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Who Are Community College Mathematics Instructors?
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Abstract

This is a preliminary study of (community) college mathematics instructors. Through interviews of twelve instructors we explore each individual's educational background and path to the college, as well as his/her preparation for and feelings about teaching. The purpose of this study is to add to the emerging research on college mathematics teaching and learning.

Introduction

The current study is based, in part, on a recent study of Ontario colleges, the College Math Project (CMP) (Assiri, Byers, Orpwood, Schollen, & Sinclair, 2008; Assiri, Orpwood, Schollen, & Sinclair, 2009; Orpwood, Schollen, Merinelli-Henriques & Assiri, 2010). The results of the CMP were startling: approximately one-third of all college students have failed their first-semester mathematics course or are at risk of not completing their studies because of their mathematics achievement. The CMP recommends that concrete action be taken; that all Ontario colleges renew their commitment to teaching.

This interest in student success in college mathematics is echoed by a recent call for proposals by Human Resources and Skills Development Canada (HRSDC) on understanding individual numeracy, which said,

> Numeracy is one of the nine Essential Skills identified and validated by recognized national and international experts and agencies. Essential skills are needed for working, learning, meeting life's challenges, and for creating and taking advantage of opportunities. They provide the foundations for learning all other skills and enable people to evolve and better adjust in times of change [...] HRSDC is particularly interested in research that examines the extent to which numeracy matters to a range of outcome measures. These include training uptake, labour market participation, employment earnings and total income, financial literacy and social participation. (HRSDC, p18)

Research into issues concerning adult numeracy has only just begun, so we do not yet understand where numeracy skills are learned. However, the community college system is the most obvious educational system in which adults learn numeracy skills. Therefore it seems that the Canadian government is interested in getting a clearer picture of how college education can affect students learning mathematics and numeracy skills.

The research reported here is directed toward exploring the Canadian college mathematics instructor demographic. Specifically, this paper is a preliminary report of a larger-scale project designed to explore college mathematics instructor profiles. We will report on instructors' preparedness for teaching college mathematics, some factual information including educational background, and personal opinions and feelings about teaching mathematics at a college. Ultimately the question of who instructors are is asked to better understand what they do – thus influences on instruction lurks just behind the questions posed here. However, so little has been done to date on this group that it seems pertinent to begin with the who before tackling the what.

In this paper we use the term "college" to indicate publicly-funded post-secondary institutions that are not universities in the traditional sense. They are sometimes referred to as community colleges, often include technical and trades schools, and typically enrol a diverse population of students including adult learners. As will be discussed, the term “college” may be too broad a term to provide for a parsimonious study.

Interviews were conducted with twelve college mathematics instructors from three provinces in Canada. The instructors hailed from three colleges in British Columbia: Douglas College, Northwest Community College, and Okanagan College; one in Alberta: the Southern Alberta Institute of Technology; and two Ontario Colleges of Art and Applied Technology: St. Lawrence College, and George Brown College. The interviewees voluntarily responded to a call for participation initially sent by e-mail and spread by word-of-mouth. All those who responded initially were interviewed; the Ontario instructors were interviewed in person, while the others were interviewed via telephone. Our aim was to determine any commonalities within the demographic, if any, and to see if any trends emerged, in the hopes that the information collected would challenge our current beliefs and inform subsequent research. From these interviews we observe, among other results, that half of the participants have some form of pedagogical training, most claim that their teaching practice is based on their reflections of other instructors-in-action, and that all of them like (or love) what they do.

Literature Review

Research into college mathematics education can be approached from a number of different angles. As the CMP suggests, many students do not learn successfully in their mathematics courses. This is an issue that can be investigated via the high school curriculum, the college curriculum, the college instructors, or the college students, or any combination of these, for example. One difficulty with a focus on content is as follows. Suppose we assume that students are not successful in their math courses because math is not being taught through applied, real-world examples. Then we could suggest changing the curriculum to include more of these types of problems. We think that this approach is inappropriate because college instructors are the ones delivering these examples and that different college instructors will interpret and present the examples in different ways, depending on their own backgrounds and interests. In fact, as suggested by a reviewer of this paper, although it may be artificial to approach any of these things independently, understanding their individual contributions to the problem is perhaps the best way to begin. We choose to consider instructors because they are at the front line of content-student contact. Hence the curriculum is filtered through each individual instructor before it is presented to students.

It is our opinion that the state of research in this field is such that any action taken by colleges would be informed by, at best, a guess. The current state of college mathematics education in Canada needs to be articulated; we are attempting to move in this direction by first focusing on the instructors.

Our broad, ultimate goal is to understand college math education in Canada. There are many perspectives we can consider with which to paint a picture of community college math education: the student's, the institution's, the faculty's, etc. We chose to consider the faculty's perspective first.

There is not much literature concerning education in colleges, especially those in Canada (Townsend, Donaldson, and Wilson, 2009; Fugate and Amey, 2000; Nesbit, 1998). There is a burgeoning body of research into community colleges in the United States and in the United Kingdom (Coban, 2006), where “college” takes on a different meanings, a small subset of which is focused on college faculty. Studies have been conducted on college and university instructors whose positions include a research component (Kane, Sandretto, & Heath, 2002). However, since it is atypical for a community college math instructor in Canada to be expected to conduct research, it seems that the research-oriented demographic could have different perspectives on teaching and learning from those found in these studies. Moreover, the literature on primary and secondary school teachers may only be tenuously relevant to our demographic, since teachers, although having a variety of backgrounds, all share pivotal educational experiences in the form of an education degree. Unlike primary and secondary teaching positions, there is no specific educational requirement to teach at a college. Those who do teach at a college come to the position through a series of choices and events that is unique to each individual. Two of these paths are seldom alike; indeed, often the only similarity is that the distinct paths lead to the event of teaching college mathematics. The American Association of Community Colleges maintains statistics on the education levels of the community college

instructorship according to a rough discipline classification (AACC, 2011). It is found that, in aggregate, 71% of instructors hold a Master's degree, while only 11% claim a Bachelor's degree as their highest level of education. These statistics may not hold for Canada, where the typical education requirement for an academically-oriented instructor position is a Bachelor's degree. Indeed, the requirements for college faculty have been shifting and the current trend is toward hiring faculty with an education degree. In addition to instructor profiles, a few case studies have investigated instructor effectiveness. For example, instructors who take a "direct instruction" approach, where the instructor walks the students through the material, have been found to be effective for highly math anxious students (Gersten, R., Chard, D. J., Jayanthi, M., Baker, S. K., Morphy, P., & Flojo, J., 2009; Clute, 1984) and those with learning disabilities (Swanson & Hoskyn, 2001). The results have bearing on questions in numeracy proficiency since the demographic of adult learners may include large numbers of students with high math anxiety (Maciejewski, forthcoming).

As we consider the results above, it is not entirely clear if the results from outside Canada are easily transferable to the Canadian context – indeed, "college" can mean something quite different in Canada than it does in the United States. Within Canada, The Canadian Society for the Study of Higher Education and The Canadian Association for the Study of Adult Education are two of several organizations with a focus on issues tied to the college system, but, again, we must be careful about how these demographic studies apply to colleges; for example, is college education "higher education"? From an even narrower perspective, colleges are dramatically eclectic, varying within individual institutions as well as among the provinces (Gallagher and Dennison, 1995). Some colleges have mathematics departments while others do not have centrally organized mathematics programs. Strictly speaking, college education is post-secondary education but it is not true that every program or course in a college can be classified as higher education since much of what occurs in a college is remedial or foundational education. Is college education "adult education"? The focus of many studies in adult education is restricted to informal learning situations so it is not entirely clear what conclusions from adult education can be carried to the college setting.

With the above in mind, it seems not a simple task to pin down the relevance of research from other contexts to college education. We must take care to learn what we can from any potential overlap of educational fields; colleges have a large role to play in education, and college faculty are on the "front lines.". Hardy and Laanan (2006) write the following about college instructors in the US:

> The faculty is the very heart and soul of the American community college. Compared to the traditional research university in which scholarship and advancement of theoretical knowledge is valued, instruction is central to the mission of the American community college (Grubb, 1999; Rifkin, 2000). A defining element of the community college is its vision of itself as a ''teaching college'' (Grubb, 1999). As a result, the values and reward structure in community colleges differ from those found at research universities. Understanding the characteristics, opinions, and degree of satisfaction of this employee group is pivotal to both understanding the culture of community colleges and determining the most effective way in which to manage them.

However, as we have seen, there is very little that is well understood about college faculty. This weak interest in college math education is troubling when we acknowledge the profound and extensive challenges facing Canadian colleges – it is likely that those challenges brought to light by the CMP are not confined to Ontario. It seems that with the diversity present within and among colleges, it would be best to inform our research with literature from domains that college education may share, while recognizing these assumed links as sources of future investigation.

Method

A set of twelve interviews, based almost exclusively on five questions given below, were conducted with community college instructors either through telephone or in person. Most of the twelve were self selected, responding to a call for volunteers advertised through the various colleges. A few of the participants were associates of the interviewers prior to the interviews. Initially the colleges that were sent a call for volunteers were chosen out of convenience, where the interviewers were familiar with at least one person. Word of the study spread through various channels and instructors at three other colleges expressed interest. In the end, the twelve participants came from six colleges across British Columbia, Alberta, and Ontario.

The study took the form of individual interviews in which a series of five questions were asked, some including follow-up or clarification questions. The questions were drawn from a selection of interview questions similar to those found in two previously conducted studies (Martin, Prosser, Trigwell, Ramsden, & Benjamin, 2000; Mertz & McNeely, 1990). Both researchers were present for the majority of the interviews which were recorded and transcribed. We selected and adapted the following questions because we believe they allow us to paint a broad picture of these instructors, especially illuminating each of their unique paths to the profession.

1. What is your educational background? What are you teaching now and how did your education prepare you to teach this?
2. How did you become a college instructor? Why are you teaching at a college? What do you think are the goals of a college education?
3. What kind of preparation do you have for teaching in higher education? Do you participate in any professional development? Why?
4. How did you come to teach as you do? Is there something specific that you model your teaching after?
5. How do you feel about teaching?

By and large, we adhered to this set of questions. However, on occasion we were prompted to stray from the list to clarify an interviewee's response.

The interviews were recorded, transcribed, and the data categorized. Because of the lack of research in this area, we did not think it appropriate, or even possible, to adopt an existing framework on which to base this research. Some methodologies were considered – notably, grounded theory – but it was decided that our goal of stimulating further research would benefit the greatest from gathering, categorizing, and presenting the data undistorted through any lens. This will be explored further in the discussion section.

Discussion of Results

Our study had two desired outcomes: that a profile of community college mathematics instructors would begin to emerge from the questions posed, and for the responses to aid in refining our research questions for subsequent studies. With respect to the first point, it's much as we suspected. There is great variety within the college mathematics instructor demographic. A few trends emerged, however, not the least significant of which is that all of the participants expressed positive feelings about teaching; specifically, six out of twelve used the word “love” when describing these feelings. Many of our other findings corroborate previous studies (Twombly and Townsend, 2008).

Discussion of Results Organized by Category

The questions asked were based loosely around a few themes: factual information (What is your educational background? How did you become a college instructor? What are you teaching now?), preparedness for teaching college mathematics (How did your education prepare you to teach this? What preparation do you have for teaching in higher education? How did you come to teach as you do? Is there something specific that you model your teaching after?), and personal expression/opinion (Why are you teaching at a college? What are the goals of a college education? Do you participate in any professional development? How do you feel about teaching?). Note that we include professional development in the ultimate category because we found that, more interesting than technical "yes/no, I do/don't participate,” were the follow-up responses qualifying the yes/no answer in which the participants expressed very strong personal feelings and opinions about professional development. We consider the three categories in series, below.

Factual information

The mathematics courses that the participants were teaching at the time of the study run the spectrum of college math courses: foundational math, to trade and business mathematics, to pre-calculus, and also include university-level courses in statistics, calculus, linear algebra, and differential equations. Many of the participants were not constrained to teaching one of these types and taught a subset of all of them. In addition, not only are the study participants teaching a wide range of mathematics, but they are also teaching courses in Chemistry, Biology, and even English.

The educational background of the study participants was varied. All had completed a Bachelor's degree from a university before getting work at a college; four of these were degrees in mathematics, and one was a minor in mathematics. Six of the twelve participants had completed a Master's degree, one of which was a Master's degree in Mathematics. One participant had a doctoral degree in mathematics before working at a college. Three participants had Bachelor of Education degrees and one had a Master of Education degree. Two in the study had participated in a program designed for elementary and secondary instructors called the Professional Development Program (PDP), which leads to teaching certification in the province of British Columbia. One participant had received a technical diploma and three had worked in industry before teaching. The educational background of the participants is organized in Appendix A. It should be emphasized that roughly half of the participants had taken few or no mathematics courses beyond high school.

It was interesting to discover the diversity of paths that people followed to this profession. These can be broadly classified as intentional or incidental. Specifically, four trends emerged:

- was asked to/opportunity arose;
- applied for it, had no prior intention of working at a college;
- applied for it, had prior intention of working at a college; and
- (if the question had been restricted to college math instructor) migrated from other departments/programs.

For examples of incidental paths to college, consider Jose, an instructor who had no prior experience in, or education pertaining to, teaching, and Harvey, who has a B.A. and a B.Ed. as well as having teaching experience aside from his B.Ed. placement. When asked how he became a college instructor, Jose responded,

> Just by chance.... it was a Friday afternoon and I was in my office and someone phoned me and said that the college wanted someone to teach a course on Monday. I found it strange that it's a degree program and they had this course that had never been offered before and the Friday before they're scrambling, looking for someone. Fortunately, someone knew me and I was actually working in that specific area that they were looking for. So I offered to teach the course for them. And that's how I got into it. (Jose)

Harvey tells a story of his then girlfriend encountering a dog that had been struck by a car. The owner of the dog was a department chair at the local college.

> A little chit-chat back and forth and he said, “have him give me a call.” We met, and he asked, how would you like to teach a course in writing? Great. One section of a course [...by] the winter of 1987, I had what amounted to a full-time load, in math and English. Two full-time positions opened in May of '87 and I got one of them. So I ask my kids, what's the moral of that story? And when they get beyond focusing on the dog, they tell me, it's not just what you know, it's who you know. And the luck – the luck of contact. That's why I'm here. I should be teaching in high school. (Harvey)

As we expected, some of the participants had not considered working at a college until the opportunity arose. And, although none of the participants specifically shaped his/her education to teaching at a college, at least one made the conscious decision to remain at the college when other opportunities were presented. But the result that was most astounding to us was that more than one of the participants in our study came to teach mathematics after teaching another subject, such as English, at the college. Many mathematics education studies suggest (e.g., Ma,1999; Hill, H. C., Blunk, M., Charalambous, C., Lewis, J., Phelps, G., Sleep, L., & Ball, D. L., 2008, Twombly & Townsend, 2008), that the quality of mathematics instruction (MQI) is strongly correlated with the instructor’s mathematical knowledge for teaching (MKT), and therefore level of mathematical education received by the instructor. As such, the prevalence of college math instructors with little or no mathematical instruction beyond high school may be directly contributing to the current student attrition in college mathematics classes.

Preparedness for teaching college mathematics

Participants were asked about their educational background, preparedness for teaching college mathematics, and their teaching practices. Some of the questions that were asked were specific and some were more general; some were intended to be specific and came out being vague. For example, as previously indicated, we could have asked about teaching mathematics in higher education. Although the individual responses to these questions played on each other making it unnatural to compartmentalize them, we found it reasonable to look for trends. By and large the participants noted three things that prepared them to teach college mathematics: observation of others, some sort of formal teaching education, and an inherently personal quality that suited them to some aspect of the position.

With the question "What kind of preparation do you have for teaching in higher education?." we were trying to uncover the individual's teaching preparedness from an angle that would include more than strictly formal education for teaching. The use of the word "preparation" in the place of "education" was intended to draw out more of the individual story. The result was that the participants gave fairly non-traditional answers to this question which are easily placed in to four categories: (1) no formal teaching education, (2) formal teaching education, (3) experience/familiarity with the material, and (4) personal attributes such as reflective practice. What we found particularly interesting was that the responses almost never began with a reference to formal teacher education, indicating that these instructors feel that they possess other qualities, whether learned or inherent, that are of great significance to their teaching abilities. These qualities are not what we would normally have categorized as "preparedness for teaching." Don provides the starkest response to this question:

> Absolutely none. In fact I've actively avoided any of those courses that a lot of institutions give especially in recent times, who hiring people with master's degrees and Ph.D.s in different areas and teaching them how to teach. I mean I walked in, to be honest, in to my first lecture [in university] in probably 1976 [...] hardly prepared at all, I had maybe read the first chapter in the textbook and had a vague idea of where I was going, I walked into the classroom, started talking, started teaching, and I think I knew that as soon as I walked out of that classroom that that was what I wanted to do for the rest of my life. You know, for some reason it just clicked, I felt right, I was able to communicate with people I got a positive response from people right away [...] but as far as having any preparation, other than having taken a lot of mathematics, and a significant interest in mathematics, I have no preparation whatsoever to teach. (Don)

After the participants listed what they currently teach, we followed up with "How did your education prepare you to teach this?" The trends that emerged were: (1) formal pedagogical preparation, and (2) experience. Some of the responses regarding formal pedagogical preparation seemed to focus on general teaching skills, while others specifically cite skills for teaching mathematics, albeit at varied levels. Many participants referred to an experience, outside of a formal educational experience, that prepared them to teach their current mathematics courses. These experiences included having used mathematics in the workplace, as well as in their own education.

A few of the responses were unexpected. Of note is Bret's shared experience of being an adult learner:

> I was a mature student when I went back to university having been out of high school for ten years and I think that it turns out that we have a considerable number of these students, so I think that helps me to relate to their situation. (Bret)

When asking participants about their own teaching practice with the question "How did you come to teach as you do?" we were particularly interested in the circumstance in which the instructor was introduced to the specific pedagogical practices he/she employed in the classroom. Research indicates that many instructors at all levels of education build their teaching practice on observation of "good" and "bad" teachers (John, 1996), but we were interested to see if the participants would indicate something other than a person in their responses. Thus, the word "something" in our original question was placed deliberately to avoid leading participants to a specific class of answers. In fact, just about half of the responses included that the observation of others informed their practice, and just under half of the participants said that they taught by trial-and-error, feedback, and a commitment to reflection. We feel it necessary to clarify that no one mentioned student feedback in their responses. Finally, although half of participants had formal teaching preparation, fewer than half included it in their responses.

In general, participants' teaching practices were influenced by either an (1) external event, such as exposure to formal pedagogical techniques developed to improve practice, or (2) by an internal reflective process that the individual chose to engage in after experiencing an event for which the primary function was not pedagogical. The majority of the responses are typified by the latter. The most common internal influence of teaching practice identified by the participants was the observation of others. In fact, half of the participants' responses included observation of teachers or professors as influencing their practice.

Personal component

Subjects' reasons for teaching at a college show the following trends: (1) it is personally rewarding, enjoyable, or challenging; (2) because of the learner demographic (adults or underprivileged); (3) able to devote time and energy into the students, and; (4) it is a good fit to the individual's background. Gert, quite succinctly, and Vince, speak to the first point.

> I just really enjoy it. I'm fortunate in that I've found a job that I really enjoy. (Gert)

> I'm thinking that I remember how I was taught when I was in high school and in university. I remember the good instructors and I remember the bad instructors, and I'm thinking, if I take what I learned from the good instructors, I thought, yeah, maybe I can be a good teacher. And actually I found it quite rewarding. Not so much the material that you teach, but the way you teach it. And that's the challenge I find. Coming up with what's the best way to teach this particular student at this particular time knowing my own limitations as an instructor and also trying to get the student engaged in what they're learning. And to me that's the challenge. And of course, there are some classes I come out thinking I did a great job. Other classes I'm thinking "What did I do wrong? And how can I improve upon that for next time?" (Vince)

It is worth noting that the responses to this question came from individuals who have already spent a period of time working at a college, and the majority of responses answer the question, "Why do you still teach at a college?" The overall feeling is positive, giving the sense that these instructors feel personally fulfilled in the job. The responses agree with those of many educators: the challenge, the rewards of seeing the pleasure students experience when they understand, and the sense that teaching is a natural fit for them. However, the participants report personal rewards regarding two things that are unique to the college system: teaching this specific group of people (e.g. adults, underprivileged) and being able to devote their time and energy entirely to the students, instead of to research, discipline, or service which can be heavy components of other positions in education. Arlene and Don speak to this:

> You don't have to deal with the discipline, you don't have to deal with parents or report cards .... And without all those other things like discipline and parents and IEPs that sort-of suck one's energy I find that ... I put a lot into the students .... You can just pour your heart and all your energy into lessons that actually meet student's needs. (Arlene)

> When I was a graduate student... doing both teaching and research, I found that I would have a tendency to compromise on my teaching because I had something to do, a paper to write, a seminar to prepare. I didn't like that. I enjoyed the teaching, the interaction with the students, the whole milieu of teaching, more than I enjoyed the research.... When I was interviewed for my first job [at a college], the person that interviewed me said "you know, if you take a position at a college you will probably never to do research again and you're not going to be able to get a job, or it would be very much difficult to get a job at a university." And I said that that was my decision and that was a decision I wanted to make at that point. And I re-iterated that almost 30 years later. (Don)

In our preparation, when including the question "What are the goals of a college education?" we expected two responses: (1) to obtain the skills or attain the education level necessary for employment or for further credentials, and, (2) for personal satisfaction or achievement. Indeed, these were the two most common types of answers, and most of the participants spoke to the first point. However, a number of perspectives emerged that we had not considered. Among them, a few of the participants recognized the ambiguity present in the question and commented on how the answer depends on context of a department, one of the

respondents indicated the emancipatory nature of college education, and another considers a possible college perspective:

> This is a business like any other. I've seen a couple of references to students as funding units. Each student is a funding unit. To be fair, there are some here who are compassionately… they're really concerned about the students. They want to see them improve themselves. And they're dedicated to that. And they're teachers. Above us, I can't speak to what the motivations are. (Harvey)

Most of the instructors in this study participate in professional development to, broadly, become better teachers. Whether this is the acquisition of new technical skills, a deeper understanding of learners or of the subject, or sharing with colleagues, the majority of the participants reflected that they had positive experiences in their professional development. There were a few responses lamenting the lack of funding to pursue professional development, as well as the relevance to the subject of mathematics. The latter is something that the authors, as mathematics instructors, have experienced as well: general educational professional development seems to be centred around the social sciences with the result that very little is transferable to the sciences, and to mathematics in particular. And the climate doesn't seem to be improving. Consider a comment from Whitney:

> It's really frustrating that we're treated as second-class teachers in this province. I'm a certified teacher, [an instructor] down the hall is certified, the other instructor that you interviewed is a teacher. We lost a good teacher in the Fall – she went back to high school. There's no PD. And as I said, we're not welcome to take additional qualification courses from the Faculty of Education. (Whitney)

Even with the quote above, however, the results of the study show that every one of the participants in the study enjoys teaching college mathematics. This can have great positive implications for the working environment, the college itself, the field of Mathematics, and most importantly, to the students themselves. We must be clear that the participants in the study were self-selected; it is likely that only instructors with relatively strong feelings about college mathematics teaching would agree to be involved in this study. We feel it necessary to also add that we had many more instructors wanting to participate, and that the researchers' own lack of time was the reason that they were not interviewed. But we were struck by the emotions that poured forth in response to the final interview question: "How do you feel about teaching?" The written transcription does not convey the ways that peoples' faces lit up, or the enthusiasm in their voices, as they described how they loved teaching.

Conclusion

This preliminary study of (community) college mathematics instructors is directed toward exploring the Canadian college mathematics instructor demographic. Interviews with twelve instructors were used to explore educational background, path to the college, as well as preparation for and feelings about teaching. It appears that the "college mathematics instructor" demographic will be very difficult to pin down: the stories gathered here report on radically different paths to the profession, and instructors gave a wide range responses to questions regarding preparation for teaching college mathematics, including experience working in industry and mathematical subject knowledge as well as personality and formal teacher education. The most general and resonant results reveal the existence of mathematics instructors in the colleges who have no formal post-secondary mathematical education, and that the participants in this study take pleasure in teaching mathematics at the college.

To be clear about what this study does and does not do, in this paper we highlight some common attributes of the college math instructors that we interviewed; we do not claim that we get a complete picture of college math instructors, as our sample size (n=12) is small, and the participants were not randomly chosen. We do not think of this as invalidating since our objective is to begin a dialogue.

Directions for Future Research

While conducting this research it became clear is that the "Canadian college" topic is too broad. There are

many possible directions that can be pursued, however, to further explore the issues in the present study, we believe it is necessary to narrow the focus to individual provinces. Canadian colleges are too diverse to be studied as one phenomenon: a community college in British Columbia or Alberta differs from a college of applied arts and technology in Ontario which differs from a CEGEP in Quebec (Gallagher and Dennison, 1995). Restricting the focus of the interviews to instructors involved with specific programs may also lead to strong results, but, as the current study indicates, instructors are seldom confined to teach within specific programs.

All of the responses we received were retrospective, describing past practices. How would they change with time? For example, hiring practices have changed over the years; it is increasingly common for colleges to require applicants to possess a Master's degree. Many of our participants do not possess anything other than a Bachelor's degree. This may create cohorts of instructors that were hired at different times according to different hiring practices. How does this affect the dynamics of a college? We agree with Twombly and Townsend (2008) that the correspondence between the level of education of a faculty member and their effectiveness as a teacher, if there is such a correspondence, should be investigated.

Most of the instructors stated that they arrived at their teaching style and practices through a process analogous to Lortie's (1975) “apprenticeship of observation”: students, by the time of graduation, have 13,000 hours of experience observing teachers. When they go on to teach themselves, they draw on these experiences and resort to teaching as they were taught. It has been argued that the apprenticeship of observation is insufficient in accounting for the range of observed teaching practices (Mewborn and Tyminski, 2006). This possible disconnect is a potential source of rich investigation. What influences an instructor's teaching? This may have pragmatic implications, since significant resources are invested in professional development at the college level – with, according to our participants, varying degrees of effectiveness. Also, many of the instructors we interviewed did not have formal teacher training. How does this affect their ability to lead a research-based, or reflective practice? Are instructors engaged in scholarly activities (Townsend and Rosser, 2009) and does it matter? According to Levin (2008) “teachers may see curriculum issues quite differently from post-secondary experts. The latter may focus on the need for high level skills in their own area, whereas teachers may be more concerned with a curriculum that will work for students with widely varying skills and interests.”.

Another direction that has been pursued in the literature on university education is the exploration of the teaching practices of faculty. We intentionally avoided asking about teaching practices, aside from how they were arrived at, since an instructor's espoused teaching practices may be quite distinct from their enacted practices (Kane, Sandretto and Heath, 2002). Determining what goes on in a college math classroom would be a major step toward understanding and explaining student achievement. The College Math Project calls on “faculties of education to support greater understanding of colleges and college programs through [...] the development of authentic Contextualized Learning Activities related to sector specific college programs” (CMP, 2009). While we agree that motivating a mathematics lesson with an application may be beneficial, we are apprehensive of the bold recommendations of the CMP. We suggest that college math students currently are receiving instruction heavily embedded in specialized context, as they have for some time, but that perhaps a heavy reliance on context is limiting student success (Oughton, 2009; Kaminski, Sloutsky, & Heckler, 2008). The fact is that, considering the paucity of research on college math education, no educator can broadly claim what works best for college math students. We can begin to address this by observing what is currently practiced by college math instructors.

It is interesting to note that the participants appear to like the subject that they are teaching, but the more prominent responses speak to the relationships that they have with the students. This leads us to the following question: How much does the enjoyment of the subject affect the instructor's experience, and how much influence do the students themselves have? Perhaps the most intriguing questions that we see that arises for the study pertains to the instructors' love of teaching. If the results are general, college math instructors love what they do. Why, then, are students doing so poorly on achievement tests? How are these two related? Does the instructor's feelings about the profession influence student achievement? understanding?

It appears that investigating college math education presents a great opportunity for understanding an issue with broad implications. Seldom does a system go unexplored as long as college math education has. Even

more rare is an opportunity to perform fundamental research that could possibly have immediate, profound effects. We have in our colleges such an opportunity.

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Appendix A

Both Wes Maciejewski and Asia Matthews are former college instructors working on Ph.D.s at Queen's University.

Contents

Appendix A
Participants' Educational Backgrounds.

Pseudonym	Education before joining college	Industry/other work prior to instructing at college influencing teaching	Additional formal education since joining the college
Arlene	B.A. (Applied Linguistics), PDP (Elementary School)		PID
Bret	B.Sc. (Math, minor in Comp Sci & Phys), Diploma (Electrical Eng.)	Engineering	
Don	B.A. (Math), M.Sc. (Theoretical Physics), Ph.D. (Math)		
Franklin	B.Sc. (Biology), M.Sc. (Zoology), B.Ed.		
Gert	B.A. (Therapeutic Recreation and Adult Education)	Computer programming	PID
Harvey	B.A. (Psychology, minor in English and Math), B.Ed.		
Jose	B.Sc. (Chemistry and Biochemistry), M.Sc. (Geology)	Geology consulting, conference organizer	
Lee	B.Sc. (Engineering)		
Ophelia	B.A. (Math, minor in French), PDP, M.Sc. (Math)		Ph.D. (Candidate)
Philippe	B.A. (English Lit. with courses in science), M.A. (Theology)	Tutoring	
Vince	B.Sc. (Engineering Mechanics and Materials)	Mining industry	Certificate: Comp. programming, M.A. (Ed.)
Whitney	B.Sc. Honours (Math, minor Comp Sci), B.Ed., M.Ed.		