Alternative Approaches to Skill and Assessment Development in a Co-operative Education Program

Dave Harte[a]; Mark Symes[a].
Australian Maritime College specialist Institution of the University of Tasmania
Corresponding Author Email:d.harte@amc.edu.au

Structured Abstract

BACKGROUND
Maritime industry and academia constantly battle to provide seamless transition from undergraduate to professional engineer. Co-operative education (co-op) programs endeavour to bridge this divide by ensuring undergraduates experience current industry practices and procedures throughout their undergraduate program, confirming co-op graduates ability to 'hit the ground running' upon completion of undergraduate studies. Success of co-op type programs as a form of Work Integrated Learning (WIL) is reliant on structured development of skills and authentic assessment. The challenge exists to ensure this is maintained within the academic program and work placements which occur outside the academic institute.

PURPOSE
This paper describes an initiative to improve industry readiness and skill development for students enrolled in the Co-operative education program at the National Centre for Maritime Engineering (NCMEH) at the Australian Maritime College (AMC). A blended approach was adopted in development of the required skills that combines an 8 week Vocational Education & Training (VET) based practicum module along with an on campus professional development program. Assessment consists of a combination of reflective learning and VET based competencies.

APPROACH
A post-delivery review and analysis of outcomes will be undertaken to determine students' engagement levels in the VET practicum and professional development program, through the use of reflective learning assessment. Data will be gathered from semi-structured interviews, participation, attendance and assessment of the students that have participated in the modified program. This data will be analysed and compared with students who had undertaken the pre-modified program.

OUTCOMES
It is anticipated that the change in approach to assessment and development of practical and professional skills will have a positive effect on learning and job readiness of the co-op student. Preliminary results indicate high student satisfaction with the learning and assessment experience. Industry feedback supports the improvement of undergraduate students skill sets in the practical engineering and professional development spaces.

CONCLUSIONS
Student skill sets going into job placements are an area that must be developed and indeed are part of what co-op is about. The development of a competency based practicum delivered through the VET system is just one way that Higher Education (HE) can provide this practical skill sets. Combining this with the development of reflective learning practice and competency assessment provides evidence to employers of the students' capabilities at various stages throughout the co-op program. The new approach to learning and assessing of the early career co-op students does engage the students and has improved the job readiness of students.

KEYWORDS
WIL, Assessment, Co-operative education

Introduction

Multiple reports over the last fifteen years such as that by Cleary, Flynn, Thomasson, Alexander, and McDonald (2007) state that Work Integrated Learning (WIL) is a mechanism for developing graduate attributes and employability skills. This paper highlights efforts at the National Centre for Maritime Engineering (NCMEH) within the Australian Maritime College (AMC – Specialist Institute of the University of Tasmania) to develop introductory level skills beneficial to industry within WIL program student cohorts.

NCMEH has encountered challenges with its Co-operative Education Program since inception due to the structure of the program and, the attempt to place students within industry after only one academic year. The NCMEH program is not compulsory and is only offered to academically high achieving students due to the structure and workload associated with the program.

As Harte and Symes (2013) state challenges continue to exist in placing undergraduate students into industry with only two completed academic semesters. These changes to the NCMEH program are aimed at enhancing the overall employability of students in preparation for later industry placements whilst also ensuring students maintain a level of engagement with their chosen profession to reduce possible increases in attrition as evidenced by the report from Trevelyan and Tilli (2010).

Modifications have been made to the early phases of the program to alleviate pressure on employers, students, and academic support staff. Modifications include removal of Work Term 1 and replacing with a newly developed Engineering Practicum unit developed and undertaken with Tasmania TAFE (TasTAFE), and transfer of Professional Development workshops into the second academic year of the program.

This paper highlights the developments that have been made to the NCMEH co-op program structure to ensure continued development of undergraduate professional skills and greater student understanding of the engineering workplace.

Background

Academic institutes both nationally and internationally battle with balancing the competency requirements of accrediting bodies with the skills base requirements of industry. This is clearly evident in the difficulty faced by academia to place junior undergraduate students into industry work placements as previously stated by Harte and Symes (2013). This challenge has been evident in the development of the co-operative education program (Co-op) within NCMEH.

The co-op program at NCMEH is reaching the stage of graduating its first student at the completion of the 2014 academic year. This is a significant milestone with the program finally enrolling students within each work term across all years of the program. One continual area of difficulty has been convincing industry of the capabilities of undergraduate students that have completed only one academic year of a four year undergraduate degree program.

Being a specialist institute has allowed NCMEH to maintain a constant dialogue with industry representatives that have vested interest in the graduate product that is produced. By having a WIL type program allows comparative analysis between standard program and co-op program students. This input has allowed the program coordinators to continue to develop a stronger co-op program for all participants.

Although research and scoping papers such as that by the Australian Workforce and Productivity Agency Workforce (2013) indicates that employer wish lists in terms of graduates work readiness include areas such as self-management, teamwork and problem-solving, few employers/recruiters can justify developing these skills in early level undergraduate students within a paid employee company environment. Development of the

co-op program provides students with a greater perception of the role of a graduate in the workplace as stated by Precision Consultancy (2007).

New Approach

The aim of this paper is to investigate the effectiveness of the Engineering Practicum and Professional Development units in developing employability skills and to develop methods to assess related skills of the co-op program students compared to standard program students. Although many researchers such as Doel, (2009) and Gardner and Choi (2007) advocate the development of practical skills via co-op, minimal research has been conducted into the relationship between co-op and practical skills as stated by Drysdale and McBeath (2012).

NCMEH will be gathering both quantitative and qualitative data related to practical skills development to answer the following questions.

1. Which elements of a Competency based practicum support (or hinder);
    a. Student practical employability skills?
    b. Development of portable skills such as, life-long learning, innovation and enterprise and self-management?
    c. Development of student workplace readiness?

Program Development

Under the previous structure NCMEH undertook professional development workshops with co-op students in the first academic year of the program. These workshops assisted students with the early phases of the placement process such as resumes and interviews. The professional development workshops were a compulsory requirement for students to progress to their first work placement but scheduling of workshops along with timing of first work placement caused stress within the student cohort.

To improve the program modifications were made to both the professional development workshops and work term one. These changes endeavour to facilitate a settling in period for the students as well as additional time to ensure students are maintaining required level of academic progress.

Multiple initiatives over the last two years which have built strong links with Tasmania TAFE (TasTAFE) staff lead to the discussion of applying an apprentice type approach to developing practical skills within an undergraduate bachelor level engineering cohort.

To achieve an optimal outcome selected competency modules within the TasTAFE structure were chosen to give an introductory level of exposure to the practical aspects of an engineering career. This structure ensured both TasTAFE could provide the level of support required in terms of practical assessments and NCMEH could align the practicum experience within the academic calendar structure.

Under the current structure student feedback indicates a feeling of being overwhelmed within the first 18 months of the program. This can be attributed to multiple factors including introduction to university style learning and the issues associated with relocating interstate. In addition to this the structure of the program required co-op students to also undertake professional development modules covering areas such as resumes, interview skills and introduction to the workplace workshops. These workshops took place early in the first year of the program whilst students are still in the settling phase of their university life. This coupled with the pressure that built on the students to secure a work placement at the completion of first year resulted in a high level of anxiety.

To alleviate these stressors whilst still developing a skills base the TasTAFE Engineering Practicum allowed students time to settle into university life and focus on the academic program knowing that the first co-op unit was secured within the TasTAFE system. By focusing on practical skills in this early phase it was also possible to delay the professional

development workshops until the second academic year. This created a more stable development period in which students did not receive co-op pressure and could focus on maintaining academic performance levels.

Realignment of professional development workshops into second year also allowed co-op coordinators to monitor first year co-op students' academic results ensuring results are maintained to ensure continuation in the program. This provides a buffer period between commencement of undergraduate program and first

Engineering Practicum however takes away from the students that first opportunity to engage with industry. Although students are provided evidence of their achieved competencies they do not receive that initial industry assessment od their performance in a workplpace. To ensure students maintain that learning development some portion of their mark is allocated to reflectice analysis of their skills development.

Revised Program Structure

To provide a smoother transition into co-op and to reduce administrative loads on program co-ordinators the program structure was modified as shown in Table 1 below.

Table 1: Co-op revised program structure

	Nov-Feb	Feb-Jun	Jul-Nov
Yr 1	Current 1st Year Academic Program		
Yr 2	*Engineering Practicum* *(TasTAFE)*	Academic Semester 2/1	Academic Semester 2/2 *Professional Development Program*
Yr 3	Work Term 2		Academic Semester 3/2
Yr 4	Work Term 3	Academic Semester 3/1	Work Term 4
Yr 5	Work Term 4 – cont.	Academic Semester 4/1	Academic Semester 4/2

Student Skills Development

To minimise interference with academic semesters as well as holiday season TasTafe learning has been broken into two block mode sessions. Session one commences at the completion of semester two studies whilst session two commences the following February with completion at the commencement of semester one of the following year. This structure allows students to break for the festive season and return to continuous studies the following year minimising disruptions and associated travel costs.

This approach resulted in challenges associated with the method of assessment differences between the two institutions. TasTAFE modules consist of practical assessments of competency whilst academic units provide a grading based on results of multiple assessment pieces of various weighting. To allow for this difference NCMEH have developed the Engineering Practicum unit as an Ungraded Pass module which has no effect on the grade point average (GPA) of the students. Students receive an overall ungraded pass if deemed competent in each of the modules shown in Table 2 below.

Due to the nature of the modules that have been selected and the method in which they are taught, the students receive as AS certification from TasTAFE because the competency is not assessed in the workplace as part of a standard TasTAFE program. This means that the

students are not assessed however they have covered all the material associated with the module. Students can however return to TasTAFE to do a simulated test to achieve a competent (CP) result which can go towards a Cert ll in Engineering.

Table 2: TasTAFE modules undertaken in 'Engineering Practicum'

Module	Descriptor
MEM05004C	Perform routine oxy acetylene welding
MEM05007C	Perform manual heating and thermal cutting
MEM05012C	Perform routine manual metal arc welding
MEM05051A	Select welding processes
MEM05052A	Apply safe welding practices
MEM07005C	Perform general machining
MEM12023A	Perform engineering measurements
MEM18001C	Use hand tools
MEM18002B	Use power tools/hand held operations

Practical Skills and Assessment Alignment

To develop methods to evaluate co-op student employability skills it is necessary to compare relationship between skills and assessments. The eight employability skill areas have been taken from the framework developed by both the Australian Chamber of Commerce and Industry and the Business Council of Australia (*Employability skills for the future*, 2002). Table 2 below shows the relationship between employability skills and NCMEH co-op learning outcomes / assessment.

Table 3: Skills and assessment comparison

Skills	Co-op Unit Learning Outcome	Assessment
Communication	Effectively communicate verbally and in writing	Reflective Notebook
Teamwork*	N.A	N.A
Problem Solving	Interpret technical drawings in the manufacture of project deliverables	TasTafe manufacture project
Self-Management	Constructively receive and apply professional feedback	TasTafe manufacture project
Planning & Organising	Interpret technical drawings in the manufacture of project deliverables	TasTafe manufacture project
Technology	Interpret technical drawings in the manufacture of project deliverables	TasTafe manufacture project& Reflective Notebook
Life-long learning	Constructively receive and apply professional feedback	Reflective Notebook utilised for duration of degree program
Initiative & Enterprise		TasTafe manufacture project

* Teamwork is not assessed within the Engineering Practicum unit.

Future Developments

To ensure integrated learning between the TasTAFE practicum modules and the bachelor degree program it is important that students understand why they are undertaking this type of training. The authors are looking to further integrate the student Engineering Practicum with first year Engineering Design and Communication unit which will incorporate the design process at university with the manufacturing project at TasTAFE.

This will provide students with the complete process upon which to reflect on highlighting both theory and practice in achieving evident of stage one competencies as required by Engineers Australia. This reflective exercise will provide additional material towards the co-op student experience which will be evident in the final portfolio piece that all co-op students are required to produce at the completion of all work term modules.

Conclusion

Advocates of work integrated learning (WIL) programs understand that multiple parties have input into the development of a WIL student, those being the student, academia and industry. Industry understands academia is unable to cover all skills required for the workplace as stated by Katz (1993). The structure proposed in this paper intends to enhance the preparedness of co-op students and assist students' perception of their workplace roles.

This paper represents the initial phases of research study into the program development of a co-operative education program with TasTafe practicum modules and subsequent phases are underway. NCMEH is continually adapting its co-op program to provide students that have been exposed to both technical and professional skills necessary for introduction to the workplace.

References

ACCI., BCI. (2002). Employability skills for the future.. Canberra : Dept. of Education, Science and Training, 2002.

AWPA. (2013). *Work integrated learning: AWPA scoping paper*.Retreived September 5, 2014, from http://www.awpa.gov.au/publications/Documents/WIL%20scoping%20paper.pdf

Cleary, M., Flynn, R., Thomasson, S., Alexander, R., & McDonald, B. (2007). Graduate employability skills. *Retrieved May, 23*, 2012.

Doel, S. (2009). Fostering student reflection during engineering internships. *Asia-Pacific Journal of Cooperative Education, 10*(3), 163-177.

Drysdale, M., & McBeath, M. (2012). Self-concept and tacit knowledge: Differences between cooperative and non-cooperative education students. *Asia-Pacific Journal of Cooperative Education, 13*(3), 169-180.

Gardner, P., & Choi, G. (2007). How central is work to young adults?[White Paper]. *Michigan State University, Lansing, MI: MonsterTRAK*.

Harte, D., & Symes, M. (2013). *Challenges of developing and sustaining a co-operative education program in Maritime Engineering.* Paper presented at the 24th Annual Conference of the Australasian Association for Engineering Education.

Katz, S. M. (1993). The entry-level engineer: Problems in transition from student to professional. *Journal of Engineering Education, 82*(3), 171-174.

Precision Consultancy. (2007). Graduate employability skills. Retreived September 4, 2014, from:

http://aces.shu.ac.uk/employability/resources/graduateemployabilityskillsfinalreport1.pdf

Trevelyan, J., & Tilli, S. (2010). Labour force outcomes for engineering graduates in Australia. *Australasian Journal of Engineering Education, 16*(2), 101.

Copyright statement