# Self-concept and tacit knowledge: Differences between cooperative and non-cooperative education students

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The aim of this project was to determine whether there were significant psychological outcome differences between students who pursue cooperative education and students who pursue a traditional non-cooperative education program. More specifically, the goal was to examine the relationship between co-op, self-concept, and tacit knowledge-practical knowledge acquired through informal means. Participants, undergraduate cooperative (n = 2236) and non-cooperative education (n = 1390) students in all years of study and from all academic disciplines, completed an online survey measuring three domains of self-concept and five areas of tacit knowledge. Results indicated that while university co-op students demonstrated higher levels of math and academic self-concept, their scores on measures of tacit knowledge were comparable, and in some instances, slightly lower than their non-co-op peers. Implications and recommendations for future research are discussed. (*Asia-Pacific Journal of Cooperative Education, 2012(3), 169-180*)

Keywords: cooperative education, tacit knowledge, self-concept, psychological outcomes, school to work transition

## LITERATURE REVIEW

There has been a dramatic increase in the number of Canadian students from all social, cultural, and economic backgrounds attending post-secondary institutions in recent years (Statistics Canada, 2007). As fewer students enter the workforce directly after high school, it has become more and more important for college and university programs to help students prepare for the labour market (Walters & Zarifa, 2008). Given the increasing numbers of young adults now pursuing post-secondary studies, the increased prevalence of a post-secondary education has made it more difficult for students to rely only on having a degree to secure employment after graduation (Gardner & Choi, 2007). Many students are concerned about this increased competition. To allay these concerns, they attempt to gain an edge over their peers by trying out their skills and competencies in the workforce prior to graduation. Increasingly, this is achieved through work-integrated learning such as a cooperative (co-op) education program (Hanneman & Gardner, 2010).

This trend toward work-integrated learning programs is equally motivated by the expectation from employers that new university graduates will enter the workforce with high levels of competency in their field of study and have the skills necessary to transition successfully into the workplace (Gardner & Choi, 2007). Employers expect specific professional skills from the new graduates they hire, such as the demonstrated ability to build working relationships, strong analytical reasoning, and being able to work effectively in a team (Gardner & Choi, 2007; Walters & Zarifa, 2008). Increasingly, cooperative education programs are functioning as a training ground for students to develop these skill sets (Freudenberg, Brimbel, & Cameron, 2011). It is no longer sufficient for students to graduate with only the core academic knowledge and abilities they obtain in the classroom. While

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school based learning is important in helping students develop skills for knowledge acquisition and critical thinking, the opportunity for workplace experience should allow them to apply their knowledge to real world situations and to develop interpersonal skills such as conflict resolution, communication, and networking (Hanneman & Gardner, 2010).

In order to help students gain the essential skills for success in the workplace, many post-secondary institutions offer work-integrated learning programs, such as cooperative education, that provide students with the opportunity to alternate between periods of academic study and work placement (Gardner & Choi, 2007). Most co-op programs are available to students in all academic disciplines, and provide additional employment support, such as resumé building workshops, job interview preparation, and professional development courses (Doel, 2009).

Universities and colleges promote co-op as an avenue for students to prepare for the workplace by supporting the development of the practical skills that employers value, and, to help ease students' concerns around the transition into the labour market by providing employment experiences which boost their confidence (Drysdale, Goyder, Nosko, Easton, Frank, & Rowe, 2007; Doel, 2009; Gardner & Choi, 2007; Stern, Finkelstein, Urquioa, & Cagampang, 1997).

Considering the limited research that has been conducted into the relationship between cooperative education and improved results in these specific areas, these are big promises. Most of the current data regarding the effects of participation in co-op is focused on the academic and employment outcomes of students in co-op programs. For example, several studies have shown that cooperative education enhances students' employability (Drysdale et al., 2007), as employers view these students as having higher academic achievement, stronger interpersonal skills, and demonstrating more professional behavior than their non-co-op peers (Gardner & Choi, 2007; Hanneman & Gardner, 2010; Stern et al., 1997). Other research has shown that academic achievement is related to participation in co-op and other career development programs, as students may believe work and school prepare them for the future in similar ways and are more motivated when pursuing both ventures simultaneously (Stern & Briggs, 2001).

While participation in cooperative education has been found to be related to gains in academic achievement and may well give students an initial advantage in securing employment after graduation (Drysdale et al., 2007), it is unclear whether the other abovementioned aims of cooperative education programs are being realized. There are several key aspects of the cooperative education model (such as action learning, mentoring, and work-term report writing) that are designed to engage students in a process of reflection, articulation, and examination of their work term experiences (Doel, 2009; Garavan & Murphy, 2001). Similar strategies have been shown to enhance practical implicit - tacit - knowledge in individuals, teams, and organizations when implemented in workplace settings and thus comparable gains are also likely for co-op students, especially those who are in the third or fourth years of their undergraduate program (Matthews & Sternberg, 2009). Additionally, it has been suggested that positive self-concept is related to success in the workplace (Schwalbe, 1998), and is enhanced by experiences that allow individuals to develop new skills and internalize their accomplishments (Fletcher, 1990).

The psychological constructs of self-concept and tacit knowledge may seem to be distinctive. However, both have been repeatedly tied to well-being, success, and effectiveness in the workplace (Marsh, 1991, 1992; Marsh, Byrne, & Shavelson, 1992; Schmidt, Hunter, & Outerbridge, 1986; Schwalbe, 1998; Sternberg, 2002; Sternberg & Wagner, 1993). Further research is warranted to aid an understanding of wehther participation in cooperative education has a similar impact on these attitudes and behaviors. This study will help clarify the relationship between participating in a cooperative education program and these psychological variables, described in further detail below.

*Self-Concept*

Self-concept, as conceived by Marsh, Byrne, and Shavelson (1988) is a multi-dimensional construct that refers to an individual's perception of "self" in relation to a number of characteristics, such as academic, physical appearance, peer and parental relationships, goals, values, and general esteem. In particular, research in educational settings has consistently demonstrated the importance of the relationship between academic self-concept and desirable educational outcomes (Brunner, et al, 2010). Research by Marsh (1993) and Marsh and Yeung (1997a, 1997b) has shown that self-concept strongly influences how students feel about themselves, their accomplishments, and the decisions they make about their education, such as whether or not they will attend a post-secondary institution and which courses to take. This research has also established that increases in academic self-concept are associated with increases in subsequent academic achievement and other desirable educational outcomes.

One of the goals of this study was to explore the differences in math, verbal, and academic self-concept between co-op and non-co-op students. It was predicted that co-op students would demonstrate more positive math, verbal, and academic self-concept compared to non-co-op students. Demographic variables (age, gender, year of study, academic discipline, and grade point average) were also examined in relation to the self-concept measures.

*Tacit Knowledge*

The ability to learn from experience is a key to success in almost any domain, and job success has been repeatedly linked to aspects of practical intelligence, rather than academic achievement or scores on tests of psychometric intelligence (Sternberg & Wagner, 1985, 1993). Sternberg, Wagner, Williams, and Horvath (1995) consider the acquisition and utilization of tacit knowledge, often characterized as common sense, to be an important aspect of practical intelligence. Tacit knowledge is the procedural information required to function in daily life that typically is not explicitly taught or even verbalized (Sternberg & Wagner, 1985; Sternberg, Wagner, Williams, & Horvath, 1995; Sternberg & Horvath, 1999).

Tacit knowledge has also been acknowledged as both an outcome of experience-based learning and as a necessary basis for continuous learning (Matthews & Sternberg, 2009). However, tacit knowledge has not been previously examined in the context of cooperative education. Research into the relationship between work experience and tacit knowledge acquisition suggests that the relationship between cooperative education and tacit knowledge is a potentially promising avenue for further understanding of the development of the competencies which underlie successful real-world performance (Eraut, 2000).

Another important goal of this study was to explore the differences in tacit knowledge between co-op and non-co-op students. It was predicted that the results of this study would show that students who participate in co-op would demonstrate higher levels of tacit knowledge than those who did not. More specifically, it was predicted that co-op students with more completed work terms and who were in the later years of study would demonstrate the highest levels of tacit knowledge.

To summarize, the purpose of the present study was to explore the relationship between participation in cooperative education and the psychological variables of self-concept and tacit knowledge. Drawing from the literature reviewed above, the differences in the measures of self-concept and tacit knowledge were first examined between co-op and non-co-op students. Demographic variables, including age, gender, year of study, academic discipline, number of work terms, level of satisfaction with work terms, and grade point average were also analyzed. It was predicted that participation in cooperative education would be positively related to these variables, which could facilitate the skill development and confidence that is necessary to help students make a successful transition into the workforce.

## METHOD

### *Participants and Procedure*

The data for this study were extracted from a larger cross-sectional and longitudinal project examining the psychological differences between students enrolled in cooperative education and students enrolled in a traditional program without a co-op component. Undergraduate cooperative and non-cooperative education students at a large research-intensive Canadian university were recruited to participate by completing an online survey (QuestionPro). Data collection occurred during the first month of classes in two consecutive new academic years. A total of 4547 students completed the entire survey during the two data collection phases. From these, 3636 valid cases were used in the analysis (Phase 1 = 2091; Phase 2 = 1545). Validation items (i.e., items instructing students to select a specific response) were randomly inserted into the survey to ensure compliance. Participants who 'failed' a validation item were eliminated from the final data sets. Of the valid cases, Phase 1 was comprised of 62.5 percent co-op students (54.4% female; 45.6% male) and 37.5 percent non-co-op students (71.0% female; 29.0% male). Phase 2 was comprised of 81.1percent co-op students (56.3% female; 43.7% male) and 18.9 percent non-co-op students (69.2% female; 30.8% male). Participants (ages 17 – 36, mean age 20.5) ranged from first to fourth year of study, and across all university faculties (e.g., Engineering, Math, Science, Arts).

### *Measures*

Three measures were used in the survey: demographic questionnaire, self-concept, and tacit knowledge.

*Demographic Questionnaire:* Participants completed a short demographics questionnaire designed to collect data on their program (co-op vs. non-co-op), faculty (e.g., Engineering, Math, Science, Arts), year of study (first to fourth), number of co-op work terms (from one to five), gender, age, and current GPA.

*Self-Concept (Math, Verbal, and Academic):* Self-concept was measured using the *Self-Description Questionnaire III* (SDQ III: Marsh, 1992). The SDQ III contains 136 items that measure 13

domains of self-concept. Only responses on items measuring math (e.g., I have hesitated to take courses that involve mathematics), verbal (e.g., Relative to most people, my verbal skills are quite good), and academic (e.g., I get good marks in most academic subjects) self-concept were used for this study. All items were rated on a scale from 1 (definitely false) to 8 (definitely true) with higher scores indicative of higher levels of self-concept. The maximum score for any one domain is 80. Marsh (1992) reports strong reliability and validity. Cronback's alphas for the 13 factors vary from 0.76 to 0.95, with a median alpha of 0.89. Overall test-retest reliability is 0.87. Using conventional and confirmatory factor analysis, strong support for both construct and convergent validity was reported (Marsh, 1992).

*Tacit Knowledge:* Tacit knowledge was measured using a modified version of the *Business Management Tacit Knowledge Measures - Students* (Wagner, 1987*).* The measure contains eight scenarios - each with six items – asking students about their views on matters relevant to their academic and career success, as well as the success of a manager. Each scenario consisted of a situation - which posed a problem for the participant to solve. The participant indicated how he or she would solve the problem by rating (on a 7-point scale) the importance or quality of the six items in making academic and work related decisions and judgments (Sternberg et al., 1995). Hence each scenario resulted in a score ranging from 7 to 42. Five subscale scores were calculated from the scenarios: managing self, managing others, managing tasks, local tacit knowledge (specific response to the situation at hand) and global tacit knowledge (response to the situation at hand as it fits into the larger context of the school or work environment). Scale reliability (Cronbach's alpha) is reported as 0.87.

## RESULTS

*Self-Concept*

To examine the results of the self-concept measure, a MANOVA was performed for each of the two sample phases with participation in co-op and gender as the independent variables and scores on the scales of self-concept (math, verbal, and academic) as the dependent measures. The results from Phase 1 (Table 1) and Phase 2 (Table 2) showed a significant main effect of co-op and gender for all three domain-specific self-concepts. In addition, there was a significant interaction effect of co-op x gender for Phase 1 but not for Phase 2.

TABLE 1. MANOVA and ANOVA F Ratios for Gender x Co-op x Self-Concept Measures – Phase 1

| | | ANOVA | | |
|---|---|---|---|---|
| | MANOVA | | | |
| | F(4,2091) | SDQ Math | SDQ Verbal | SDQ Academic |
| | | F(1, 2090) | F(1, 2090) | F(1, 2090) |
| Gender | 51.007** | 104.263** | 14.409** | 7.805** |
| Co-op Participation | 53.472** | 147.638** | 11.115* | 5.106* |
| Gender x Co-op | 7.101** | 13.301** | 8.611* | .015 |

Note: F ratios are Wilk's approximation of F's. *$p$<0.01, **$p$<0.001

TABLE 2. MANOVA and ANOVA F Ratios for Gender x Co-op x Self-Concept Measures – Phase 2

| | | ANOVA | | |
|---|---|---|---|---|
| | MANOVA | SDQ Math | SDQ Verbal | SDQ Academic |
| | F(4, 1545) | F(1,1544) | F(1,1544) | F(1,1544) |
| Gender | 12.842** | 32.015** | 4.241* | 1.225 |
| Co-op Participation | 24.391** | 60.170** | 3.028 | 5.106* |
| Gender x Co-op | 3.142 | .006 | 6.556* | .006 |

Note: F ratios are Wilk's approximation of F's. *$p$<0.01, **$p$<0.001

In both phases, math and academic self-concept scores were significantly higher for female and male co-op students compared to the scores of students in non-co-op traditional programs. As shown in Figures 1 (Phase 1) and 2 (Phase 2), it is evident that the scores for math self-concept are remarkably higher for female co-op students than for female non-co-op students (Phase 1: 56 vs 44; Phase 2: 51 vs 42.5). Female non-co-op students, however, had significantly higher verbal self-concept in both phases compared to the other groups. There were no significant differences in self-concept scores in relation to age, faculty (e.g., Engineering, Math, Science, Arts), year of study (from first to fourth), number of co-op terms (from one to five), satisfaction with co-op terms, and grade point average.

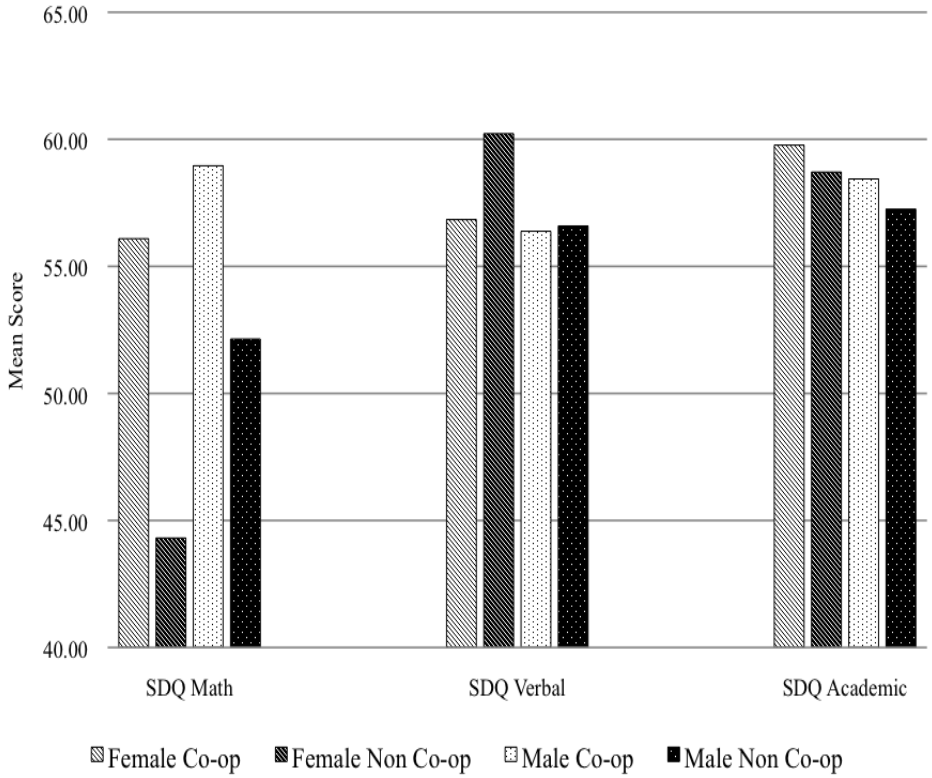


FIGURE 1. Phase 1 Math, Verbal and Academic Self-Concept scores for male and female, co-op and non-co-op students *$p$<0.01, **$p$<0.001

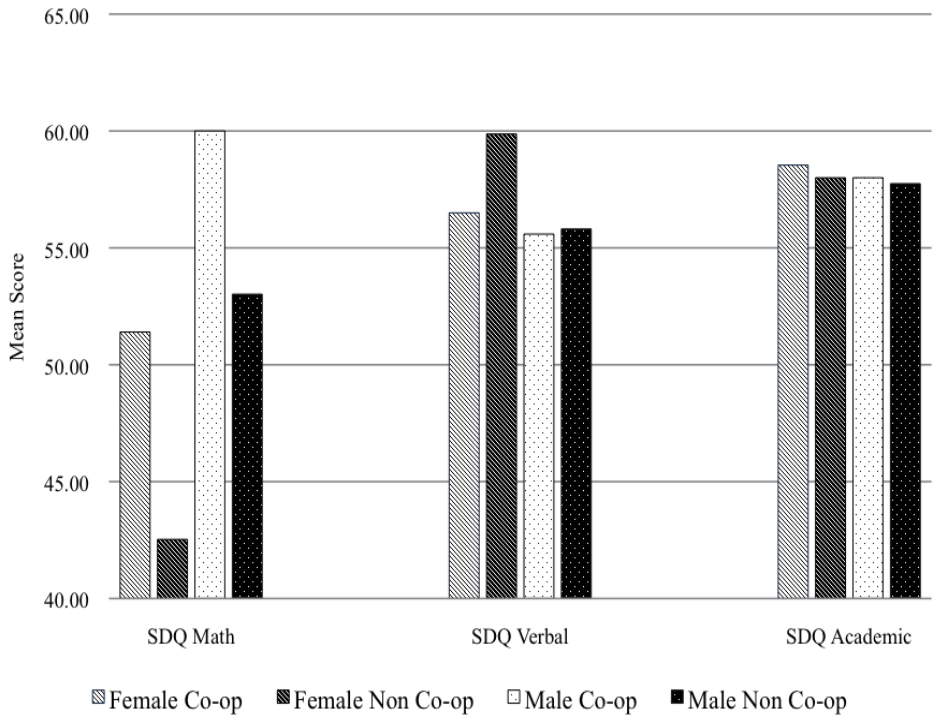


FIGURE 2. Phase 2 Math, Verbal and Academic Self-Concept scores for male and female, co-op and non co-op students. *p<0.01 **p<0.001

*Tacit Knowledge*

To examine the results of the tacit knowledge measure, a multivariate analysis of variance (MANOVA) was performed for both phases of the data with participation in cooperative education (co-op and non-co-op) as the independent variable and scores on the scales of tacit knowledge (i.e., managing self, managing others, managing tasks, local tacit knowledge, and global tacit knowledge) as the dependent measures. Analysis of the between-subjects effects from the Phase 1 data revealed that non-cooperative education students (i.e., those in a traditional program), compared to their co-op peers, demonstrated significantly higher scores in four of the five tacit knowledge areas: managing self, managing others, local tacit knowledge, and global tacit knowledge (Table 3). Analysis of the between-subjects effects from the Phase 2 data did not show a significant difference in scores between the co-op and non-co-op groups for any of the five tacit knowledge measures. Furthermore, there were no significant differences in the tacit knowledge scores as a function of age, gender, faculty (e.g., engineering, math, science, arts), year of study (from first to fourth), number of co-op terms (from one to five), satisfaction with co-op terms, and grade point average.

TABLE 3. MANOVA and ANOVA F Ratios for Gender x Co-op x Tacit Knowledge Measures –Phase 1

| | | ANOVA | | | | |
|---|---|---|---|---|---|---|
| | MANOVA F(2, 2091) | Global F(2,2090) | Local F(2,2090) | Managing Self F(2,2090) | Managing Tasks F(2,2090) | Managing Others F(2,2090) |
| Co-op Participation | 1.438 | 2.613* | 4.429* | 3.777* | 2.694 | 1.581* |

Note: F ratios are Wilk's approximation of F's. *$p$<0.01

DISCUSSION

The self-concept data revealed the most significant differences between the students in cooperative education and the students in a non-co-op traditional program. Essentially, student's perceptions of their self-concepts (math, verbal, academic) differed depending on whether they were in a co-op or non-co-op program. More specifically, academic and math self-concept were significantly higher for co-op students in both phases, while verbal self-concept was higher for the non-co-op students. Furthermore, math scores were much higher for the female co-op students as compared to females who were not in co-op. In fact, non-co-op females had only moderate views of their competence in mathematics (44 for Phase 1 and 43 for Phase 2 out of a possible 80). Males in co-op had the highest perceived competence in math with scores at or near 60 (indicating a strong self-concept) and females in co-op were not far behind – especially in Phase 1. This relationship between participation in co-op and enhanced math self-concept in females suggests that co-op may help to compensate for the gender gap in math confidence, which is consistently found to be reinforced in college and university (Sax, 1994). Perhaps the exposure to math in real world settings (i.e., many jobs include some math/data analysis) help co-op students (particularly females) gain confidence in their abilities. Interestingly, this finding was not a function of discipline. In other words, the high math self-concept for co-op students did not differ between students in engineering or math (typically more male-dominated) and those in arts (more likely to be female-dominated).

The same can be said about the higher academic self-concept reported by the co-op students (especially in Phase 1). However, this difference is not as pronounced as the differences in math self-concepts. These findings are important in light of research that has shown increases in self-concept can lead to increases in subsequent academic achievement and other desirable educational outcomes (Marsh, Hau, & Kwong, 2002; Marsh & Yeung, 1997a, 1997b). Further research is needed to determine whether participation in cooperative education is directly related to increased academic self-concept and if so, how it mediates the effects of other desirable educational outcomes. While these results are quite interesting, one must be cautious when interpreting them. It is possible that students with high math and academic self-concept may, in fact, be drawn to the co-op program and therefore it is not the program itself that is affecting the scores but an attribute in place before admission. The same could be argued for verbal self-concept – where females with high scores are drawn to a traditional

academic only program. It is not possible to determine the causal direction of these results as this was not examined; however, future experimental research is recommended to examine possible causality.

Despite the extensive work experience co-op students receive and the processes in place to enhance their professional skills, most scores of tacit knowledge were significantly lower for co-op students in the Phase 1 sample, and equivalent to non-co-op in the Phase 2 sample. There are several proposed explanations for this puzzling finding. The first is the cooperative education model itself. In Canada, it is based on short (four-month) work terms, interspersed with equal length academic terms. This may not afford students enough time with employers to develop the comfort and expertise associated with gains in tacit knowledge (Eraut, 2000). Many co-op students spend each work term with a different employer and are obliged to integrate into a new work environment and culture several times during their degree. This constant readjustment may be confusing and result in co-op students questioning their judgement more than their non-co-op peers, especially when making decisions related to interpersonal situations. It would be interesting to examine tacit knowledge amongst students who remain with the same employer for all their work terms.

A second explanation could be the relationship between the development of expertise and increases in tacit knowledge. Several studies have shown that gains in tacit knowledge are related to high levels of expertise in a particular job (Schmidt et al., 1986). The co-op system may not be the best model for becoming an expert in tacit knowledge or there may be other gains in tacit knowledge that are not being identified by this particular measure. More research is needed to understand how students learn from their work term experiences and what factors predict how well an individual will learn on the job (McCauley, Ruderman, Ohlott, & Morrow, 1994; Tesluk & Jacobs, 1998). It is also possible that co-op students require more effective tools and exercises to process and retain the implicit knowledge they pick up during their work terms. Research by Freudenberg et al. (2011) found that increases in generic skill development (including interpersonal skills, self-management skills, learning and adaptability skills, problem-solving skills, concept and analysis skills, oral communication, team skills etc.) were significantly higher for co-op students who were enrolled in a Professional Development course throughout their university career.

Lastly, an explanation may lie in the tacit knowledge measure itself. By its very nature, tacit knowledge is ambiguous and difficult to quantify (Insch, McIntyre, & Dawley, 2008). Hence, it is hard to know whether the scale used is a comprehensive measure and suitable for measuring tacit knowledge acquisition in co-op students. In previous research, this measure has gleaned the most consistent results for participants in very well defined and rigid professions (i.e. military personnel), or highly experienced positions (i.e. senior managers) (Eraut, 2000; Matthews & Sternberg, 2009). As the non-co-op students performed equally well on the tacit knowledge measure as the co-op students (and in some instances significantly better) it is possible that the scores actually reflect an ability to apply general problem-solving techniques that are normally acquired through an undergraduate education, rather than tacit knowledge gained through work experience. Other weaknesses in Wagner's measure have been noted, such as the lack of contextual information provided (such as managerial level, type of industry, or organizational culture), and the adequacy of using such an objective instrument to measure the arguably elusive construct of tacit knowledge (Kerr, 1995).

The findings of this study certainly contribute to an understanding of the students in cooperative education. However, they must be interpreted in light of the limitations. To begin, the exploratory design of the study itself is a limitation. To truly recognize the outcomes of cooperative education, an experimental design is recommended, one where cooperative education is treated as a manipulated variable. The data were collected at a single post-secondary institution which is well known for its engineering program and where the majority of students participate in cooperative education. Institutional differences are likely to exist in the emphasis and importance of math ability and professional development. Future research should compare institutions that offer cooperative education with those that do not. Research should also be conducted between institutions with different academic concentrations (i.e. a polytechnic university vs. liberal arts university). Other variables, such as the availability of meaningful co-op employment, variety in the professional development programs offered, and the quality of employer feedback and evaluation, may also be related to self-concept and tacit knowledge in co-op students.

An additional limitation of this study was the non-random sampling method of recruiting participants. The invitation to participate was sent via email to all undergraduate students but only the first 2200 students to respond (in each phase) were able to access and complete the survey before it was closed. It is possible that those who responded more quickly to the survey may have differed from those who did not see the email in time or who may have delayed responding to the survey. In light of the constraints of this sample and the exploratory nature of the research, no conclusions about the possible causal relationship between cooperative education and the outcomes observed can be drawn. Future research should include a random sample of participants to control for sampling bias and to ensure that a representative sample of both co-op and non-co-op students is obtained. This research should also include experimental studies in order to understand the causal path of psychological outcomes associated with cooperative education.

In light of the above-mentioned limitations, this study does highlight the positive relationship between participation in cooperative education and several aspects of positive self-concept, but it has also shown that non-co-op students perform to some degree better on a measure of tacit knowledge than co-op students. These mixed findings suggest an uncertain picture of how successfully the promised benefits of cooperative education are actually being realized. More research is needed to clarify this relationship and to understand how students can adapt most effectively in the workplace and gain the confidence they need to be successful as they enter the labour market.

## ACKNOWLEDGMENTS

This study was supported by the Waterloo Centre for the Advancement of Cooperative Education (WatCACE) at the University of Waterloo. We thank Dr. Patricia Rowe and Dr. Gary Waller for their contributions on the tacit knowledge measure. We also thank the following student research assistants who worked on this project during their co-op work terms: Caitlin Chiupka, Christina Pawliszyn, and Hayden Tay.

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Asia-Pacific Journal of Cooperative Education
ISSN 1175-2882

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