

## **Approaches to Applied Learning**

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### **CONTEXT**

The CQUniversity Bachelor of Engineering (Co-op)/Diploma of Professional Practice (Engineering) is a four and one half years program which includes a minimum of 48 weeks of work placement in the student's relevant discipline. The CQUniversity engineering program incorporates Project Based Learning and Co-operative Education with Professional Practice, providing learning in context, both in formal and informal learning environments (e.g. in workshops and classes and project studios) and in industry employment; which is integrated into the student's study program. Teamwork and problem solving skills are learned alongside the technical content in a real-world engineering environment.

### **PURPOSE OR GOAL**

Applied learning is primarily an approach that links the 'real world' to the concepts being taught in the classroom (Victorian Curriculum and Assessment Authority, 2006). Theory is a vital part of applied learning. The theory and the practical application are linked by the context (Victorian Curriculum and Assessment Authority, 2006). This paper will examine the CQUniversity Bachelor of Engineering (Co-op)/Diploma of Professional Practice (Engineering) to determine to what extent the project based curriculum supports applied learning.

### **APPROACH**

The introduction of project based learning for engineering co-op students has better prepared these students for work placement which in turn prepares them for a career as a professional engineer. Project based learning, for all engineering degrees, ensures that those students opting to study the Bachelor of Engineering, which does not have work placement, are also prepared for entry into the work force. Using applied learning theory to guide the observations, the analysis of the conditions to applied learning will be identified.

### **ACTUAL OR ANTICIPATED OUTCOMES**

The introduction of project based learning for engineering co-op students has better prepared these students for work placement which in turn prepares them for a career as a professional engineer. Project based learning, for all engineering degrees, ensures that those students opting to study the Bachelor of Engineering, which does not have work placement, are also prepared for entry into the work force. Using applied learning theory to guide the observations, the analysis of the conditions to applied learning will be identified.

### **CONCLUSIONS/RECOMMENDATIONS/SUMMARY**

When applied learning is incorporated into engineering courses, students are able to relate the skills and knowledge acquired directly to the field in which they are preparing to enter (Blake, 2007). Choi, Hui, Lee, and Chui (2010) found that through work placement students were able to fine tune skills they learnt in an academic setting. Work placement exposes students to values and situations they will experience in the work force while cementing the theoretical concepts learnt. PBL can support the development of skills required for the workplace (Howard and Jorgensen 2012)., however, real world projects give students the experience to complete real engineering project in a safe learning environment.

### **KEYWORDS**

Applied Learning, Project Base Learning.

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## ***Introduction***

Traditionally applied learning has been associated with 'hands-on' experience and training (VCAA 2006). Since the early 1990s significant changes in post compulsory education have occurred (Blake 2007). This was largely due to the linking, by many governments across the globe, of educational policy to economical reforms (Blake & Gallagher 2009). These changes have increased the educational opportunities available to young people and blended two traditionally opposed forms of training and learning (Blake 2007). Even though the definition and understanding of 'applied learning' differs between Australian states as well as other countries, there remains consistencies underpinning all applied learning approaches (VCAA 2006).

The CQUniversity Bachelor of Engineering (Co-op)/Diploma of Professional Practice (Engineering) will be examined through the context of applied learning as presented in this paper. This qualification is 4.5 year full time undergraduate degree. The four and one half years includes a minimum of 48 weeks of work placement in the student's relevant discipline (CQUniversity *Handbook* 2013).

This CQUniversity engineering work integrated learning program incorporates Project Based Learning, Co-operative Education with Professional Practice, providing learning in context, both in formal and informal learning environments (e.g. in workshops and classes and project studios) and in employment in industry, integrated in your study program. Teamwork and problem solving skills are learned alongside the technical content in an exciting real-world engineering environment (XXXXXX *Handbook* 2013, n.p.).

## ***Principles of Applied Learning***

### ***Connecting Theory and Application***

Applied learning is primarily an approach that links the 'real world' to the concepts being taught in the classroom (VCAA 2006). Theory is a vital part of applied learning. The theory and the practical application are linked by the context (VCAA 2006). Ash and Clayton (2009) note that "learning is maximized when it is active, engaged, and collaborative".

During the first two years of full time study all CQUniversity engineering students, whether a Co-op student or a straight bachelor student, participate in project based learning. This is a university based attempt to link theory and practice. This also helps to prepare students for work placement. Even though the university liaises with industry to organise work placements for students, the student must still prepare a Curriculum Vitae and apply for the position meeting all of the selection criteria – they will then be shortlisted for an interview. Eraut (2008) acknowledges that work placements provide a very different context for learning than is offered at university. Work placement is a vital component of becoming a professional engineer. Experience is recognised by Benner (1982, p.406) as being essential in the transition from novice to expert and states "A deep understanding of the situation is required before one acquires a repertoire of ways of being and coping with a particular illness experience". Even though Benner (1982) is referring to nursing practice, this statement is applicable to any practice or vocation.

## **Partnerships**

*Partnerships with organisations and individuals outside the classroom are a vital component of applied learning as they provide the necessary context in which to substantiate the relevance of what has been taught in the classroom (VCAA 2006). The partnership arrangements between schools, TAFEs, Registered Training Organisations and workplaces have increased the diversity of opportunities available to young people in school (Blake 2007). Ash and Clayton (2009) describe applied learning as collaborative learning as it is associated with interactions involving others – including classmates, community members, lab partners and office colleagues.*

The project based learning within the CQUniversity Engineering degrees engages students not only with the theoretical content of the project but also with classmates, materials, applications and industry (Elgezawy & Martin 2008). Co-op students are required to participate in industry placement. The university has a working relationship with the companies involved with the work placements. Companies apply to the university to participate in the programme. The university will determine if the company has the required accreditation to participate and if so the company will participate in accordance with the course requirements. Work placement within the Engineering Co-op degree is assessable and considered to be a course; therefore both the student and the company must contribute evidence and views of the student's performance. As part of the assessment the student is required to maintain a journal that is to be submitted as part of a portfolio addressing company information, job objectives, and reflections (Devenish 2010). The students are provided with details of the portfolio format and requirements on the course website.

## **Nurturing**

Applied learning affords a more holistic approach to the student; it considers their personal strengths, interests, goals and previous experiences (VCAA 2006). Ash and Clayton (2009) see nurturing learning and growth as an essential element of applied learning pedagogies. Student nurses in Hong Kong found their patients developed more respect for them and they in turn experienced increased confidence when their teacher provided positive reinforcement in the presence of the patient (Hui Choi et al 2010).

Since all courses in the first year of the CQUniversity engineering programmes are generic there is the potential to create a learning community (Elgezawy & Martin 2008). Elgezawy and Martin (2008) assert many of the engineering first year courses are designed to meet the objectives of creating a learning community and this supportive environment is reinforced in the second year courses as well. Elgezawy and Martin (2008) have found that project based learning not only develops generic skills such as communication, teamwork and the capability of life-long learning but students also have the capacity to develop excellent analytical skills and deal with complex engineering problems.

Teachers of applied learning need a certain temperament – they need to be energetic, tolerant, enthusiastic and able to view their students as equal participants in the learning process (Harrison 2006). It is also believed that for applied learning programmes to be truly successful support is required for both the teacher and the student.

## **Transitions**

Lamb and Rice (2008) emphasise the importance of higher levels of education required by the present generation to successfully complete the transition from school to work. Blake (2007) acknowledges that the completion of year 12 alone does not facilitate a flawless transition between school and employment or school and further education. VCAA (2006) recognise that applied learning fosters the transition of students into independent learners and being viewed and treated as adults. Part of this transition is the change in the

relationship between the student and the teacher. Blake (2007) attributes the adult-like relationship that develops in applied learning to the incorporation of principles of adult learning, work-based learning, project-based learning and service learning combined with significant 'real-world' projects that are associated with local communities and industry.

According to Elgezawy and Martin (2008), before CQUniversity incorporated project based learning into its engineering courses, the feedback they received from companies providing work placement for students was that the students were ill equipped for work placement – as were most newly graduated students at the time. The introduction of project based learning for engineering co-op students has better prepared these students for work placement which in turn prepares the student for a career as a professional engineer. Project based learning for all engineering degrees ensures that those students opting to study the Bachelor of Engineering are also prepared for entry into the work force.

Reflection on teaching and learning is a prime element of project based learning as presented in the CQUniversity engineering courses. Reflective journals form part of the assessment of both the project courses and the work placement. Ash and Clayton (2009) too recognise critical reflection as an important feature of applied learning, but in order for it to achieve the desired results it must be carefully and intentionally designed.

### ***A Revolution of Change***

The concept of applied learning can be traced back to the Nineteenth Century when Freidrich Froebel coined the term 'child-centred' in relation to the kindergarten movement (Harrison 2006, p.3). In 1897 John Dewey published *My Pedagogical Creed* outlining his philosophy on experiential and child-centred learning. He believed in real-life experiences and school as a median to build experiences in order to make education meaningful (Harrison 2006, p. 3,4). In the 1960s Bruer made further moves toward the modern concept of applied learning (Harrison 2006, p. 4)

Since the 1980s post compulsory education in Australia has undergone radical changes unlike any in the history of education and training in this country (Blake 2007). Within this period the percentage of 16 and 17 year-olds attending school has increased dramatically – largely due to the low availability of youth employment and assisted by changes in government policy which increased the compulsory schooling age (Blake 2007). Unfortunately traditional upper-secondary education with its focus on university preparation was unable to meet the demand of the increased number of young people forced to remain in the educational system (Blake & Gallagher 2009). What was required within schools was a greater selection of courses and career paths from which these young people could choose. Pushing the change in and diversity of programs being offered to students was the altered learning temperaments of students brought about by the retention at school longer (Blake 2007).

Learning and training can only be successful when conducted in a supportive environment (Garrick 1999). Not only is learning affected by the physical environment, it is also affected by the emotional environment. Forcing young people to remain in schooling longer has permanently altered the learning culture within schools (Blake 2007).

The introduction of Vocational Education and Training (VET) programs into schools in the early 1990s in response to inflated enrolments has greatly increased the secondary curriculum. This diversity was further augmented by the introduction of School Based Apprenticeships and partnerships with TAFE, Private Providers of VAT and Adult and Community Education (ACE) providers (Blake 2007).

Now, more so than ever before, there are proven lifelong economical benefits for staying at school longer (Lamb & Rice 2008). The Victorian Certificate of Applied Learning (VCAL) enables students to obtain senior secondary school qualification whilst studying non-traditional programmes in non-traditional contexts such as work-placements, community

projects and participation in youth development programs (Blake & Gallagher 2009). Choy and Delahaye (2005) found that youth were puzzled when educational institutions did not formally acknowledge work experience in the formal learning context.

### ***Engaging Community Understanding***

Amerson (2010) notes service-learning by nursing and social work students exposes these students to real-life health issues within the community as well as the community's cultural values and beliefs. This enables these students to recognise the interconnectivity between cultural values and beliefs, decision-making and health care practices (Amerson 2010). Hui Choi et al (2010) found that even though student nurses, in Hong Kong, were aware of the cultural beliefs surrounding childbirth and their impact they were little prepared to deal with the situations.

Community-oriented projects are utilised "to achieve a unique blend of work-based learning, service-learning, school-based learning, and adult learning" within the VCAL (Blake & Gallagher 2009, p. 67). Jonassen and Rohrer-Murphy (1999) believe that students must have projects that are interesting, relevant and emerge from the real world. They also attest that "understanding the world requires experiencing it" (p. 69).

One of the defined graduate attributes of the Engineering Co-op programme is an "understanding of the social, cultural, global and environmental responsibilities of the professional engineer, and the need for sustainable development". This is achieved through a combination of theoretical subjects, project based learning and industry placement. Both the project based learning and the work placements require students to reflect on their learning, roles, relationships, responsibilities and activities encountered during the project or the placement.

### ***Advantages of Applied Learning***

VCAA (2006) highlights several benefits of applied learning which have been demonstrated across the globe. These include: improvement in student confidence, motivation and commitment; more fluent transition from school into the work force or further education; individualisation; and providing a context to develop generic skills and learn both theoretical concepts and practical skills.

Students are often able to participate in the direction of their study and tailor courses to suit their individual requirements or interests (Blake 2007). Applied learning, as it is presented as part of the VCAL programme, is largely responsible for re-engaging students who were formally at-risk of dropping out of school (Blake & Gallagher 2009). Choy and Delahaye (2005) point out that when adult learning principles are applied to youth they do not have the relevant life experiences to relate their learning to. Applied learning provides the practical or 'hands-on' experience to which the youth can relate their learning.

One of the key features of work placement, according to Eraut (2008), is informal learning from experience. Often work placement takes students out of their comfort zone away from their student cohort and places them in an unfamiliar environment through which they must negotiate. Eraut (2008) describes situational understanding as a crucial component of professional employment.

When applied learning is incorporated into university and TAFE courses, students are able to relate the skills and knowledge acquire directly to the field in which they are preparing to enter (Blake 2007). Hui Choi et al (2010) found that through work placement students were able to fine tune skills that they had learnt in an academic setting.

Elgezawy and Martin (2008) explain the goal for project based learning within the CQUniversity engineering degrees is to increasingly engage the students by necessitating active and responsible participation in their own learning. Students are required to work in teams in the tutorial sessions. The discussions that ensue lead to a deeper understanding

of the presented content (Elgezawy & Martin 2008). Elgezawy and Martin (2008, p. 4) also state “team project work encourages peer learning as well as clarifying the link to ‘real’ engineering.” Work placement reinforces the concepts taught through the project based learning as well as providing a monetary reward for learning.

### ***Disadvantages of Applied Learning***

Schools may not take full advantage of the opportunities offered by applied learning and may only view it as a strategy for at-risk students (Blake 2007). Blake (2007, p. 67) recognises the unfortunate tendency of some school-based teachers to see school-based applied learning such as the Victorian Certificate of Applied Learning (VCAL) as an intervention for at-risk students or a “dumping ground for dummies”. There is also a danger that applied learning pedagogy could be viewed as an insignificant form of learning.

Students are exposed to different learning contexts as they move between school-based learning, TAFE and work-based learning situations – often each having a different or conflicting assumption of the learning process (Blake 2007). School-based teachers involved in applied learning programmes require a new skills set to enable them to successfully engage and instruct students involved in non-traditional means of education (Blake & Gallagher 2009).

A study by Choy and Delahaye (2005) indicated that the majority of youth were surface learners with inadequate readiness for self-directed learning. It was also found that even though there were aspects from andragogy that the students liked, such as addressing the teacher by their Christian name, the students were not so receptive to “taking responsibility for what should be learned, how it should be learned or even how it should be assessed (p. 7).

Each institution and industry involved in the applied learning process has a different view of what is considered to be valuable learning and useful knowledge (Blake 2007). Within the transitions between school, TAFE and work-based learning situations also reside differing beliefs of how the relationship between the student and the instruction should proceed (Blake 2007). Students tend to be treated as dependent learners while at school but are expected to be independent learners maintaining an adult-to-adult relationship while at TAFE or on work placement (Blake 2007). Further conflict exists between assessments. School-based assessment tends to be both formal and summative whilst TAFE and work-based assessment tends to be competency based where students demonstrate that they have acquired the required skills (Blake 2007). Eraut (2008) believes that much of the literature on competency make false assumptions about competency – assuming that it is a ‘generalisable’ skill where as competency requires meeting the expectations of significant others.

Even though there are many benefits to project based learning some students do not fare well in group work. Part of the assessment process of the projects is a peer review. This has the potential to be considered by some students as a popularity contest with students being judged by other students on their personal traits rather than on their performance or participation.

### ***Conclusion***

Post compulsory education has undergone significant changes since the early 1990s (Blake 2007). The changing temperaments of students obliged to remain at school has forced the introduction of applied learning strategies to provide greater variety to meet the needs of student cohorts (Blake 2007). VCAA (2006) recognises important qualities in the many and inconsistent definitions of applied learning. These are: a connection of the theory to the practical or application: the development of a variety of partnerships: the nurturing of

students and teachers and a holistic approach to education; and smoother transitions between school and work or school and further education.

When applied learning is incorporated into engineering courses, students are able to relate the skills and knowledge acquire directly to the field in which they are preparing to enter (Blake, 2007). Choi, Hui, Lee, and Chui (2010) found that through work placement students were able to fine tune skills they learnt in an academic setting. Work placement exposes students to values and situations they will experience in the work force while cementing the theoretical concepts learnt. PBL can support the development of skills required for the workplace (Howard and Jorgensen 2012)., however, real world projects give students the experience to complete real engineering project in a safe learning environment.

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