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# Using cooperative education and work-integrated education to provide career clarification

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**Abstract**
*When students commence university studies they typically choose subjects that are of interest to them, and hold only vague notions of intended career paths. However, some universities offer work-integrated learning degrees (WIL), programs that require students to undertake relevant practical work experience by way of work placements, internships or sandwich degrees. The underlying notion of these degrees is that learning occurs, as Lave and Wenger (1991) argue, by way of legitimate peripheral participation, where the student as the 'newcomer' works alongside a practising expert (the 'old timer'). As the student becomes more engaged with workplace practices, he or she begins to learn workplace norms by way of mediated action and situated learning. These workplace norms include things such as the use of workplace-specific language, and particular methodological techniques unique to that workplace (Eames & Cates, 2011). Past research has shown that work placements can greatly enhance career clarification for students (Dressler & Keeling, 2011), and that students gradually become enculturated into a community of practice. Recent research in our group suggests that WIL programs also allow the development greater awareness of career paths. This research indicates, for example, that for some students work placements provide clarity about skills and qualifications needed to become a research scientist – subsequently providing motivation to complete graduate studies. Several OECD reports highlight the need for more PhD level scientists and engineers, and we argue here that WIL programs provide a career clarification that is more convincing than any amount of career counselling.*
***Keywords:*** Work-integrated education; cooperative education; work placements and internships; community of practice; enculturation; science and engineering

## Introduction

When students commence university studies they typically choose subjects that are of interest to them, and hold only vague notions of intended career paths. However, some universities offer cooperative education or work-integrated learning degrees (WIL), programs that require students to undertake relevant practical work experience by way of work placements, internships, or sandwich degrees. The underlying notion of these degrees is that learning occurs, as Lave and Wenger (1991) argue, by way of *legitimate peripheral participation*, where the student as the 'newcomer' works alongside a practicing expert (the 'old timer'), a professional who is part of a professional community of practice. As the student becomes more engaged with workplace practices, he or she begins to learn workplace norms (professional behavior) by way of *mediated action* and *situated learning*. These workplace norms include things such as the use of workplace-specific language (Coll & Zegwaard, in press), and particular methodological techniques unique to that workplace (Eames & Cates, 2011). Past research has shown that work placements can greatly enhance career clarification for students (Dressler & Keeling, 2011), and that students gradually become enculturated into a community of practice. Recent work in our research group also suggests that such programs also allow the development greater awareness of career paths. This research indicates, for example, that for some students work placements provide clarity about skills and qualifications needed to become a research scientist – subsequently providing motivation to complete graduate studies. Over the last several years there has been a number of governmental level reports published from OECD countries raising concern about declining numbers of science and engineering graduates (Koslow, 2005; Roberts, 2002; Scott, 2003). This decline is compounded by the expected increase in the number of scientists and engineers taking retirement in the next 10-20 years (Gago et al., 2004; Ministry of Research Science & Technology, 1998) and the growing need for more graduate level scientists and engineers (European Commission, 2002, 2003; Gago, et al., 2004). We argue here that cooperative education or WIL programs can provide a career clarification that is more convincing than any amount of career counseling, and that such programs are an effective means to address the expected shortage of science and engineering graduates.

**Cooperative and work-integrated education**

Cooperative education or work-integrated learning (WIL) programs of study are typically degree-level programs that combine classroom-based instruction with one or more periods of relevant experiential learning in authentic work settings. Examples include Bachelor of Engineering programs in which students typically do two 400-hour work placements over the summer vacation, usually a requirement of accreditation by accrediting bodies such as professional engineering associations (Todd & Lay, 2011). But WIL programs are characterized by diversity; in terms of the duration of the work placements, the number of placements, and their ‘location’ within the degree structure (and indeed the labels used to describe them – see below). So for example, in the UK, the sandwich degree - a program where there is one 12-month block of work placement ‘sandwiched’ between the first two years and final fourth year of a four year degree program - is a common model (Ward & Jefferies, 2004). In the USA, a ‘pure’ cooperative education degree is typically a four or five year program with alternating work placements and on-campus learning throughout the duration of the degree (Sovilla & Varty, 2011). In modern parlance, a cooperative education or WIL program is viewed as almost anything with some form of experiential learning component or workplace-based, off-campus component. According to Coll and Zegwaard (2011b) this variety represents both strength and weakness for cooperative education programs. They argue there are some minimum requirements, for example, arguing that the learning gained in a very short placement is minimal and does not allow for deep learning, and such programs should not be labeled cooperative education. Furthermore, authors such as Coll, Eames, Zegwaard and Hodges (2002) argue the placement needs to be formally assessed, preferably paid, and of clear value to an employer, and that it is essential that some form of integration is facilitated by the education providers (Coll et al., 2009; Coll & Zegwaard, 2011a). That is, the student must be guided to understand how on-campus work informs learning in the workplace, and vice versa. What cooperative education is not, and what it is often confused with, is ’cooperative’ or group learning (Groenewald, Drysdale, Chiupka, & Johnston, 2011). That is, cooperative education is more than learning by working collaboratively (although it typically involves this); it is the *integration* of learning across the two sectors of campus and off-campus. The identifying and distinguishing feature of cooperative education is then that it is a combination of work experience with on-campus academic learning, but also the notion that learning from each 'site' is integrated. So, for example, a student studying for a bachelors degree in analytical chemistry at university might take knowledge learnt from his or her studies, and use this to engage in meaningful and relevant work with an employer who runs an analytical service laboratory. But at the same time the student might take current research ideas based on leading edge research in a particular analytical technique (e.g., modern chromatographic techniques like GC-MS, or HPLC) learned from university study into to the workplace. Even if student does not take such direct knowledge into industry, they take a different culture or way of thinking, and this can form part of the integration in work-integrated learning (Coll, et al., 2009; Coll & Zegwaard, 2011b).

Such programs are reported to provide an effective means of developing graduate competencies (e.g., Braunstein, Takei, Wang, & Loken, 2011 and references therein), and may provide an avenue for the development of talent (Groenewald, 2003), along with the development of non-technical or behavioural skills – something deemed difficult to achieve at university (Coll & Zegwaard, 2006). The experiential learning component of a cooperative education or WIL program can complement classroom learning, and education thereby becomes a more holistic, three-party, endeavor in which students, employers, and educational faculty work together to produce graduates that are more 'work ready' (Eames & Cates, 2011; Groenewald, et al., 2011). Cooperative education and WIL programs are now employed in a wide variety of academic disciplines including science (Zegwaard & Laslett, 2011), engineering (Todd & Lay, 2011), and specific science disciplines such as chemistry (Ward & Jefferies, 2004).

Cooperative education or WIL programs are seen by some authors as an important *educational* strategy with, for example, a UK-based report by Lord Dearing into higher education recommending that all higher education programs incorporate at least some form of work experience (Dearing, 1997). In support of this, many authors report that these programs produce better balanced graduates; for example, graduates who have a better understanding of the nature of science, and what it means to be a scientist (Coll, Zegwaard, & Lay, 2001). Authentic work experience also is reported to help students who often feel marginalized in participation in science (e.g., indigenous peoples & females) feel a sense of belonging, and aid in 'border-crossing' into science from school (Aikenhead, 2001; Paku, Coll, & Zegwaard, 2004).

**Learning in cooperative and work-integrated education**

There has then been increasing acceptance over of the value of gaining work skills in an integrated program of learning in higher education. This led to the development of significant numbers of educational programs that incorporate some experience in a relevant workplace (Sovilla & Varty, 2011). Research suggests that cooperative education programs are successful in providing students with more certainty about their career direction through completing placements (Parks, 2003), and gain confidence in their ability to work (Wessels & Pumphrey, 1995), and graduate career-ready, often obtaining jobs with their placement employers work (Weisz, 2000). However, it is less clear how the educative processes, particularly for the placements, works or if it does (Hsu, van Eijck, & Roth, 2010). It seems that up until recently, student learning that occurs during work placements has been under-researched (Bartkus & Higgs, 2011), as is its theoretical basis (Eames & Bell, 2005), however, there has been progress of late and a substantive body of literature in this area has become available (e.g., Eames & Cates, 2011; Johnston, 2011 and references therein).

Eames (2000) and Eames and Coll (2006) argue that to understand co-op as an educational strategy, we need to be cognizant of the importance of contextual factors, especially sociological factors. So a student learning to become a scientist via *legitimate peripheral participation* (Lave & Wenger, 1991) does so by situated participation within the sociological context of a community of practice, and is socialized into this community by learning the behavioral norms and workplace culture by working alongside a scientific expert. This opportunity to appropriate the knowledge, skills, and *culture* of that scientific workplace, leads to a deeper understanding of science content and helps in the development of scientific skills; but more importantly what it means to work in science (Rogoff, 1995). A second aspect or component of sociocultural theories of learning is the notion of *mediated action.* Here learning in the workplace is viewed as a feature of the social circumstances specific to the place of work – even for companies or organizations in the same type of business (e.g., chemistry). For example, language, such as the use of acronyms, features as a psychological tool (Vygotsky, 1986), and there is a particular way of using language (e.g., writing or speaking 'scientifically'), that is specific to the context in which the learning occurs (McCurdy, Zegwaard, & Dalgety, 2009). To illustrate, acronyms like LCMS, GLC, and NMR are normal 'language' in a chemistry laboratory; but even within the field of chemistry, some of these acronyms might be used on one type of laboratory, and others in another type of laboratory. Across disciplines too there are variations, with, for example, terms like ATP and ADP common in a biology laboratory. A third idea is that of *distributed cognition* (Perry, 2003), where knowledge is seen as not resident solely in an individual (e.g., the workplace supervisor/scientist), but is spread out or *distributed* across the workplace. For example, the scientist in a research laboratory would hold knowledge about how to conduct scientific research, but the technicians in the same laboratory might well hold more knowledge about an instrument - its operation and maintenance. Likewise, in the same organization, administrators or general staff might hold knowledge about workplace occupational safety and health (OSH) policies, and so on.

**Enculturation into the professional workplace: science as culture**

Science and scientific thinking is so different from everyday life, that it has been described as being like a separate 'culture' (Aikenhead, 2001). Based on this view, then for a student to become a scientist, he or she would then need to learn about and become part of a scientific culture, and eventually a community of practice (Lave, 1991). In the view of many authors, this represents a considerable challenge for students. Aikenhead describes this as 'border crossing', meaning that students are required to cross-cultural 'borders' from their life world into the culture of the scientific community. This border crossing is difficult for any student even when school science beliefs are aligned with their own beliefs and they come from a cultural background similar to that of the scientific community (Cobern & Aikenhead, 1998). However, for others such as indigenous peoples, whose culture is different from the domain culture and certainly from the scientific community, such a transition is reported to be much more difficult (Glasson, Mhango, Phiri, & Lanier, 2010).

Cooperative education or work-integrated learning (WIL), it is reported, can allow students to develop an understanding of the nature of science during practice (Paku & Coll, 2011). Moreover, WIL allows students to be involved in decision making, problem solving and being able to make informed choices about the science they are doing. This not only gives the student experience within the science subculture, but it gives them an understanding of what it means to be a scientist, which can help them see that they 'fit' into the scientific community and help see career paths that might otherwise look untenable. A work placement can then allow a science student to develop an identity and potentially become enculturated within a science community of practice (Eames & Bell, 2005).

## Career clarification by means of legitimate peripheral participation

According to Dressler and Keeling (2011), a key outcome of cooperative education is enhanced career benefits for students. There are in fact a large variety of ways cooperative education is reported to benefit students. So students gain practical experience in discipline-related career areas (Scholz, Steiner, & Hansmann, 2004), they get increased employment opportunities (Calway & Murphy, 2000), increased salaries (Gardner & Perry, 2011; Lentz, Holland, & Alloy, 2011), and progress quicker in their careers (Hayward & Horvath, 2000). Of particular relevance to this chapter, it is reported that undergraduate placements help in career identification and clarification (Dressler & Keeling, 2011). We suggest here that this can be understood by considering occurs since students engage in legitimate peripheral participation, which in turn allows for enculturation into the scientific community of practice. This means that students who do work placements as part of a cooperative education or WIL program come to understand the role of science, the specific roles of scientists, and the nature and culture of the scientific community. This in turn allows important insights into the nature of career options. The way this works is quite subtle, and such enculturation or enlightenment consist of far more than developing an understanding of what a particular science job would be like, and how appealing it might be. Work placements also importantly help students see understand the nature of the scientific community of practice in a quite fine-detailed way. To illustrate, Zegwaard, McCurdy, and Paku (2007b) say one concern expressed about cooperative education is that it allows industry to 'capture' highly able students, who might go out of the system whereas they would benefit in the long term from further study. However, it seems that the uptake of undergraduate students into graduate studies is proportionally much the same for students that carry out work placements as for students that do not. This is somewhat unexpected, given that these students had spent sometimes considerable time in the work place and, more the often, had receive (several) job offers (Ward & Jefferies, 2004). This suggests that students' experiences during the work placement influence any decision to carry on with graduate studies. Of particular interest is the fact that Zegwaard et al (2007a) observe that students who did work placements report that the work placement gave insight to career options, *but that the choice of direction varied depending on the nature of their placement*. For example, students that conduct research projects during their work placements talk about the experience of doing 'real' research where project outcomes were used for decision-making. This is consistent with the work by Eames (2000) whose longitudinal study indicated this occurred via the apprenticeship model involving legitimate peripheral participation as described above. It seems that the experience of doing a research project invokes a greater interest for science research. But students who do placements come to believe that to have a research career; one must complete a higher degree, typically a PhD. In some cases this seems to arise from a negative experience, that is, observing that a bachelors degree may mean boring or relatively mundane, low level, work (Eames, 2000; McCurdy & Zegwaard, 2009). In other cases it seems to arise from a positive experience – where undertaking some research develops a passion for research, or awakening about the enjoyment of doing research (Eames & Bell, 2005). Either way, the work placement experience can become a primary motivator for undertaking and investing into postgraduate studies (Zegwaard, et al., 2007a). The experience of legitimate and relevant participation, particularly one where a challenging research investigation was undertaken, can even raise students self-efficacy of undertaking further research (Coll, et al., 2001), including research projects such as masters or PhD.

## Conclusions

Cooperative education and work-integrated learning programs are able to provide career clarification by way of student's engagement in legitimate peripheral participation in a science community of practice. This participation allows insight to the community's activities, its nature and culture, and provides students with the opportunity to learn the norms of behavior as well as exposure to possible science career avenues. This legitimate peripheral participation can be facilitated in degree programs by way of work placements. Key elements for successful career clarification require work placements to be authentic, relevant, and meaningful, with a significant period of time in the workplace alongside a practicing expert to allow for some enculturation, by way of socialization, into the community. The literature reports numerous student benefits from legitimate peripheral participation, including gaining relevant technical and behavior skills, learning the workplace-specific language, increased employment and salaries, and faster career progression, as well as increased uptake into postgraduate qualifications by students pursuing research career paths. It is, therefore, argued here that, consistent with Lord Dearing's report, greater access to legitimate peripheral participation by way of work placements should be provided for student to encourage the development of some career clarification early their studies, allowing students to make better informed decisions on study and, ultimately, career direction.

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