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Reflections on Our First Calculus Undergraduate Teaching Assistant

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Abstract

This article describes some reflections from the first Calculus I undergraduate teaching assistant in our department as she explored the various ways in which she was able to support both novice and experienced Calculus teachers and the effect of her experience on her academic and career plans.

Keywords: Undergraduate teaching assistant; instructional support; calculus.

Introduction

There is a growing body of literature (across academic disciplines) that supports the use of undergraduate teaching assistants (UTAs) in college classrooms for a variety of reasons. The use of UTAs provides benefits for all involved in the process—the faculty members who work with UTAs in the form of support in teaching; the students enrolled in the courses in which the UTAs assist in the form of additional support in (and sometimes outside of) class; and the UTA in the form of experience teaching and mentoring from more experienced supervisors.

Over the last few years there has been a steady rise in the general undergraduate population at our institution, a large land-grant public research university, as well as in the number of students taking undergraduate mathematics classes. In addition to this, in response to calls for more active learning models in our classrooms to support improved student understanding, our department implemented changes within course structures in several undergraduate mathematics classes to allow for more in-class participation of students in an effort to move away from the traditional lecture format seen in many undergraduate mathematics classes to allow students to explore active learning. Specifically, in Calculus I, class sizes were lowered and graduate teaching assistants (GTAs) added as instructional support in the classroom to aid more experienced instructors in implementation of active learning strategies. GTAs have been called a "crucial intermediary in the classroom" between faculty members and the undergraduates they teach (Stoecker et al., 1993, p. 334). This belief has been extended to UTAs (Fingerson & Culley, 2001) and is the perspective of this article's author.

To facilitate the use of UTAs in the classroom, the department recently began allowing undergraduate students to earn credit by enrolling in a teaching practicum course. For this credit, they are to offer instructional support to Calculus instructors who are willing to supervise them. This paper describes the first instance of using a former Calculus I student as a UTA in Calculus I during subsequent semesters. I will present my own reflections on the process of supervising her over the course of several semesters as well as the reasons I (and the instructional team for Calculus I) initially sought the assistance of a UTA, the benefits and drawbacks of the experience, as well as some logistics of the entire process and lessons learned to aid us in improving the experience for both faculty who supervise UTAs and for the UTAs themselves. Most importantly I describe the effect of the process on the UTA and how it has affected her collegiate and post-collegiate career plans.

Institutional Context

With simultaneous growth in enrolment and efforts to provide a more active, personalized learning environment for students, there has been a parallel increase in the demand on instructional resources. Indeed, between fall 2008 and fall 2014 we increased our offerings in lower level mathematics courses (Liberal Arts Mathematics through Calculus II) from 60 sections to over 130 sections. The existing instructional pool in our department was not sufficient to implement desired pedagogy and curriculum changes to shift toward more interaction and groupwork in our Calculus I classrooms. In an effort to relieve the instructional need of Calculus instructors, the notion of UTAs was considered and the first, Ann, was enrolled in the teaching practicum course.

Other departments at our institution had successfully been enrolling undergraduates in their own undergraduate teaching practicum courses for years. While there are currently no existing university guidelines for this university-wide course, many departments had developed their own guidelines and requirements for UTAs. The Department of Mathematics had not yet developed guidelines or requirements for UTAs so we treated our experience with Ann as a learning experience wherein we could define both her role and that of her supervisor as her teaching practicum progressed. The only guideline instructors did agree upon was an equivalence of three hours work per week for each credit earned. Therefore, during Ann's first semester, she enrolled in 3 hours of credit and was expected to work roughly 9 hours per week in the support of Calculus I.

While existing UTA programs generally use more systematic processes for selection of assistants and assigning faculty supervisors (Fingerson & Culley, 2001; Mendenhall & Burr, 1983) these processes were more spontaneous in our case. Ann learned of the teaching practicum opportunity by discussing with her GTA (during calculus) how he became a class assistant. From there, she was referred to her instructor then to the course coordinator and her assignment to a faculty supervisor was made based solely on the times she was available to attend calculus classes the next semester.

Ann's Experience

Ann's Experience as a Student of Calculus

During Ann's semester as a student in Calculus I, both the instructor of record for her class and the class assistant were GTAs (one more experienced than the other). One of the primary

responsibilities of the class assistant is to work with students during group work activities. Near the end of the semester, Ann was frustrated in her class assistant's ability to facility effective groupwork. As a disgruntled student, she decided to ask her class assistant how he got his job. He explained the position of GTA to her, and informed her of how she might become an assistant and earn credit for this as an undergraduate.

While Ann didn't have any mathematical preparation beyond the course in which she would be assisting, we felt comfortable using her as our first UTA for two reasons. First, she had just successfully completed the course and was therefore aware of what was expected of the students in the course. Second, throughout the semester she spent as a student in calculus, she was seen by her instructor assisting a classmate who struggled throughout the semester. Her skill to work well with others was thought to be an asset in a class with a focus on active learning and relatively frequent group activities.

Ann's First Day as a UTA

Ann's class assignment was determined by the course coordinator the night before classes began that semester. Therefore, Ann showed up to class on the first day without clearly defined expectations for appropriate classroom behaviour. During that first class, Ann (having just successfully completed the course) was eager to play the role of student in class and answer questions as they arose, already knowing the answers. It became evident that a discussion about her role in the classroom was needed. This was just the first of several instances throughout the semester where it was apparent that the instructional team had made assumptions about the knowledge Ann had with regards to her responsibilities and roles as a UTA.

While there were no predetermined guidelines for the undergraduate teaching practicum in mathematics, there was an initial need of support for grading. Our calculus course was multi-section with hundreds of students each semester. Students use an online homework system for some homework problems, but approximately 50% of homework and all exams and quizzes are completed by hand, requiring many hours of grading. Exams and group work projects are group graded, meaning one grader grades only a subset of problems, but grades these for each student enrolled in the course regardless of which section they are enrolled in. Despite the ever-present need for grading help, the instructional team was aware that responsibility for supervision of a UTA extended beyond grading oversight. However, as this was the first experience for any of the instructors, we decided to learn to navigate the additional responsibilities as they arose throughout the semester.

Ann's Past, Present and Future

Both of Ann's parents were secondary school teachers during her childhood, which greatly affected her career choice. She was always interested in science, but was unsure about what she would do with that career choice. The one thing she was sure of, though, was that she did not want to become a teacher. She maintained this belief during her first two years in college but was still uncertain about her future plans. With an interest in science, she began her college career as a chemistry major and eventually decided that a career in the medical field would be more satisfying. She applied to and was accepted into the university's Medical Laboratory Science program while working as a calculus UTA.

Ann assisted in Calculus I classes for over two years. While the initial need and easiest way to implement additional support was in grading, that was only a small part of her role as a UTA. Over the first few months, and subsequent semesters, Ann took on more and more responsibilities in and outside of the classroom. She proctored exams, graded homework and quizzes, ran help sessions, answered questions related to the online homework platform students used, and most importantly, she assisted in the facilitation of group work in class with the assistance of the instructor and GTA. Ann came to realize one significant contribution she was able to make as a UTA. While working over several semesters, she worked under instructors with various levels of experience, from faculty with over 12 years teaching experience to GTAs in their first or second year of graduate school. After her first semester, she assisted in multiple classes each semester. Classes met most days of the week, and most classes followed roughly the same pace throughout the semester. Therefore, on any given day Ann could have worked with students in multiple classes on the same activity or topic. She soon learned to watch for different ways in which different instructors taught the same material. She also learned how to take information from the classes of the more experienced instructors to the less experienced ones. She began to regularly meet with the more novice instructors before class to discuss what the more experienced instructors had been doing in their classes. Ann felt this to be her greatest contribution to newer instructors.

The experience of assisting others to learn mathematics had significant effects on her career plans. During her first year assisting, her interest in mathematics grew and by the end of the second year, she had changed her major to mathematics, and had decided she wanted to pursue teaching. The experience of working with students had shown her a side of teaching that she didn't get to see from her parents. She realized that not all teaching would be the same and that it was a career she could enjoy. She graduated with her undergraduate degree in mathematics, completed her senior capstone in mathematics education and is currently enrolled in a graduate program in mathematics education.

Discussion

Undergraduate Teaching Assistants are used throughout institutions in various disciplines to provide instructional and administrative support for laboratory or recitation sections and serve as class assistants. Their roles are as varied as their disciplines and institutions. Being a UTA is a way for undergraduates to solidify their content knowledge, gain confidence, gain classroom experience and prepare for leadership positions. For an instructor, having a UTA in the class can provide both administrative (attendance tracking, grading, data entry) and instructional (non-traditional pedagogy implementation, active learning assistance) support in the undergraduate classroom.

One benefit of having Ann as an assistant for several semesters was that she was well prepared to assist instructors as needed with little direction after her first semester whereas GTAs who are new(er) to the course each semester required more time spent by instructors informing them of course policies and procedures and in implementation of course-specific curriculum. Roughly half of our GTAs are Master's students, many of whom spend two years or less in our program, so their progression through GTA assignments moves rather quickly to enable them to teach their own class before degree completion. This results in a relatively quick turnover in GTAs assisting within any given course. The availability of a reliable individual each semester who needed little oversight was an asset to the instructional team.

However, there were also unanticipated benefits to both Ann, and to the instructors who supervised her. Her greatest instructional contribution was her ability to take information from experienced instructors' classes to novice instructors. The UTA can present this information from the perspective of a student in the class, as well as from that of an assistant working with students providing the novice instructor with information that would not be present if the more experienced instructor were to simply tell the novice instructor how they teach certain topics or lead certain activities. This role has been emphasized as a role of UTAs in subsequent semesters when UTAs assist multiple instructors, including novice GTAs.

The greatest unanticipated benefit Ann received from her experience cannot be understated. While she entered college not knowing what she wanted to do for a career, she was sure about what she didn't want to do—teach. However, as she gained confidence in her mathematical ability, her interest in mathematics increased as well. This increased interest led to an eventual change in academic and career plans, leading to one completed degree in mathematics and an advanced degree in progress.

While the opportunity to work with this specific UTA presented itself to course instructors and coordinators in this case, future endeavours to recruit, select and assign UTAs will be more systematic. Instructors should be involved in choosing their own UTAs as opposed to having them assigned to their classes based on schedules. They should be chosen based on personality traits which the instructors feel will most benefit the instructor, the UTA or the students depending on the ultimate goal of the instructor in overseeing the UTA throughout the semester. Clear expectations of classroom behaviour and conversations about the goals of the UTA and the goals of the instructor will occur before the assignment begins.

In addition, many of our majors do not declare mathematics as an academic major until well past the level of calculus, usually in their third year after taking many upper level mathematics and science classes. Indeed, very few students enter the university with a declared major in mathematics. While Ann made her decision roughly during her third year (the same time that most of our majors do), she had only taken Calculus I. With a more systematic approach to recruiting UTAs early in their mathematical careers, specifically from within the most successful Calculus I students, we have the opportunity to attract more mathematics majors earlier in their academic career providing them with more opportunities to explore mathematics and mathematics education at deeper levels and to pursue undergraduate teaching.

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