The Challenge of Developing Intellectual Capital Using Co-op Education

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ABSTRACT: In a knowledge-based economy, the development of intellectual capital is critical to an organization's success. Co-op and internships offer an opportunity to engage students in higher order thinking skills that contribute to the development of intellectual capital. Results from a study on learning strategies failed to produce significant results on the direct impact of co-op on learning. Course selections, faculty engagement, and peer interactions appeared to directly influence the use of higher order learning strategies. However, when considering the indirect effects of co-op and internship participation, the evidence suggests the participation influences the type of courses selected by the student, the level of participation in the classroom, and the level of faculty to student interaction. These indirect effects indicate potential of experiential education if certain challenges can be met: moving action learning model, developing better reflective practices after the completion of the work terms, reinforcing higher thinking levels in the classroom, and improving assessment techniques.

Introduction

Preliminary results from a study on the utilization of critical skills and competencies have revealed the powerful impact that the knowledge economy has on the utilization of skill sets during early careers. Imagine a funnel on its side. College graduates enter the narrow end in their first position. The narrow confined end represents the limited skills that are utilized in this position: principally, applying academic knowledge (mastery), writing, teamwork, some supervision, and organizational savvy. But the tenure in this job is short, at least in the United States; usually lasting approximately 18 months. When the recent graduate is pushed out the funnel's neck into the mouth, the skills change dramatically. Original skills are supplanted by: oral justification and persuasion, formulating creative solutions, thinking analytically, acquiring new learning/skills, evaluating alternatives, leadership, followed by teamwork and writing. This shift clearly documents the importance of intellectual capital and knowledge management in the

"new workplace." Do our graduates possess knowledge skills with sufficient confidence to immediately contribute? How can experiential activities be positioned to support the development of these skills.

Challenge of Knowledge-based Economy

The advent of the "knowledge economy" was heralded in the early 1990's. Robert Reich described in "In the Work of Nations" (1991) three broad groups of workers: routine production services, in-person services, and "symbolic analysts." The latter group will be involved in activities that require higher order thinking skills in order to identify problems, solve problems and take strategic action. Stewart (1997, 2001) offers definitive insight into the nature of the knowledge economy and the onus placed on business owners to develop and manage intellectual capital, and likewise on each employee to expand their learning strategies to handle increasingly complex information (and information systems). Companies have responded by establishing communities of practice, fostering teamwork, and pursuing social forms of learning.

Even with college degrees, today's employees struggle to maintain their expertise and ability to cope with complex problems. The principal culprit can be traced to an educational system (in the U.S.) that has been built on the linear dissemination and utilization of information. Raelin (2000) echoes similar concerns, stressing the passivity of students and the low expectations of much of the university's curriculum.

The challenge is to engage students to use their experiences as a means to advance learning. While a co-op provides opportunity to master a craft (discipline) and leads to employment, the co-op's real merit may be the empowerment of participants toward higher learning abilities.

To pursue this idea, a set of data on student engagement and learning has been re-examined in light of the critique on the knowledge economy and a new view on learning patterns among college students. This re-examination will allow co-op and internship participants to be isolated and compared to those without experiential practice. The question driving the analysis is to test whether participants in co-op engage in higher learning strategies when they return to campus.

Looking for Learning Patterns

The scholarship on learning processes is extensive and under continued scrutiny. For the purpose of this discussion two perspectives will be shared in order to set the framework for the analytical exercise.

Shortly after WWII, Bloom (1964) began the development of his cognitive learning taxonomy; the kinds of learning aspired to in education. Bloom identified six levels of learning that a student progresses through toward mastery. Briefly, the levels are defined as:

Memorizing:	learning specific things, words, ideas, methods, so they can be remembered the same way.
Interpreting:	mentally putting things in different terms, translating, reorganizing, and extending one's thinking based on principles.
Applying:	drawing upon a variety of concepts and applying them to new problems or

situations.

Analyzing: breaking material (e.g. data, literacy work, processes) into parts and detecting relationships among parts and why they are organized.

Synthesizing: organizing ideas into new plans, relationships, or structures; integrating information from diverse sources.

Evaluating: making judgments about the value of concepts, evidence, theories, and methods.

Bloom's taxonomy has influenced the thinking of many practitioners and scholars. However, Shulman, McDermott and Snyder (2002) warn about the dangers of taxonomies. Taxonomies create myths that the world is linear, uni (one) directional, simple and hierarchical. What ends up occurring is very rigid, isolated ways of learning.

Shulman would argue that this happens frequently – learning can begin anywhere. A student can jump into a contextual situation and propel her learning ahead, leaping over steps, if given the understanding and meaning to what is happening.

Shulman posited a revised taxonomy of learning that involves these components:

Engagement: involved in experiences would not have otherwise participated; shifts away from passive learning situations and processes.

Understanding: ability to restate ideas learned from others; gain a basic foundation of knowledge.

Performance: (practice) where understanding is tested by taking action and recognizing consequences associated with performance.

Reflection: ability to find meaning in one's experiences to transform into new meaning.

Judgment: exercise of understanding and application of competencies under a variety of constraints – with unpredictable aspects – that may involve values and standards.

Commitment: development of value and character that stimulates the initiation to act on ones' own by being committed to a larger group, profession, or community.

Shulman's perspective brings pause to how we view learning. If learning can be visualized as a non-linear event (or series of events), then a practice experience (co-op, for example) can initiate and transform learning. Which, theoretically, should lead to advancement in understanding, then to further engagement and commitment.

Looking for Patterns

A. Experiment. In a study conducted between 1995 through 1997, nearly 3000 students evaluated their proficiency in seven key "soft skills." In addition, a lengthy paper-pencil survey was also completed that examined academic engagement, learning styles, extracurricular activities (including co-ops, internships, and career-related summer employment), and satisfaction/involvement with faculty and peers.

One specific question concerned cognitive strategies employed in the student's learning activities. The Bloom taxonomy (six levels of learning) was employed, as it has been adopted in previous research. First, participants were asked to indicate how much time they devoted to each level as they pursued their learning. This question was followed by an exercise where participants ranked the six levels from their most preferred approach (ranked 1) to their least preferred approach (ranked 6).

The purpose of this paper is to examine these hypotheses:

H. Students with experiential learning experiences will employ more advanced learning strategies (analyzing, synthesizing, and evaluating) than other students.
H. Students with experiential learning experiences will employ a different mix of all six strategies than other students

B. Sample. Slightly more than 3,000 students were recruited from an undergraduate student population of approximately 33,000. Initially the effort focused on students with junior and senior academic standing (third and fourth years). The project was expanded to first year and second years (or sophomores) to capture a picture of the entire undergraduate population.

The respondent pool can be characterized as female (58%) and white (82%) with an average grade point of 2.94. These figures reflect similar percentages and averages for the entire student body. A class representation was first year (19%), sophomore (13%), junior (32%) and senior (36%). All academic programs were represented with the highest participation from business (34%), communication (12%), natural sciences (10%), and engineering (8%).

For this presentation the focus will be on juniors and seniors, as they have engaged in internships and co-ops and have a more classes completed to measure how the different types of disciplines impact learning strategies.

C. Method. The research protocol was conducted in two stages. The first stage involved the administration of the soft skill scenarios. Next participants completed a survey (available from the author), containing a variety of questions on their learning activities and co-curricular engagement. This presentation will analyze data extracted from the survey instrument. Information pertaining to the assessment results can be requested from the author.

Initial Patterns

For all students, the preferred strategies were memorizing and interpreting, 42% and 30% employed these strategies more than half the time, while 57% ranked memorizing as either their first or second choice; interpreting was ranked first or second by 51%. Strategies such as analyzing, synthesizing, and evaluating received first and second ranking by 30%, 15%, and 23%; respectively. Applying, which appears in the middle of the taxonomy, was only utilized by 19% fifty percent of the time or more and garnered a 29% ranking at first or second (Table 1).

Clearly, there appears to be a mix of strategies being used. While the majority of students engage in lower level learning strategies, approximately 20% to 30% choose to utilize higher level thinking skills. Unfortunately, a shift in usage was not found over class level. Seniors were just as involved in memorizing and interpreting information and methods as first year students. They also showed no proclivity to engage in higher order strategies.

Class level does not account for the students using higher-level strategies. Some of the variation was accounted for in these comparisons:

- Women tend to use lower level strategies more than men (memorizing $t = 6.06$, $p = .000$ and interpreting $t = 5.37$, $p = .000$) while men chose more applying strategies ($t = 3.08$, $p = .002$). Interestingly, women were more apt to be involved in synthesizing information to create new knowledge than men.
- Non-white students tended to engage in more interpreting ($t = 4.985$, $p = .000$), applying ($t = 2.155$, $p = .031$), and analyzing ($t = 3.787$, $p = .000$) than whites. Both groups shared about the same amount of time memorizing.
- Students who were undecided about their academic major were heavily involved in memorizing and interpreting.
- Memorizing was given higher priority by students in programs housed in the natural sciences, communications, agriculture, and business. Lowest priority was given by students from humanities programs and engineering. Fields in the social science majors held the middle ground. Engineering majors used applying extensively while the humanities did not.

Table 1. Overall Ranking of Strategies by all Respondents (%)

	Ranking		
	1-2	**3-4**	**5-6**
Memorizing	57	21	22
Interpreting	51	35	15
Applying	29	43	28
Analyzing	30	42	28
Synthesizing	15	28	57
Evaluating	23	55	22

Experiential Results

Approximately 31% of upperclass students had participated in experiential programs: a total of 733 comprising 642 internships and 91 co-op experiences. A small subset of 42 individuals and participants were in both types of experiences. Considering only respondents who were juniors or seniors, 653 reported participating – 580 in internships and 73 in co-op. The individuals who participated in both opportunities numbered 37. Those participating in experiential programs represented 39% of all the junior and seniors who responded to the survey.

Separate mean comparisons between those who participated in co-op and internships and non-participants revealed few significant results. Clearly co-op and internship participants spent significantly less time memorizing information ($t = 2.490, .013$; $t = 2.167, .030$, respectively). Co-op and interns also spent more time synthesizing information (ANOVA $F = 4.930, .026$; $F = 5.07, .024$, respectively). The remaining time allocation comparisons showed the means do not differ significantly. However, the time not spent memorizing was shifted to analyzing, synthesizing, and evaluating. Co-ops and interns spent slightly less time interpreting information. Those in experiential programs allocated a similar amount of time to applying information as non-participants.

Mean comparisons and ANOVAs revealed no new significant differences. The pattern became clearer for those upper class students involved in experiential programs. Less time was spent memorizing and interpreting and more time analyzing, synthesizing, and evaluating.

Causal Model for Learning

To explore the factors that influence the development of higher level learning strategies, a causal model was developed for each type of learning. The first step examined the direct effects of selected independent variables. The variables were grouped in common blocks and blocks were added in this order, using step-wise regression procedures:

Coursework Pattern (Type of Courses Taken)
Academic Resource Utilization
Classroom Assignments
Faculty/Classroom Interaction
Personal/Student Interaction in Class
Outside Classroom (Academic)
Co-Curricular Participation
Socio-Economic Characteristics

Presented below are the variables which entered significantly in the final model (at the inclusion of the socio-economic characteristics). (Note: Statistical parameters – R^2, betas, and significance level – will be provided as a separate attachment when the entire model has been completed.)

Individuals who tend to utilize a specific learning strategy were more likely to share these characteristics:

Memorizing:	Lower grade point average, female, fewer books assigned in classes, faculty ask memory type questions in class, respondents ask for evaluative questions, respondents respond with memorized

	answers, less integration of material from various sources, no internships or coops.
Interpreting:	Female, majority students (white), likely to search periodicals for material; seek faculty outside class about a course problem, fewer team projects, fewer assigned books and reading, more essay exams, faculty ask more memory based questions.
Applying:	More consideration of application of material, more student to student interaction in classroom, more likely to socialize informally with faculty outside class, fewer humanities courses taken, students raise more evaluative questions in classroom, respondents less likely to respond in class with memorized answer, likely to search periodicals more.
Analyzing:	More likely to seek references cited in books/materials, more likely to integrate ideas from various sources, more likely to talk with faculty about a course problem outside class, more writing courses, more term papers, questions from faculty more likely to be evaluating types, more student-to-student interaction in class, see more movies, spend less time hanging out with friends, tend to find advisors too rigid, mother's education level lower.
Synthesizing:	Lower grade point averages, respondents more likely asks evaluative questions in class, more likely to integrate ideas from various sources, faculty more likely to use student ideas in class, more likely to seek references cited in books/materials.
Evaluating:	Lower grade point averages, more likely to integrate ideas from various sources, fewer science courses, see more movies, more likely to use library computer system to locate information, less likely to participate in university sponsored activities, take more essay exams.

Recognizing the Bloom's cognitive taxonomy may not be the most appropriate measures or proxy for action learning – at least action learning embraces the higher level strategies – what can be gleaned from these results can be used to structure future research.

Lower level strategies appear to involve:

1. Passive teaching strategies
2. Focus on memorizing course material
3. Little integration of class material with other courses, materials or perspectives
4. Fewer written assignments
5. Little engagement in activities outside the classroom, such as internships and co-ops

Higher level strategies appear to involve:

1. More integration of class material with other sources, materials, perspectives

2. More student-to-student interaction in classroom
3. Faculty use evaluative/probing questions rather than memory based questions
4. Faculty more likely to use student ideas in learning context
5. More written assignments
6. Student more likely to have adequate balance of humanities, social science, and science courses

What about Experiential Learning's Impact?

We anticipated that internship/co-op experiences probably influenced classroom dynamics and interactions indirectly. The indirect causal models have not been completed at this time; but we investigated the bivariate correlation between internships/co-op and the first six blocks of variables listed above to determine likely conduits for the indirect effects.

Three clusters of variables revealed significant bivariate correlations (at the .001 level):

1. Coursework: internships or co-ops were more likely to have more technical courses (our co-ops are engineers), more writing courses, and more social science courses, while having fewer science and math courses.
2. Personal interaction in class: internships and co-ops reported that they were more likely to participate in class, ask evaluative (non-memory) type questions, and engage in peer-to-peer learning.
3. Faculty student interaction: internship/co-ops sought faculty outside class for academic discussions; they assisted faculty with projects and research; and they consulted their faculty on career related issues.

Challenges

Our hypotheses had expected that co-op/internship experiences would contribute to the utilization of higher level learning strategies. The results failed to produce strong direct effects; however, the shift away from memorization practices provided more encouraging evidence that experiential learning can shape learning.

When we examine the indirect impact of the importance of learning engagement outside the classroom we found relationships that suggest experiential engagements can influence the learning environment. Raelin (2000) makes an important distinction in his discussion of practice between active and action learning. Active learning involves the practice of one's craft (engineering, accounting, science research for example) where the goal is to gain mastery in a craft. However, action learning strives to understand the meaning of one's experience through the inclusion of tacit knowledge in order to expand and even create new knowledge. The action realm offers the participant the opportunity to create one's own learning. We have some clues that internships/co-ops can serve as a vehicle to do that.

Too often co-ops and internships are set-up to provide practice and support post-graduation employment. Scant time is expended on promoting learning. The challenge for co-op, and certainly the challenge we all face in developing intellectual capital, is to shift the focus from active to action learning.

Shulman (2002) believes this is possible by taking a non-linear view of the learning process. Practice (or performance) can trigger learning – and the commitment to future learning – before similar commitment takes place in the classroom. To Shulman, co-op becomes more than a work experience, but a conduit to engagement in the thinking process. The cost of this switch is providing the student's opportunities to understand and gain meaning from their learning experience.

The practice of reflection involves "uncover(ing) and mak(ing) explicit to oneself what has planned, observed, or achieved in practice" (Raelin, 2002, p. 58, also see Wenger,1998). Unfortunately, most students are unable to develop a coherent explanation of their work experience. To engage and evoke reflective practice requires both employers of students and faculty and advisors to commit time to engage students. Simply writing a paper at the end of the work term is inadequate for a transforming experience.

While many faculties may be reluctant to expend time for reflective sessions, they could realign their instruction methods to aim at higher-level thinking; and recognize and acknowledge that learning takes place outside the classroom. The vast majority of baccalaureate graduates in the U.S. today report some type of experiential learning (much of it not academic sponsored) on their resume. Too often this learning is totally ignored. The path to bringing these experiences into the classroom is not clear-cut; neither is the need for higher thinking in the classroom.

Confounding the entire process is our current frustration at finding ways to measure learning gains. Simple exercises like the one shared in this paper are inadequate and full of methodological and statistical issues. First, any investigation must be longitudinal and involve both quantitative and qualitative techniques. Journals and process mapping may be initial approaches that will aid in identifying measurable concepts. As the economy shifts to focusing on intellectual capital, co-op professionals will be critical participants in managing intellectual growth.

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