Maximising graduate capabilities: Linking knowledge, skills, and workplace experiences

TARA NEWMAN
DAVID DOWLING
University of Southern Queensland, Toowoomba, Australia

Work Integrated Learning (WIL) experiences are most effective when situated in a framework of learning outcomes, either a framework associated with a specific WIL experience or a framework that underpins the curriculum of their degree program. At a basic level, such a framework enables students to plan, prepare for and then reflect on their work experiences. At a higher level, a framework enables students to plan, manage and identify their learning while they are at university. Using the Masters of Engineering Practice (MEP) program case study as an example, this paper describes how the Define your Discipline (DYD) process has been used to gather critical information about a discipline's expectations and how the resulting Graduate Capability Framework can be used to inform the development of new programs or to enhance existing programs.

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Over the last decade, increased attention has been placed on the need for universities to provide students with Work Integrated Learning (WIL) opportunities (Abeysekera, 2006; Brown, 2010; Emslie, 2011; Smith, 2012; Swart, 2014). Simultaneously, the demand for criterion-based approaches in all areas of higher education has also become an increasing concern (Shah & Jarzabkowski, 2013; Tam, 2014). Accountability, evidence-based decision making, and directed student learning have become internationally used key terms as employers' expectations for new graduates have been made clearer to the institutions charged with educating emerging professionals in their prospective fields. Throughout this transition to a more outcomes-based education, WIL has been identified as an effective way for students to develop those critical employability skills and enhance their professional preparation (Freudenberg, Brimble, & Cameron, 2011; Gamble, Patrick, & Peach, 2010; Wilton, 2012; Yorke, 2011).

The implementation of meaningful WIL experiences has been explored at length throughout the literature. For example, WIL can include internships, supervised practice, practica, or simulations (Smith, 2012). Each of these models differs from the others in some way; however, they share the common element of uniting the formalised learning of the university with the processes undertaken by practitioners, with the aim of strengthening the student's preparation to enter the workforce (Jackson, 2014).

Because the attention on the quality of emerging professionals' workplace preparation shows no signs of decreasing (Swart, 2014), it stands to reason that similar attention will continue to be focussed upon the quality of work integrated learning programs. According to Smith (2012), the quality of these initiatives is inconsistent from organisation to organisation, and there is some uncertainty about how specific outcomes are achieved during the undergraduate program. In well-designed programs, however, students have significant experiences that strengthen their employment skills, as well as their academic outcomes (Coll et al., 2009; Gamble et al., 2010; Orrell, 2004). Programs that are poorly administered can also have undesired impacts (Abeysekera, 2006).

A variety of frameworks have been proposed for the implementation and assessment of WIL initiatives (Coll et al., 2009; Ferns & Moore, 2012). Despite the differences between those frameworks, however, it is clear that there are several elements of WIL that stand out as significant. For example, physical and cognitive authenticity in the workplace setting enables students to face realistic problems that contribute to increased learner engagement and motivation (Keogh, Sterling, & Venables, 2007; Smith, 2012). Such rich learning experiences contribute to significant learning and an enhanced ability to apply that learning in different contexts (Fink, 2013). Furthermore, well-designed WIL experiences also emphasise the integrative nature of those experiences. Strategies requiring students to apply their classroom knowledge to their work-based experiences contribute positively to student learning (Jaekel et al., 2011; Smith, 2012). Simply participating in an undefined work experience is insufficient, however, and a number of authors are calling for an emphasis on WIL experiences that deliberately integrate the theories introduced in the university classroom with the practice encountered in the workplace setting (Jackson, 2014; Orrell, 2004; Smith, 2012; Yorke, 2011).

To this end, it is important that students are able to situate their WIL experiences in a framework of learning outcomes, either a framework associated with a specific WIL experience or a framework that underpins the
curriculum of their degree program. At a basic level, such a framework enables students to plan, prepare for and then reflect on their work experiences. At a higher level, a framework enables students to plan, manage and identify their learning while they are at university.

There are many processes that can be used to develop learning outcomes for a program of study. For example, using Bloom’s taxonomy as a basis for their work, Besterfield-Sacre et al. (2000) proposed a framework of 11 broadly-designed outcomes to guide engineering education for the Accreditation Board for Engineering and Technology. Another model that can be used to develop significant and detailed learning outcomes for a discipline, at school, state or national level, is the Define Your Discipline (DYD) stakeholder consultation process (Dowling & Hadgraft, 2013a).

THE DEFINE YOUR DISCIPLINE (DYD) PROCESS

The DYD process allows the stakeholders in a discipline, such as nursing, to negotiate and clearly define a Graduate Capability Framework for their discipline. The process invites, values, and integrates the views of the sometimes disparate groups of stakeholders, while keeping a ‘future-proofing’ mindset that focuses on the capabilities graduates will need in five to ten years rather than current requirements. The DYD process ensures that the input from each stakeholder is equally valued so that the opinions or biases of individuals or groups do not impact on the final outcome. Figure 1 clearly shows how each of the key stakeholders may influence the definition of the graduate outcomes for a program, and the development of the program. It also shows how the DYD process, and the resulting Graduate Capability Framework, can be used at a national level to facilitate the contribution of both individual stakeholders and groups of stakeholders into the program design process. Importantly, the DYD process can be used to capture the views of stakeholders that may not normally be included in the program development process, such as practitioners and recent graduates.

![Diagram showing the Define Your Discipline (DYD) process](image-url)
The Graduate Capability Framework that results from the DYD process generally incorporates three types of capabilities and a set of contexts in which the discipline is practised. The three sets of capabilities are:

- Technical capabilities – discipline knowledge and skills;
- Process capabilities – the processes that practitioners use to apply their knowledge and skills, e.g. an investigation; and
- Generic capabilities – graduate attributes and employability skills.

Two capability cubes can be developed to help users to visualise the relationships between the Graduate Capabilities and the contexts in which they used.

For example, the Environmental Engineering Graduate Capability Cube (Dowling & Hadgraft, 2013b), reproduced in Figure 2, shows the interrelationships between the three sets of capabilities which make up the axes of the Capability Cube. When undertaking a project, a graduate uses Generic Capabilities when applying a Process in one or more Technical Domains. For example, the shaded cell in the cube shows that a graduate may be gathering information (a Generic Capability) to prepare a design (a Process Capability) for a resource management and remediation project (a Technical Domain) at a mine site (a Practice Context).

![FIGURE 2: The environmental engineering capability cube](Source: (Dowling & Hadgraft, 2013b))

A Practice Cube can be used to show the scope of the work undertaken by an individual environmental engineering practitioner, i.e. their specialist practice domains. For example, the Environmental Engineering Practice Cube, which is shown in Figure 3, was developed by replacing the seven Generic Domains (shown in Figure 2) with the seven Practice Contexts. A person’s specialist practice domain is a combination of their Process and Technical Capabilities, and the knowledge and skills they have gained from their work experience in one or more Practice Contexts.
The capability cube concept has proved to be an important outcome of the DYD process as it has promoted discussion about the nature of practice in the relevant discipline. This is because it is the intersection of these three dimensions, and the Generic Capabilities, that define professional practice and many employers would expect graduates to develop capabilities across all three dimensions while they are at university. Obviously, students may use their WIL experiences to develop their capabilities in all three domains, WIL experiences generally provide them with authentic opportunities to develop their Process Capabilities and to gain an understanding of the contexts in which their profession is practised.

Once a Graduate Capability Framework has been defined, a program development team can use it to inform their work by:

- identifying the capabilities that are to be incorporated in the program either in the curriculum, or in WIL activities. The team may also list the capabilities that are not included in the program, including those capabilities that the School expects employers to include in workplace training or professional development activities;
- unpacking each of the adopted capabilities, or aspects of capabilities, to determine those aspects that should be part of the curricula, and those that should be part of the training that graduates receive when they enter the workforce;
- developing a detailed set of graduate outcome statements for the program; and
- allocating the graduate outcomes to individual courses as course learning outcomes.

Importantly, students can use the Graduate Capability Framework to gain a better understanding of their discipline, and to inform their decisions about specialisations and career choices. They may also use the Framework to help manage their learning so that they acquire the knowledge and skills required for them to commence practice in their chosen specialisation.

Finally, the development and publication of a national Graduate Capability Framework for a program should engage members of the profession in the education process and help them to develop a shared understanding of both contemporary practice and future trends.

The following case study demonstrates how the detailed set of graduate outcomes defined for a program can be used by students to demonstrate their prior workplace learning.

**CASE STUDY**

The University of Southern Queensland’s (USQ) Master of Engineering Practice (MEP) program was developed to address a specific need identified by Engineers Australia: the need for an accessible, efficient and relevant
articulation pathway that would enable many of its experienced Engineering Technologist members to gain the credentials required for them to become Professional Engineers.

In 2002, Engineers Australia’s Articulation Committee invited the Faculty of Engineering and Surveying to collaborate in the development of a distance education program that would meet the aforementioned identified need. A key criterion was that students should be able to use their workplace learning to demonstrate achievement of the objectives in up to half of the courses in the program. The Faculty accepted the challenge and the Associate Dean (Academic) developed and implemented the program, guided by a Program Development Team which included Faculty staff and three members of Engineers Australia’s Articulation Committee. The innovative Master of Engineering Practice program allows experienced Engineering Technologists from diverse cultural, educational and employment backgrounds to re-engage in higher education and undertake learning experiences that are tailored to their individual needs and enable them to become Professional Engineers. The program structure and pedagogies resulted from a creative synthesis of research-based learning and teaching approaches associated with distance education, adult learning, reflective practice, negotiated curriculum, and the self-assessment of workplace learning (Dowling, 2006). It enables students, who generally work full-time and study part-time, to use their workplace learning to complete at least half of the courses in their program. There has been a sustained growth in student numbers since the first offer in 2004: 281 students have enrolled and 57 have graduated. The program was offered for the first time in Semester 2, 2004, is accredited by Engineers Australia, and is having a significant impact on the careers of students and graduates.

A coherent and systematic approach was used to ensure the program structure and adopted learning strategies would achieve the defined objectives. The critical design features were:

- A detailed set of graduate outcomes was defined at the program level, with each outcome being allocated, as a learning objective, to one of the courses in the program. This enables students to use their workplace learning to demonstrate achievement of the learning objectives of a course;
- The first course must enable students to acquire the skills required to self-assess their prior learning and plan their individual learning pathway through to graduation;
- The students must complete the capstone courses in each technical field in the relevant Bachelor of Engineering specialisation (e.g. Civil engineering) so that the program could be accredited by Engineers Australia;
- A rigorous admission process would be used to assess prior qualifications and the length, type and level of engineering experience of each candidate; and
- The program was designed to satisfy both the Australian Qualifications Framework (AQF) and university requirements for a masters degree.

FIGURE 4. The structure of the Master of Engineering Practice
Source: (Dowling, 2011)
As shown in Figure 4, the MEPR program now consists of 12 units of study: eight one-unit courses, two two-unit courses and a zero unit practice course, as follows:

**The one-unit Self-assessment Portfolio:** This is the first course students undertake in the program. It is used to assess:

a) whether a student has, or would be able to acquire, the workplace learning required to demonstrate achievement of the learning objectives in at least six units of study; and

b) whether a student has the communication skills required to identify and prepare reports on career episodes that clearly demonstrate achievement of the defined learning objectives for a course.

In this course students also collaborate with Faculty staff to develop their individual *Pathway to Graduation Plan*.

**Nine one-unit Technical courses:** The students then complete two prerequisite courses (T1 & T2 in Figure 4) before completing the seven technical courses in their specialisation (s1-s7). Students may complete a technical course (or the practice course) by: studying the course; using their workplace learning; or by receiving an exemption based on prior studies. It is important to note here that, because students can study a maximum of five of the *Technical* courses in their specialisation, they must complete at least two of the courses in their *Workplace Portfolio* (S6 and S7), or be exempted from those courses. Students who plan to use their workplace learning to complete additional *Technical* courses list the graduate outcomes for these courses in their *Workplace Portfolio*.

**Two, two-unit Workplace Portfolio courses:** The students use their workplace learning to demonstrate achievement of the specific learning objectives defined for the *Workplace Portfolio* courses, and any learning objectives from the core or technical courses allocated to the portfolio in their *Pathway to Graduation Plan*.

**A zero-unit Practice course:** During their program the students complete a one-week residential school.

The self-assessment process demonstrates the flexibility of the program structure because it caters for the diversity of knowledge, skills, prior learning, and workplace experiences that the students bring to the program and allows students to negotiate an individual learning contract that suits their learning needs.

“The Self-Assessment Portfolio was an excellent tool to identify deficiencies in my knowledge and to implement a strategy in the workplace to acquire the competencies to successfully complete the program” (Tony, pers. comm., 2008).

Although regarded as a single portfolio, the Workplace Portfolio (See Figure 4) consists of two Workplace Portfolio courses where the students demonstrate achievement of the following learning outcomes, called Elements of Competency in this program:

- the three compulsory Engineers Australia Stage 2 Units of Competency (C1 – C3);
- two of the ten Engineers Australia’s Stage 2 Elective Units of Competency (E1 and E2);
- a specific list of six Master of Engineering Practice Elements of Competency (MEP); and
- the Elements of Competency for at least two of the Technical courses in their specialisation (S6 and S7), unless they have received an exemption in those courses.

Having two separate Workplace Portfolio courses provides students with great flexibility as they can select and demonstrate up to half of the listed Elements of Competency in one of the courses early in the program, and then enrol in the second course at the end of the program when they have gained the additional work experiences required to demonstrate the remaining Elements of Competency.

The adoption of the Stage 2 Competency Standard, and the related presentation and assessment tools, for the MEP program means that graduates can use the documents they prepared for the MEP Workplace Portfolio courses in their application to Engineers Australia for Chartered status. This is an important outcome because gaining Chartered status is a key driver for many students to undertake the MEP program. While the high standards USQ staff set when assessing Career Episode Reports challenge MEP students, they ensure a smooth transition to Chartered status. For example, Ben achieved Chartered status a few months after graduating and wrote: “I did not have to rewrite any of the career episode reports (CER) that addressed the compulsory Units (C1, C2, and C3), but I did have to write some additional CERs to cover all of the Elements of Competency in the Elective Units I chose” (Ben, pers. comm., 2011).
The MEP program highlights the effectiveness of developing a detailed set of learning outcomes for a program as it enables students to:

- identify prior workplace experiences that they can use to demonstrate achievement of one or more learning outcomes;
- plan workplace experiences that they will be able to use to demonstrate achievement of one or more learning outcomes; and
- manage their learning.

These skills are important skills for graduates as they enable practitioners to reflect on, and learn from, their workplace experiences, and to manage their professional development. Consequently, they should be included in all undergraduate programs.

CONCLUSION

The interest in work integrated learning shows little signs of decreasing. As university program leaders consider the inclusion or modification of their WIL initiatives, it is imperative that they consult the industry for which they are preparing their graduates. This is to ensure that the learning outcomes adopted for WIL programs represent current practice. More importantly, the definition of a detailed set of graduate outcomes for a program enables students to assess and demonstrate their workplace learning, manage their learning.

This paper described how the DYD process has been used to gather critical information about a discipline's expectations and how the resulting Graduate Capability Framework can be used to inform the development of new programs, as outlined in this paper, or to enhance existing programs. It also engages all of the relevant stakeholders in the development of education programs in their discipline.

The MEP program case study demonstrated how the detailed definition of a set of graduate outcomes enables students to use their prior workplace learning to demonstrate their achievement of the learning outcomes in a course. It also showed how the adoption of a detailed set of graduate outcomes for a program enables program development teams to increase the flexibility in their programs whilst maintaining the integrity of those programs. This would be a key outcome for students, particularly those who work either full-time or part-time while completing their studies.

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