The Effect of Cooperative Education on Change in Self-Efficacy among Undergraduate Students: Introducing Work Self-Efficacy

JOSEPH A. RAELIN
Northeastern University

JONATHAN D. RAELIN
University of Bath

MARGARET B. BAILEY
Rochester Institute of Technology

RACHELLE REISBERG
Northeastern University

JERRY HAMANN
University of Wyoming

DAVID WHITMAN
University of Wyoming

LESLIE K. PENDLETON
Virginia Polytechnic Institute and State University

Abstract

This study examines the effect of cooperative education, controlling for contextual support and demographic characteristics, on three dimensions of self-efficacy change: work, career, and academic. Of the three forms of self-efficacy, work self-efficacy was found to be the one efficacy form impacted by cooperative education. Since self-efficacy is shaped by performance accomplishments, student success in their co-op jobs appears to enhance their confidence in performing a variety of behaviors that are particular to handling the requirements of the workplace. Change in work self-efficacy was also affected by change in students' confidence in their career orientation. This study claims to open up the so-called *black box of co-op* to articulate the practices and behaviors of cooperative education that shape its contribution to the undergraduate experience.

Keywords: Work self-efficacy, cooperative education, internships, contextual support, career self-efficacy, academic self-efficacy, placement quality.

Introduction

The overarching model for the study outlined in this article proposes that retention is shaped by self-efficacy, which, in turn, is based on the impact of students' demographic characteristics, the effect of work experience, in particular cooperative education, and the contextual support provided by one's university as well as by others, such as parents and friends. This

research is supported by a National Science Foundation Research on Gender in Science and Engineering program grant, designed to determine the effect of self-efficacy and other factors on the retention, especially of women, in undergraduate engineering programs. In this paper, we report on the effect of students' first co-op experience, pursued in the second year of college education, on three forms of self-efficacy change, controlling for contextual support and demographic characteristics. The three efficacy forms consist of work, career, and academic self-efficacy, signifying the confidence that students have in their own success within the workplace, within their career, and within the classroom, respectively. Contextual support was measured as the support provided to students in their first two years of college through a number of mechanisms, in particular, financial aid, mentors, advisors, family, friends, teachers, profession, campus life, and living-learning communities.

These data represent the pre-survey of the study, completed in the 2009-2010 academic year, and a post-survey follow-up in the 2010-2011 academic year. Students initially completed a 96-item survey referred to as Survey 1. They then completed a second 102-item survey (Survey 2) approximately one year later. Surveys were completed both in written format and online. Additional data will be gathered in year 3 of the study, corresponding to the students' fourth year in an undergraduate engineering program.

The data pool is from colleges of engineering from four universities — Northeastern University, Rochester Institute of Technology, Virginia Polytechnic Institute and State University, and the University of Wyoming. The first two institutions provide formal cooperative education while the third and fourth do not require it. The total number of respondents at the point of Survey 1 was 1637 students. The combined response rate was 67%. The response rate for Survey 2 (calculated as the number of respondents from Survey 1 who successfully completed the 2nd survey) was 54% and represents 886 students.

The field of cooperative education and internships has relied on the use of the concept of self-efficacy as a promising avenue to link practice-oriented learning processes to learning outcomes.

This paper first presents the background, conceptual framework, and methodology of the study. Next, we describe the results to date regarding the effect of cooperative education, in conjunction with descriptive measures of respondent demographics and contextual support, on self-efficacy change. We then conclude by reviewing the significant findings of the study along with recommendations for the enhancement of particular features of cooperative education.

Background

The field of cooperative education and internships has relied on the use of the concept of self-efficacy as a promising avenue to link practice-oriented learning processes to learning outcomes (Eames, 2004). Self-efficacy is defined as an individual's perceived level of competence or the degree to which she or he feels capable of completing a task. Self-efficacy is a dynamic trait that changes over time and can be influenced by experience. Self-efficacy expectations are considered the primary cognitive determinant of whether or not an indi-

vidual will attempt a given behavior. Bandura (1986) identified four sources of information that shape self-efficacy: (1) performance accomplishments, (2) vicarious experience, (3) verbal persuasion, and (4) physiological and affective states.

Lent and associates (2002) expanded on general self-efficacy theory to develop a Social Cognitive Career Theory (SCCT), a "conceptual framework aimed at understanding the processes through which people develop educational/vocational interests, make career-relevant choices, and achieve performances of varying quality in their educational and occupational pursuits" (p. 62). In addition to highlighting cognitive-person variables, such as self-efficacy, SCCT emphasizes the role of other personal, contextual, and learning variables (e.g., gender, race or ethnicity, ability, social support, external barriers) that can help shape career trajectories, including the means to remediate any disadvantages from being under-represented in particular occupations (Blustein, McWhirter, & Perry, 2005).

SCCT theory has also made an impact on models, attempting to explain the withdrawal of students from undergraduate education, by focusing on cognitive-person variables, especially self-efficacy, that can enable personal agency in students' career endeavors. What is especially important about these variables is that they can be assessed and their conditions altered in order to enhance students' perceived consequences of succeeding in college (Kahn & Nauta, 2001). In particular, consistent with SCCT theory, recent studies have found that enhanced self-efficacy and social support during the collegiate experience can lead to improved adjustment and academic performance, which, in turn, shape overall satisfaction and commitment to remain in school (Chemers, Hu, & Garcia, 2001; Friedlander, Reid, Shupak, & Cribbie, 2007; Meyers, Silliman, Gedde, & Ohland, 2010).

While this study's path model (Figure 1) bears some resemblance to Lent et al.'s (2003) theoretical SCCT model, Lent and colleagues used outcome expectations and interests as additional cognitive-person variables (Lent, Brown, & Hackett, 1994). This study concentrates on support and self-efficacy constructs, especially since the latter are believed to be the most central and pervasive mechanism of personal agency (Bandura, 1989). Subsequent analyses will focus on the effects of these variables on retention.

Other than Lent's work on contextual factors, there has been some modest research on counseling interventions that may lead to increased self-efficacy. In theoretical papers, Betz (1992) and Brown and Lent (1996) discussed ways that counselors could increase the self-efficacy beliefs of their clients, such as by structuring successful performance experiences, finding successful role models, providing techniques for anxiety management, offering encouragement and support, encouraging data gathering that might counteract detrimental self-efficacy beliefs, and helping process efficacy-relevant data. At the secondary school level, a three-day problem-based camp experience was found to increase students' self-efficacy for specific tasks as well as general self-efficacy (Speight & Rosenthal, 1995). At the college level, Hutchison, Follman, Sumpter, and Bodner (2006) more recently reported a relationship between academic and advisory support and female students' academic self-efficacy. Focusing in particular on cooperative education, a pilot study was performed

by the University of Wyoming's and Northeastern University's Colleges of Engineering to discriminate the effect of co-op versus other competing measures on self-efficacy (Raelin, Reisberg, Whitman, & Hamann, 2007). Cooperative education was found to significantly predict change in work self-efficacy, prior academic achievement was found to predict subsequent academic self-efficacy, and academic support was found to significantly enhance all three forms of self-efficacy. Women undergraduates were found to be more confident than their male counterparts in obtaining occupational information and learning from their work experiences.

In a theoretical study Fletcher (1990) provided a first glimpse attempting to explain how cooperative education experience might enhance self-efficacy and help students make the transition from student to practitioner. Specifically, Fletcher suggested that cooperative education increases self-efficacy through performance accomplishments, one source of efficacy information. In this instance, performance accomplishments would be co-op experiences in which students need to use skills, abilities, and coping strategies to perform tasks. Successful experiences can result in a feedback loop where performance accomplishments would lead to increased self-efficacy, which in turn, enhances students' performance, further strengthening their self-efficacy beliefs. The possibility that cooperative education can be a source of efficacy information through performance accomplishments is provocative, given that performance accomplishments are generally viewed as the most potent source of self-efficacy information. That is, of the four sources of efficacy information, performance accomplishments are thought to exert the most influence (Bandura, 1986; Lent et al., 1994). Nevertheless, formal workplace experiences also expose students to successful peer models, mentor figures, and verbal encouragement that can provide self-efficacy information through Bandura's (1986) vicarious experiences and verbal persuasion sources.

Although the co-op field itself has not fully identified what happens during the co-op experience to produce beneficial outcomes — leading some researchers to refer to this as the *black box* of co-op (Ricks, Cutt, Branton, Loken, & Van Gyn, 1993) — there have been a number of outcome studies demonstrating its salutary effects on students' subsequent employment and career. For example, Weinstein (1980) found that co-op students evinced greater certainty about career choice compared to students who did not participate in a co-op experience, and engineering co-op students in particular were found to have a higher level of professional orientation (Blackwell, Bowes, Harvey, Hesketh, & Knight, 2001). Co-op students were also more likely to have first jobs related to their major and overall career plans (Brown, 1984) and were more likely to hold positions with higher levels of responsibility (Brown, 1976; Gore, 1972). They were also shown to more successfully adjust at the outset of their employment (Brown, 1985), were more self-reliant in learning about their organization and work groups, and rated their knowledge of task and role more highly than non-co-ops (Gardner & Koslowski, 1998). Finally, as related to the social cognitive stream of research, co-op experience has been found to increase self-confidence, self-concept, and career identity (Ducat, 1978; Weston, 1986).

It goes without saying that cooperative education and other related formal work experience programs during the undergraduate experience offer students opportunities to try out, learn from, and reflect on ongoing work experience (Raelin, 2008). As a result, these programs help students transition into full-time work more easily, helping them overcome the *reality shock* attributed to first job experiences for uninitiated novices (Elfering, Semmer, Tschan, Kalin, & Bucher, 2007; Wanous, Poland, Premack, & Davis, 1992). In addition, through its enhancement of self-efficacy, cooperative education can also prove beneficial to students in sustaining their ongoing academic performance and their persistence to graduation (Davie & Russell, 1974; Gardner, Nixon, & Motschenbacker, 1992; Lindenmeyer, 1967; Smith, 1965; Somers, 1986). Blair, Millea, and Hammer (2004), in a study of undergraduate engineering majors, concurred that those who completed three semesters of co-op had superior academic performance and they also earned higher starting salaries (though it took them longer to complete their undergraduate program). Of the various dimensions of self-efficacy that are likely to be affected by co-op, it could be work self-efficacy that would be the construct of choice. Work self-efficacy measures a range of behaviors and practices — e.g., exhibiting teamwork, expressing sensitivity, managing politics, handling pressure — attending to students' beliefs in their command of the social requirements necessary for success in the workplace. Since efficacy is a malleable property, there are methods by which student employees may achieve relative success in their jobs as well as learning within the workplace by increasing their confidence in performing many of these work-related behaviors (Raelin, 2007). Further, though they may have limited confidence in performing especially highly technical work at the outset of their placements, be they co-ops or internships, their success in such tasks as solving difficult problems, working on a team, or learning completely new skills can expand their work self-efficacy over time (Coll, Zegwaard, & Lay, 2001).

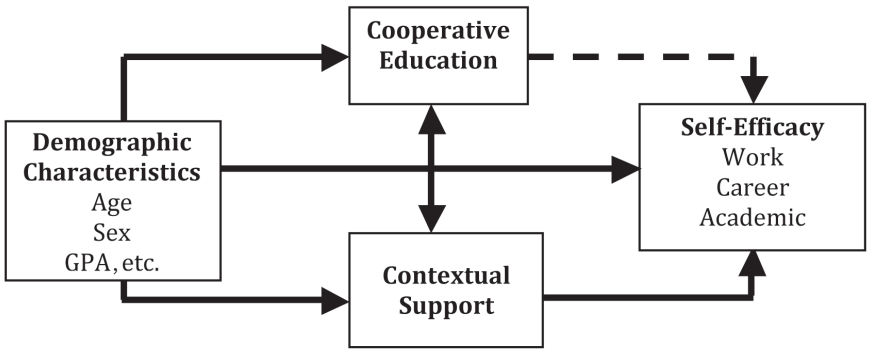
Framework

The conceptual framework for this study is depicted in Figure 1 as a set of paths between four variable clusters. The determination of self-efficacy is based on the impact of students' demographic characteristics, the effect of work experience — in particular cooperative education — and contextual support. In this study, we are especially interested (denoted by the dashed arrow) in the effect of cooperative education on self-efficacy, controlling for demographic characteristics and contextual support. Although the relationship between self-efficacy and its predictors can be bidirectional if prior self-efficacy is taken into account, we are concerned in this study with relationships that are unidirectional.

Thus, the principal research question to be posed in this study is whether cooperative education, by itself, even when controlling for contextual support and demographic characteristics, has an effect on one or more of three forms of self-efficacy: work, academic, and career, and if it does, whether the quality of the co-op placement accounts for self-efficacy enhancement.

Figure 1.

Conceptual Framework of the Study



Data

The data pool represents all sophomores in the colleges of engineering from the four participating universities. Respondents filled out two 20-minute surveys, spaced out over approximately 1 year. While Survey 1 was completed entirely in written form, some 54% of Survey 2 respondents completed their survey online. All surveys were conducted anonymously, although IDs were used to track students for follow-up purposes and to verify some of the descriptive data against the student record. Since IDs were not associated with names on the data file, the data analysis was conducted in total anonymity. Incentives were used to generate higher response rates and entailed both direct gifts for completion (e.g., coupons to on-campus bookstores or coffee shops) and raffles (e.g., VISA gift cards, iPods). As Table 1 reveals, the total number of respondents was 1637 students for Survey 1 and 886 for Survey 2. The response rate at Survey 2 was 54%.

Besides the expected dominance of males in the sample, 79% at Survey 1 and 76% at Survey 2, the initial sample was predominantly Caucasian (79.5%) and middle and upper-middle class (83%) in socioeconomic status. The average SAT score was 1269 (math plus verbal scores), based on the original SAT version with a 1600 maximum score. The average GPA was 3.21 as reported at the end of the freshman year, and 3.07 at the end of the sophomore year for the full sample and 3.12 for those who completed Survey 2. For both surveys, the most popular major was mechanical engineering (at nearly a third of the sample) followed by civil, chemical, and electrical engineering, in that order.

By the time of Survey 2, 39 students had left their university and 110 students had transferred out of engineering. Of those who had left engineering, the most popular new major was science, followed by math and social sciences. The engineering students in the sample are seen as hard-working since some 94% declared that they were working in some capacity. Further, 543 students (65%) participated in a co-op program during their sophomore year, and an additional 118 (13%) undertook an internship, be it in their major or not connected

to their major. Finally, 42% of the sample at Survey 2 reported one year or less of total work experience in their lives, 33% worked between one and three years, and 24% had worked over three years.

Table 1.

Overall Sample Statistics

School	# Students Completing Survey 1	# Students in Data Pool	Response Rate %	# Students Completing Survey 2	Response Rate %
Northeastern University*	363	422	86	325	90
Rochester Institute of Technology*	315	399	79	174	55
University of Wyoming	128	287	45	94	73
Virginia Polytechnic Institute	831	1353	61	293	35
Totals	**1637**	**2461**	**67**	**886**	**54**

**** Signify the two universities with predominantly co-op engineering colleges.***

Methodology

Measurement. The measures of the principal study variables are as follows. The new work self-efficacy inventory (WS-Ei), developed by Raelin (2010) at Northeastern University, measures a range of behaviors and practices that relate to the non-technical and social skills necessary to achieve success in the workplace. The inventory features seven subscales: problem-solving, sensitivity, communication, teamwork, learning, pressure, and politics. Career self-efficacy was obtained directly from the short-form of the Career Decision-Making Self-Efficacy Scale of Betz, Klein, and Taylor (1996), and academic self-efficacy was derived from the Self-Efficacy for Academic Milestones and the Self-Efficacy for Technical/Scientific Fields surveys (Lent, Brown, & Larkin, 1986). Among the contextual support variables, the majority (friends, family, professional, financial) were derived from familiar support scales in use such as the support subscales of Lent et al. (2001). Two variables were drawn from the college students' mattering literature (Rayle & Chung, 2007; Schlossberg, 1989), purporting that the mattering of one's friends and college were key components of social support. From the retention literature, three other important variables were included: the quality of instruction, the involvement of the student in campus life, and the opportunity to be involved in a living-learning community (Habley & McClanahan, 2004; Nicpon et al., 2006; Tinto, 1999; Ziskin, Hossler, & Kim, 2009). Finally, the support of both an advisor and a mentor (Thom, 2001) was measured deploying the advisorship and mentorship scales from the rapport and apprenticeship subscales of the Advisory Working Alliance Inventory (AWAI) prepared by Schlosser and Gelso (2001). Demographic data were self-reported by the respondents directly on the survey instrument or obtained from their student records.

The first round of analyses established the validity and reliability of these measures. Factor analyses were conducted on the components of each of these established scales using

principal component analysis as the extraction method with eigenvalues set at the Kaiser greater-than-1 rule. The initial solutions for each of the analyses found all the components to load as specified on the first factor. Although not an established scale, a composite social support measure was constructed, based on an exploratory factor analysis, although financial support was found to be a separate construct.

Each of the three self-efficacy scales — work, career, and academic — produced high reliabilities, measured by Cronbach's alpha coefficient of internal consistency:

WS-E: .94
CS-E: .93
AS-E: .91

These scores are above the recommended .70. The advisor, mentor, and social support scales also performed well: advisorship at .95, mentorship at .97, and social support at .74.

One additional scale was created from the Survey 2 data composed of 10 measures used to evaluate the quality of students' co-op experiences. Research by Blackwell et al. (2001) has highlighted the differential learning and employment effects that can ensue from variety in the provision of undergraduate work experience. For example, some co-ops are better at expressly providing students with an opportunity to learn or in enabling them to reflect on what they are learning. The measures used in this study were based on the work of Fogg and Putnam (2004) and Highsmith, Denes, and Pierre (1998) and include such indicators as whether the placement was intellectually challenging and applied the knowledge used in one's field, or whether the student worked as part of a team of professionals. All ten variables loaded on the same factor and achieved a Cronbach's alpha of .87.

The three major self-efficacy scales were found to have a high degree of concurrent validity, measured initially by correlations that are high and significant but not so high as to be equivalent. It was therefore determined that each efficacy measure represents a different facet of self-efficacy.

WS-E and CS-E = .67
AS-E and CS-E = .44
WS-E and AS-E = .32

Convergent validity was also established by significant correlations among discriminating variables. For example, academic advisorship and mentorship, provided as part of programs to support women and underrepresented students, were both significantly correlated with the three efficacy measures. Meanwhile, second and third-year GPA was found to be highly and significantly correlated with academic self-efficacy at both respective time periods. Academic self-efficacy in the second year was also significantly correlated with teaching quality and prior SAT scores.

Statistical analysis. To determine whether cooperative education has an effect on self-efficacy, we performed t-tests of means for two groups: those students who completed a co-op versus those who did not. We performed this analysis to determine for these two groups whether significant change in self-efficacy occurred over the period between the end of the second year and end of the third year. Significance was established based on the more demanding two-tailed test (rather than a one-tailed test) because we are interested in changes from the mean in both directions. We also noted whether any other changes were affected by students' co-op experience.

Thereafter, to determine whether cooperative education had a direct effect on self-efficacy change, independent of the contextual support variables as well as the demographics, a multiple regression was performed for each of the three self-efficacy change measures. The purpose is to determine how much of the variance in each of these dependent variables can be explained at the intermediate phase of the project by the study variables.

Results

Relationship Between Cooperative Education and Self-Efficacy Change. Before computing the relationship between cooperative education and self-efficacy, it is first important to determine if there has been significant change in the three main efficacy scores. Although the difference in self-efficacy between the second and third year was not huge, the scores were significant in each case (see Table 2).

Table 2.

Differences Between Pre and Post-Surveys on Self Efficacy

Self-Efficacy	N	Survey 1 Mean	Survey 2 Mean
Work	886	3.88**	3.93**
Career	882	3.75**	3.81**
Academic	878	3.98**	3.90**

*** Significant at p<.01 using two-tailed paired sample t-test*

It is interesting to note that both work and career self-efficacy increased between the second and third years, whereas the students' confidence in their academic achievement significantly decreased. In a separate analysis, it was discovered that the change in academic self-efficacy was accompanied by a corresponding significant reduction in students' GPA. A significant decrease was also recorded for the change in the contextual support composite scale, with the most significant component being change in *college mattering*, a reflection perhaps of the famous undergraduate convention of the *sophomore slump* (Wilder, 1993).

Turning next to the relationship between co-op and self-efficacy, as can be seen in Table 3, there was a very significant change (p<.01) in co-op students' work self-efficacy upon completion of their co-op experience. Those who participated in co-op indicated a significant

increase in their work self-efficacy, whereas those who did not participate, decreased a little. There were no significant outcomes in the other two self-efficacy change scores between co-ops and non-co-ops.

As could be expected, the overall support co-op students experienced during their time on co-op decreased; in particular, support available from their collegiate advisor. Interestingly, co-op students' GPAs did not decrease as much as non-co-op students' GPAs, a finding consistent with research by Gardner et al. (1992) and Blair et al. (2004). Lastly, co-op students reported a reduction in the quality of instruction; a finding that is not unusual especially among students returning from co-op who begin to question the currency of their teachers' applied engineering experience. This finding may also reflect what Mann (2001) and Auburn (2007), among others, surmised as an alienation resulting from the lack of opportunity of returning students to demonstrate their new knowledge in class due to a teaching style that controls the agenda of learning.

Although the principal focus of this paper is on the impact of cooperative education on self-efficacy, readers of this journal are likely interested in the impact of internships, be they in one's major or not, and whether the findings differ from those attributed to cooperative education. Consequently, we added the 118 internship students in our sample to our original co-op measure and performed the same series of t-tests. Although the overall pattern of the findings did not change substantially, there was one interesting twist. Again, the most pervasive impact of cooperative education and internships was on change in students' work self-efficacy; however, the addition of internships also affected career self-efficacy change. When performing a t-test on interns separately from co-op students, the same effect was produced. Thus, it can be concluded that students on internships are more likely to experience a positive change in their career self-efficacy compared to students choosing neither co-ops nor internships. Besides change in career self-efficacy, there appears to be a likelihood that interns are also more involved in campus life and feel more supported by their university, although these results, given the relatively low number of interns in our sample, can only be considered a trend rather than a statistical finding. It could be a mere artifact of co-ops, in some cases, lasting longer than internships. Nevertheless, they point to a potentially important difference between interns and co-op students, that being the extent of their continuing connection to the university during their internship.

Table 3.

T-Tests for Cooperative Education and Change Scores

	Reported Work Experience	N	Mean	Significance (two-tailed)
Work Self-Efficacy Change	Co-Op	477	.13	.000
	Other	295	-.02	
Career Self-Efficacy Change	Co-Op	477	.09	.326
	Other	295	.05	
Academic Self-Efficacy Change	Co-Op	476	-.04	.750
	Other	294	-.05	
Advisor Support Change	Co-Op	422	-.09	.000
	Other	259	.22	
Support (Composite) Change	Co-Op	472	-.09	.001
	Other	220	.05	
Teaching Quality Change	Co-Op	468	-.05	.016
	Other	215	.14	
GPA Change	Co-Op	543	-.08	.019
	Other	293	-.12	

Relationship Between Cooperative Education and Self-Efficacy Change Controlling for Contextual Support and Demographics. It is important to determine whether any effect of cooperative education on self-efficacy persists when controlling for the contextual support variables, the demographics, and the comparable forms of self-efficacy themselves. In examining the three regression equations, each of which had significant r-squares, the co-op variable only entered one equation with a high ($p.< 01$) level of significance, that being work self-efficacy change. Table 4 displays this regression equation, and as can be plainly seen, participation in cooperative education is the only significant predictor other than a control for career self-efficacy change, which is also highly significant. The conclusion from the regression analysis is that cooperative education has a distinctive impact on the work self-efficacy of its participants. Work self-efficacy change was also impacted by both co-op and non-co-op students' change in confidence in their career orientation. Since it was also found that change in career self-efficacy was influenced by change in work self-efficacy, it appears that each form of self-efficacy has an impact on the other.

Relationship between co-op quality and subsequent self-efficacy. As noted in the description of the data, a set of questions were included to measure the quality of students' co-op experiences, such as their intellectual challenge or their application of subject-matter knowledge. The composite scale composed of the ten co-op quality indicators did not enter the efficacy change regression equations, but separate regressions were run for the post measure of work self-efficacy (as well as the other efficacy measures).

In the regression for work self-efficacy after students' first co-op, three co-op quality dimensions were found to be significant predictors. The most potent predictor was whether the co-op placement made a difference to the unit or organization employing the student. The second was whether the placement allowed the student to be part of a team, and the third was whether the placement applied knowledge in the student's major. It also turns out that this latter co-op quality measure appeared significantly in the two other regression equations. In other words, placements that afford students opportunities to apply knowledge enhance the students' career and academic self-efficacy as well as work self-efficacy. Career self-efficacy was also found to be bolstered by placements that provided students with opportunities for feedback on their performance.

Ancillary findings. There are two clusters of findings not related to self-efficacy that are of interest to report to co-op faculty and administrators, even though the select sub-samples are too low to infer statistical significance. The first is a report of our data on mentorships, limited to those students who sought out a mentor affiliated with a women-in-engineering or multicultural engineering program. For these students, a solid association was found between the perceived support received from one's mentor and six of the ten co-op quality dimensions. Mentors appear to make a difference in assisting students in getting the most out of their co-op experiences.

Secondly, continuing our attention on internships and their distinctiveness, the study differentiated those internships that were connected to the students' majors and those that were not. The same quality of placement questions were also administered to both sets of interns. Although only 16 of the 118 internships were reported as not connected to the major, it was discovered that the mean score for all 10 of the quality measures for these internships were lower than for those internships connected to the major. As would be expected, the difference between these two types of internships varied most dramatically on the measure of the placement's applicability to knowledge in one's major (by over 1 point on a scale from 1-5), but two measures also exceeded a difference of .5, specifically, having a placement with an attentive supervisor and one that involved the intern as part of a team.

Table 4.

Regression for Work Self-Efficacy Change

MODEL SUMMARY

R	R^2	Adjusted R^2	Standard Error of the Estimate
0.555[a]	0.307	0.287	0.431

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	41.963	15	2.798	15.038	0.000
Residual	94.501	508	0.186		
Total	136.464	523			

ENTERED VARIABLES [b]

	Unstandardized Coefficients		Standardized Coefficients		
	B	Standard Error	Beta	t	Sig.
(Constant)	-.246	.701		-.352	.725
Career Self-Efficacy change	.498	.039	.540	12.928	.000
Co-op participation	.123	.044	.112	2.789	.005
Contextual support change	-.047	.041	-.049	-1.133	.258
Advisory support change	-.021	.022	-.038	-.922	.357
Amount of prior work	.009	.013	.028	.703	.483
SAT scores	.089	.000	.020	.518	.605
Financial support change	-.008	.017	-.018	-.479	.632
Academic Self-Efficacy change	.011	.032	.014	.329	.742
Living in learning dorm	.010	.039	.010	.258	.797
Change in GPA	.011	.088	.005	.121	.904

a *Dependent variable is Work Self-Efficacy change.*

b *The demographic variables of age, socioeconomic status, and gender were also entered as controls in this equation, along with the extent of any current work experiences, but were found to be not at all significant.*

Conclusion and Implications

This study has developed one of the key components of a path model that ties cooperative education to students' self-efficacy, controlling for contextual support and students' demographic characteristics. At the third phase of the study, there will be a determination of whether co-op's impact (especially having a second co-op) can contribute to a reversal of the trend, especially among women, to drop out of their engineering concentration. Thus, while demonstrating the impact of co-op on self-efficacy, this article has not shown whether and how self-efficacy may lead to retention in undergraduate education. Further, this analysis has not taken into consideration the impact of time and latency sufficiently to estimate the structural relations between the study variables. Lastly, the co-op effect may be confounded by other latent conditions among the respondents since the comparison group constitutes

universities that do not provide formal cooperative education. A study that can obtain sufficient co-op and non-co-op data from the *same* institution would be recommended to override some of these latent confounding effects.

This study has introduced a form of self-efficacy that has received little attention in the literature, that being work self-efficacy. Work self-efficacy measures a range of behaviors and practices — e.g., exhibiting teamwork, expressing sensitivity, managing politics, handling pressure — attending to students' beliefs in their command of the social requirements necessary for success in the workplace. Since efficacy is shaped by performance accomplishments, it was theorized in this study that student success in their co-op jobs would enhance their confidence in performing a variety of behaviors that are particular to handling the requirements of the workplace.

The results have supported the link between cooperative education (both separate from and including internships) and change in work self-efficacy from the second to the third year. Change in work self-efficacy was also affected by change in student's confidence in their career orientation. However, cooperative education, unlike the recommendation of Weaver-Paquette (1997) and the research of DeLorenzo (2000), did not produce a unique effect on career self-efficacy. A likely explanation for this difference is that work self-efficacy — a new property heretofore unavailable in prior studies — is likely to have accounted for the variance in change in career self-efficacy.

An ongoing effort needs to be made by those responsible for placements that the quality of the experience be an affirmative training ground that not only teaches productive work skills but also productive work habits that may transfer into full employment when the time comes.

In examining the quality of the co-op experience that affects work self-efficacy, it was found that when the placement afforded students a chance to make a difference, to be part of a team, and to apply knowledge from their major, subsequent work self-efficacy was significantly enhanced. This finding is consistent with the practical view (see, e.g., Ryan, Toohey, & Hughes, 1996) that not all work experience programs are of equal value. An ongoing effort needs to be made by those responsible for placements that the quality of the experience be an affirmative training ground that not only teaches productive work skills but also productive work habits that may transfer into full employment when the time comes.

Co-op students were also found to rely less on support provided by their colleges, friends, and parents or as provided by their academic advisors. Although this finding may be initially discomforting, it may also reflect a maturity required of co-op students or interns now having to fend for themselves more independently in the working world. It may also lend insight into findings (see, e.g., Gardner & Koslowski, 1998) that have shown a reduced *reality shock* among co-op students once they have to fully enter the workforce.

Co-op students were also found to value the instruction of their professors less once returning to class after their first co-op experience, a reflection of a possible mismatch between the

expectations of the returning student and the classroom instructor (see, e.g., Auburn, 2007). Some instructors may simply not wish to or may not know how to take sufficient advantage of their students' newfound knowledge and maturity to enhance the classroom experience. In fact, it is conceivable that students fresh from the field may be able to provide an updating of some engineering applications. This would require, however, an explicit attempt by the respective instructor to involve returning students in voicing their new knowledge and contributing to the lessons that have obvious workplace implications. Besides the foregoing rationale for the reduction in co-op students' teaching quality assessment, an alternative explanation is that some co-op-based engineering programs have given special emphasis to dynamic instruction during the freshman year (versus the subsequent years) as a means to enhance first-year retention.

[W]ith the addition of the measure known as work self-efficacy, this study has claimed to open up the black box to show that co-op's eminent contribution to undergraduate studies is based on its enhancement of a special form of self-efficacy that addresses the confidence acquired during co-op in handling the demands and requirements of the workplace.

Finally, throughout much of the history of cooperative education in undergraduate study, there has been affirmation of the value and contribution of cooperative education to students' personal, career, and academic development. However, the actual contributory processes of co-op have been benignly assigned to what has been referred to as the *black box of co-op* because it was thought to be too complex a proposition to determine the complexity of co-op's operational impact. Now, with the addition of the measure known as *work self-efficacy,* this study has claimed to open up the black box to show that co-op's eminent contribution to undergraduate studies is based on its enhancement of a special form of self-efficacy that addresses the confidence acquired during co-op in handling the demands and requirements of the workplace.

With the identification of the components of work self-efficacy, co-op administrative staff and supervisors/preceptors in the field can now focus on the specific meta-competencies associated with this form of efficacy; namely, work learning, problem solving, stress management, role identification, teamwork, sensitivity, and handling politics. In particular, since these competencies are eminently learnable, they can be explained and modeled for students through mentorship and on-the-job demonstration, practice, and feedback. They can be incorporated into their co-op evaluations and raised publicly in any post-co-op reflection meetings held with their co-op advisor. Students should also be given assignments that may enhance these vital work-based skills, and a work culture should be fostered that encourages open dialogue and reflection concerning students' development of their work self-efficacy.

JOSEPH A. RAELIN
Northeastern University, Boston, MA 02115, USA

MARGARET B. BAILEY
Rochester Institute of Technology, Rochester, NY 14623, USA

JERRY HAMANN
University of Wyoming, Laramie, WY 82071, USA

LESLIE K. PENDLETON
Virginia Polytechnic Institute and State University, Blacksburg, VA 24060, USA

JONATHAN D. RAELIN
University of Bath, Bath BA2 7AY, UK

RACHELLE REISBERG
Northeastern University, Boston, MA 02115, USA

DAVID WHITMAN
University of Wyoming, Laramie, WY 82071, USA

Correspondence to Joseph A. Raelin, email: **j.raelin@neu.edu**

Acknowledgement

This material is based upon work supported by the National Science Foundation under Grant No. 0827490. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

References

Auburn, T. (2007). Identity and placement learning: Student accounts of the transition back to university following a placement year. *Studies in Higher Education, 32*(1), 117-133. doi:10.1080/03075070601099515

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1989). Human agency in social cognitive theory. *American Psychologist, 44*(9), 1175-1184. doi:10.1037//0003-066X.44.9.1175

Betz, N. (1992). Counseling uses of career self-efficacy theory. *Career Development Quarterly, 41*(1), 22-25.

Betz, N. E., Klein, K., & Taylor, K. M. (1996). Evaluation of a short form of the career decision-making self-efficacy scale. *Journal of Career Assessment, 4*(1), 47-57. doi:10.1177/106907279600400103

Blackwell, A., Bowes, L., Harvey, L., Hesketh, A. J., & Knight, P. T. (2001). Transforming work experience in higher education. *British Education Research Journal, 27*(3), 269-285. doi:10.1080/01411920120048304

Blair, B. F., Millea, M., & Hammer, J. (2004). The impact of cooperative education on academic performance and compensation of engineering majors. *Journal of Engineering Education, 93*(4), 333-338.

Blustein, D. L., McWhirter, E. H., & Perry, J. C. (2005). An emancipatory communitarian approach to vocational development theory, research, and practice. *The Counseling Psychologist, 33*(2), 141-179. doi:10.1177/0011000004272268

Brown, S. (1976). *Cooperative education and career education: A comparative study of alumni.* Boston: Northeastern University, Cooperative Education Research Center.

Brown, S. (1984). *The influence of cooperative education on first job after college.* Retrieved from ERIC database (ED254663).

Brown, S. (1985). *The relationship of cooperative education to organizational socialization and sense of power in first job after college* (Unpublished doctoral dissertation). Boston College: Chestnut Hill, MA.

Brown, S. D., & Lent, R. W. (1996). A social cognitive framework for career choice counseling. *Career Development Quarterly, 44*(4), 354-366.

Chemers, M. M., Hu, L., & Garcia, B. F. (2001). Academic self-efficacy and first-year college student performance and adjustment. *Journal of Educational Psychology, 93*(1), 55-64. doi:10.1037//0022-0663.93.1.55

Coll, R. K., Zegwaard, K., & Lay, M. (2001). The influence of cooperative education on student perceptions of their ability in practical science. *Journal of Cooperative Education and Internships, 36*(3), 58-72.

Davie, R., & Russell, J. (1974). Academic performance and work experience: An Australian cooperative experience. *Journal of Cooperative Education, 10*(2), 1-12.

DeLorenzo, D. R. (2000). The relationship of cooperative education exposure to career decision-making self-efficacy and career locus of control. *Journal of Cooperative Education and Internships, 35*(1), 15-24.

Ducat, D. (1978). *Cooperative education, self-concept, and occupational concept for community college students* (Unpublished doctoral dissertation). Columbia University: New York.

Eames, C. (2004). Researching in cooperative education: How a practitioner met the challenge. In P. Linn (Ed.), *Handbook for research in cooperative education and internships* (pp. 71-94). Mahwah, NJ: Lawrence Erlbaum.

Elfering, A., Semmer, N. K., Tschan, F., Kalin, W., & Bucher, A. (2007). First years in job: A three-wave analysis of work experiences. *Journal of Vocational Behavior, 70*(1), 97-115. doi:10.1016/j.jvb.2006.07.001

Fletcher, J. (1990). Self esteem and cooperative education: A theoretical framework. *Journal of Cooperative Education, 26*(3), 41-55.

Fogg, N., & Putnam, M. (2004). Considering the needs of different stakeholders: The impact of co-op job quality on post-graduation earnings. In P. Linn (Ed.), *Cooperative education and internships* (pp. 229-249). Mahwah, NJ: Lawrence Erlbaum.

Friedlander, L. J., Reid, G. J., Shupak, N., & Cribbie, R. (2007). Social support, self-esteem, and stress as predictors of adjustment to university among first-year undergraduates. *Journal of College Student Development, 48*(3), 259-274. doi:10.1353/csd.2007.0024

Gardner, P. D., & Koslowski, S. W. J. (1998). Learning the ropes: Co-op students do it faster. *Journal of Cooperative Education, 28*(3), 30-41.

Gardner, P. D., Nixon, D. C., & Motschenbacker, G. (1992). Starting salary outcomes of cooperative education graduates. *Journal of Cooperative Education, 27*(3), 16-26.

Gore, G. (1972). New evidence of co-op system relevancy. *Journal of Cooperative Education, 8*(2), 7-14.

Habley, W. R., & McClanahan, R. (2004). *What works in student retention?* Iowa City: ACT, Information for Life's Transitions.

Highsmith, R., Denes, R., & Pierre, M. M. (1998, June). Mentoring matters. *National Action Council for Minorities in Engineering Research Letter, 8*(1), New York: National Action Council for Minorities in Engineering.

Hutchison, M., Follman, D., Sumpter, M., & Bodner, G. (2006). Factors influencing the self-efficacy beliefs of first-year engineering students. *Journal of Engineering Education, 95*(1), 39-47.

Kahn, J. H., & Nauta, M. M. (2001). Social-cognitive predictors of first-year college persistence. *Research in Higher Education, 42*(6), 633-652. doi:10.1023/A:1012225510213

Lent, R. W., Brown, S. D., Brenner, B., Chopra, S. B., Davis, T., Talleyrand, R., & Suthakaran, V. (2001). The role of contextual supports and barriers in the choice of math/science educational options: A test of social cognitive hypotheses. *Journal of Counseling Psychology, 48*(4), 474-483. doi:10.1037//0022-0167.48.4.474

Lent, R W., Brown, S. D., & Hackett, G. (1994). Toward a unifying social cognitive theory of career and academic interest, choice, and performance. *Journal of Vocational Behavior, 45*(1), 79-122. doi:10.1006/jvbe.1994.1027

Lent, R. W., Brown, S. D., & Larkin, K. C. (1986). Self-efficacy in the prediction of academic performance and perceived career options. *Journal of Counseling Psychology, 33*(3), 265-269. doi:10.1037//0022-0167.33.3.265

Lent, R. W., Brown, S. D., Schmidt, J., Brenner, B., Lyons, H., & Treistman, D. (2003). Relation of contextual supports and barriers to choice behavior in engineering majors: Test of alternative social cognitive models. *Journal of Counseling Psychology, 50*(4), 458-465. doi:10.1037/0022-0167.50.4.458

Lent, R. W., Brown, S. D., Talleyrand, R., McPartland, E. B., Davis, T., Chopra, S. B., Alexander, M. S., Suthakaran, V., & Chai, C. (2002). Career choice barriers, supports, and coping strategies: College students' experiences. *Journal of Vocational Behavior, 60*(1), 61-72. doi:10.1006/jvbe.2001.1814

Lindenmeyer, R. (1967). A comparison study of the academic progress of the cooperative and the four-year student. *Journal of Cooperative Education, 3*(2), 8-18.

Mann, S. J. (2001). Alternative perspectives on the student experience: Alienation and engagement. *Studies in Higher Education, 26*(1), 7-19. doi:10.1080/03075070123178

Meyers, K. L., Silliman, S. E., Gedde, N. L., & Ohland, M. W. (2010). A comparison of engineering students' reflections on their first-year experiences. *Journal of Engineering Education, 99*(2), 169-178.

Nicpon, M. F., Huser, L., Blanks, E. H., Sollenberger, S., Befort, C., & Robinson Kurplus, S. E. (2006). The relationship of loneliness and social support with college freshmen's academic performance and persistence. *Journal of College Student Retention: Research, Theory and Practice, 8*(3), 345-358. doi:10.2190/A465-356M-7652-783R

Raelin, J. A. (2007). Toward an epistemology of practice. *Academy of Management Learning & Education, 6*(4), 495-519. doi:10.5465/AMLE.2007.27694950

Raelin, J. A. (2008). *Work-based learning: Bridging knowledge and action in the workplace.* San Francisco: Jossey-Bass.

Raelin, J. A. (2010). *The work self-efficacy inventory.* Menlo Park, CA: Mind Garden. Retrieved from: http://www.mindgarden.com/products/wsei.htm

Raelin, J. A., Reisberg, R., Whitman, D., & Hamann, J., (2007, October). *Cooperative education as a means to enhance self-efficacy among sophomores (with particular attention to women) in undergraduate engineering.* Paper presented at the 37th ASEE/IEEE Frontiers in Education Conference, Milwaukee, WI. doi:10.1109/FIE.2007.4418055

Rayle, A. D., & Chung, K-Y. (2007). Revisiting first-year college students' mattering: Social support, academic stress, and the mattering experience. *Journal of College Student Retention: Research, Theory and Practice, 9*(1), 21-27. doi:10.2190/X126-5606-4G36-8132

Ricks, F., Cutt, J., Branton, G., Loken, M., & Van Gyn, G. (1993). Reflections on the cooperative education literature. *Journal of Cooperative Education, 29*(1), 6-23.

Ryan, G., Toohey, S., & Hughes, C. (1996). The purpose, value and structure of the practicum in higher education: A literature review. *Higher Education, 31*(3), 355-377. doi:10.1007/BF00128437

Schlossberg, N. K. (1989). Marginality and mattering: Key issues in building community. *New Directions for Student Services, 48*, 5-15. doi:10.1002/ss.37119894803

Schlosser, L. Z., & Gelso, C. J. (2001). Measuring the working alliance in advisor-advisee relationships in graduate school. *Journal of Counseling Psychology, 48*(2), 157-167. doi:10.1037//0022-0167.48.2.157

Smith, H. S. (1965). The influence of participation in the cooperative program on academic performance. *Journal of Cooperative Education, 2*(1), 13-23.

Somers, G. (1986). How cooperative education affects recruitment and retention. *Journal of Cooperative Education, 25*(1), 72-78.

Speight, J. D., & Rosenthal, K. S. (1995). Medcamp's effect on junior high school students' medical career self-efficacy. *Career Development Quarterly, 4*(3), 285-295.

Thom, M. (2001). *Balancing the equation: Where are women and girls in science, engineering and technology?* New York: National Council for Research on Women.

Tinto, V. (1999). Taking retention seriously: Rethinking the first year of college. *National Academic Advising Association Journal, 19*(2), 5-9.

Wanous, J. P., Poland, T. D., Premack, S. L., & Davis, K. S. (1992). The effects of met expectations on newcomer attitudes and behaviors: A review and meta-analysis. *Journal of Applied Psychology, 77*(3), 288-297. doi:10.1037//0021-9010.77.3.288

Weaver-Paquette, E. (1997). Crystallization and congruence: Implications of cooperative education experiences upon the career development process. *Journal of Cooperative Education, 32*(2), 63-69.

Weinstein, D. (1980). *Cooperative education strategies and student career development* [Monograph]. Northeastern University, Cooperative Education Research Center, CEA: Boston.

Weston, W. D. (1986). Career identity and its relationship to participation in a cooperative education program. *Journal of Cooperative Education, 23*(1), 25-36.

Wilder, J. S. (1993). The sophomore slump: A complex developmental period that contributes to attrition. *College Student Affairs Journal, 12*(2), 18-27.

Ziskin, M., Hossler, D., & Kim, S. (2009). The study of institutional practices related to student persistence. *Journal of College Student Retention: Research, Theory and Practice, 11*(1), 101-121. doi:10.2190/CS.11.1.f