different learning outcomes to be assessed. It also keeps students interested.
- 4. Students need to understand clearly what is expected of them in assessed tasks

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Assessment of Learning

- 5. Criteria for assessment should be detailed, transparent and justifiable.
- 6. Students need specific and timely feedback on their work - not just a grade

  .
- 7. Too much assessment is unnecessary and may be counter-productive.
- 8. Assessment should be undertaken with an awareness that an assessor may be called upon to justify a student's result.

Assessment of Learning

- 9. The best starting point for countering plagiarism is in the design of the assessment tasks.
- 10. Group assessment needs to be carefully planned and structured.
- 11. When planning and wording assignments or questions, it is vital to mentally check their appropriateness to all students in the class, whatever their cultural differences.
- 12. Systematic analysis of students' performance on assessed tasks can help identify areas of the curriculum which need improvement

Types of Assessments

There are a number of methods in use to assess student learning.

These are formative or summative.

Formative and Summative Assessments

Formative assessment deals with student performance at early stages of learning within a programme generally defined as Knowledge Type & Breadth.

Summative assessment deals with student performance at later stages of learning within a programme generally defined as Know-how & Competence.

Direct & Indirect Assessments

Some methods may be used to directly assess the Programme Learning Outcomes.

Other methods can only be for indirect assessment of Programme Learning Outcomes.

Traditional Assessment Methods

Traditionally the following methods are used to assess student learning:

- Written time constraint Examinations.
- Open book time constraint Examinations.
- Written Assignments with submission date.
- Group Assignments with submission date.
- Laboratory/Studio/Workshop work.
- Oral interview/vive-voce method

Assessment Method vs. Learning Outcomes

Not all assessment methods are appropriate for assessing Programme Learning Outcomes.

Time constraint Examinations are primarily suitable for assessing LOs 1 and 2 (Knowledge).

However, Lecturers are being encouraged to use Examinations to assess some other LOs when ever possible.

Current Practice in the UK & Ireland

It is now expected that lecturers will specify on a covering page which questions in an Exam Paper are assessing which LOs and to what percentage.

This is of course a very subjective process for assessing LOs 3 to 8. Furthermore, currently there is no system of recording the student performance to record the extent of his/her Learning within any of the LOs 3 to 8.

Current Practice in the UK and Ireland

It is generally recognised that for direct assessment of LOs 3 to 8, Individual Project, group Project, and most importantly Industrial Placement provide best opportunities which are assessed by Reports, Presentations & Interviews.

Unfortunately, in Engineering Education 70 to 80 percent of Assessments are Examination based.

Way Forwrd

In order to make meaningful direct Assessment of Learning Outcomes, the performance of students in each module may need to be recorded for each LOs a in addition to the normal grading as a whole.

Sum total of all the marks for each LO and module over the duration of the Programme should then allow Evaluation of Direct Assessment of Programme Learning Outcomes. However, this is still not implemented.

Thank You