

Teaching Assistants Thrive in a Collaborative Team: A TA Development Case Study

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Abstract:

It is time to critically examine how Teaching Assistants (TAs) learn to teach and how they develop as educators. This exploration informs the design of courses to effectively foster TA professional development and deliver the best possible quality of instruction for undergraduates. Here we describe how the collaborative and multi-disciplinary First-year Seminar in Science (SCIE 113) educational team at the University of British Columbia (UBC), composed of graduate students and faculty members who teach the course, and a staff member who coordinates and supports the course, learn from and with each other. Our team approach creates a unique environment for TAs to grow and develop as educators, a higher level than the more common TA training. We describe multiple unique roles that TAs play in this course, showing that as contributing members of a team, they learn about teaching, curriculum development, mentorship, and leadership through observation, practice, collaboration, and reflection. The result of this approach is TAs who are well-prepared for the immediate demands of the classroom, have experienced and contributed to curricular design, have the opportunity to create and reflect on their own teaching philosophies and to apply the skills, knowledge and attitudes honed in SCIE 113 to other teaching endeavours.

Key Words:

First-year seminar in science, teaching assistant (TA) development, teaching philosophy, TA roles, graduate students, teaching team.

Introduction and purpose of study

The roles of graduate student Teaching Assistants (TAs) in post-secondary institutions are often underappreciated. This is unfortunate because undergraduates typically spend a large proportion of their class time interacting with their TAs (Gardner & Jones, 2011; Kendall & Schussler, 2012). TAs are often in ideal situations to enhance student learning, and to recognize and provide extra support to students who are having difficulties in class. Furthermore, providing opportunities for TAs to meaningfully engage in teaching can encourage the acquisition of leadership, collaborative, and communication skills that benefit their future careers (Park, 2004).

Many post-secondary institutions offer seminars, workshops and resources to train and prepare TAs for their pedagogical responsibilities (Burke et al., 2005; Gardner & Jones, 2011; Harris et al., 2009). For example, the Instructional Skills Workshop (ISW), offered at the University of British Columbia (UBC) through the Centre for Teaching, Learning and Technology (CTLT)

http://wiki.ubc.ca/Documentation:CTLT_programs/ISW_Grad_Students is a staple professional development opportunity for both TAs and faculty members. This workshop provides TAs with an arena to experiment with different teaching methods by leading several “low stakes” short lessons and receiving feedback from peers in a variety of formats. Additionally, the UBC Biology program

http://wiki.ubc.ca/TA_training/Overview/Biology offers BioTAP workshops spanning two terms that offer ongoing support and training for TAs to discuss and improve their teaching. Topics include facilitation strategies for active learning, anti-oppression, inclusivity and diversity in the classroom, amongst others.

While professional development and training programs typically aim to support and improve TA instruction at the tutorial and/or laboratory level, scholars are advocating for TA opportunities that engage them in all aspects of a course (e.g. curriculum development, teaching, assessment) and help them with their own development as instructors (Kendall & Schussler, 2012; Park, 2004). We adopted this TA development approach in a First-Year Seminar in Science course (SCIE 113), which brings together graduate students, faculty members, and staff, who learn from and with each other to enhance undergraduate learning.

In this case study, we describe the many positive attributes that TAs develop as a result of their participation in this course, considering this to be a higher level than training TAs how to teach. More specifically, we describe the multiple, and in several cases, unique roles TAs take on in SCIE 113, and explore how these experiences are developmental in nature, helping TAs hone skills, knowledge, and attitudes, often culminating in a teaching philosophy statement and/or portfolio that they can apply in future teaching endeavors. This study not only allows us to share the successes of how SCIE 113 contributes to TA development, but we hope, also offers others ideas as we feel this approach is applicable to other courses involving TAs, regardless of the discipline or level.

Overview of the First-Year Seminar in Science (SCIE 113)

SCIE 113 was developed to offer first-year science students an enriched educational experience. This writing intensive course engages students in interactive and collaborative activities and promotes learning of scientific argumentation and writing skills (Fox et al., 2012; Birol et al., 2013). In-class and out-of-class activities allow students to frequently discuss, debate, and defend their views of science in small group settings. Since its inception in 2010, SCIE 113 has been a model of collaborative course design, instruction and ongoing research and development (Fox et al., 2013).

Each term, this multi-section course is co-taught by a unique team of faculty members and TAs drawn from across every department in the Faculty of Science. Class size is limited to 27 students with one faculty member and one TA assigned per section. With up to 18 sections offered per year, a large team of faculty and TAs (some new, many returning) make up the course instructional team and teach from a common curriculum. We are fortunate in often having TAs return in subsequent terms, hence the relatively low number of TAs involved in the course to date. Course materials, in both hard copy and online, help faculty and TAs to effectively and efficiently lead their classes. A common syllabus, learning objectives, grading rubrics and assignments across sections ensure consistency, while class lesson plans are fine-tuned by each member of the instructional team to make it their own. A staff member, the course coordinator, coordinates SCIE 113, works with the course director to update course materials including a website and blog with input from the team, and leads professional development for the teaching team throughout the term including at bi-weekly instructional support meetings. Ongoing discussions about course development and improvement also lead to conducting and disseminating research at workshops, conferences and through publications (e.g. Cassidy & Fox, 2013; Welsh et al., 2013). The interdisciplinary make-up of the instructional team, the purposeful inclusion of TAs, the unique curriculum, and the active learning in the small classes sets up an environment primed for collaboration and learning about teaching.

Prospective TAs are identified through an application process including an expression of interest and a resume and/or teaching portfolio, followed by an interview with the course coordinator and their response via email to a typical question a student might ask of the TA. A mix of TA and/or other teaching or facilitation experience, ability to communicate clearly and appropriately in writing, and expressed enthusiasm for the unique TA roles in SCIE 113 are considerations in choosing TAs to fill any open slots. Each graduate student is hired for a full TA load, including TAing two course sections and related work, for 12 hours per week (192 hours per term). This is the same workload as other TAs at UBC and meets TA union rules.

One of the unique aspects of course is the multiple roles of the TA. Most science TAs tend to be responsible for attending lectures and facilitating labs or tutorials (Gardner & Jones, 2011; Park, 2004; Pentecost et al., 2012), often using prescribed materials. In SCIE 113, TAs are engaged with all aspects of the course, being at every class, co-teaching parts of or whole classes with faculty, engaging with students both inside and outside of class time, providing feedback on student writing, and tracking participation, including homework completion. TAs are active participants and contributors at the bi-weekly instructional support meetings. SCIE 113 encourages each

TA to not only teach in their own style in collaboration with faculty members, but also to help develop course materials for use by the whole team.

These interactions with the faculty, the students, and the course coordinator provide TAs with the opportunity to discuss, evaluate, and enhance their views of science and teaching. As such, SCIE 113 is an excellent course for TAs who are interested in developing or honing his or her own teaching philosophies, and who want to go beyond the typical TA experience.

Methodology and background

This article shares our experiences of how SCIE 113 contributes to TA development and offers ideas for how others may adapt, adopt, or add to the information/ideas we present to promote dynamic communities for teaching and learning. We use an interpretive, (Creswell, 2009; Erickson, 1998) case study (Merriam, 1998; Stake, 1995; Yin, 2003) approach to frame and analyze this work. The data represents an amalgamation of the individual and collective perceptions of TAs and instructors in SCIE 113, collected by the course coordinator in a series of semi-structured interviews (Bogdan & Biklen, 1998) from 2011-2013.

During the interviews, the TAs were asked to describe: their perceived successes as TAs; changes they would make to the course and their teaching; advice for facilitating positive student interactions; why other graduate students should consider acting as a TA in SCIE 113; and how the course has influenced their teaching practices and philosophy. A total of 13 TAs have been involved in SCIE 113 since its inception and all have consented for their interview responses to be included in this study.

The TA roles were identified through analysis of the interviews and further contributions by TAs, three of whom are authors, providing additional insight into the roles of TAs in SCIE 113. Furthermore, the interview responses from two faculty members were included to highlight the collaboration among instructors, the TAs, and the course coordinator. We apply these data to present a model of TA development within SCIE 113 that demonstrates how TAs can become engaged, scholarly, and reflective teachers. This study was conducted using an ethics protocol for human subjects approved by the Behavioural Research Ethics Board at UBC (BREB # H10-01749).

TA Roles in SCIE 113

Within SCIE 113, TAs play a variety of roles (Table 1). These include traditional ones (A-E) that are common to other courses and across disciplines (Gardner & Jones, 2011; Park, 2004; Pentecost et al., 2012; Rosales et al., 2013), including facilitator, liaison, mentee and student mentor. While these roles are embedded within most undergraduates courses for which TAs are hired, scholars call for additional opportunities that cultivate and broaden TAs understanding of effective teaching and to include them in all aspects of instruction and course development (Pentecost et al., 2012; Rosales et al, 2013).

SCIE 113 offers TAs opportunities to take part in additional roles, which we see as being unique (F-I), including instructor, mentor for faculty, course developer and collaborator, and scholar.

Table 1. Summary of traditional (A-E) and unique (F-I) roles that TAs play in Science 113

TA Role	Detail
Traditional TA roles	
A. Facilitator	Leading portions of class or assisting primary instructor
B. Marker	Providing feedback to students
C. Liaison	Between sections or classes
D. Mentee	With faculty members
E. Student Mentor	To undergraduates in class
Unique TA roles in SCIE 113	
F. Instructor	Leading entire class, with or without faculty member present
G. Mentor for faculty	Especially working with instructors new to the course
H. Course Developer and Collaborator	Working with faculty and staff for ideas and creation of materials
I. Scholar	Through research, conferences and publications

It is the combination of these nine roles that makes SCIE 113 a unique experience for TA development. The following section draws from the semi-structured interviews and explores the roles in more detail.

A. Facilitator

In many science courses, TAs are responsible for facilitating tutorials, labs, and/or discussion seminars of roughly 30 students or less (Gardner & Jones, 2011; Rosales et al., 2013). Within these settings, the TA is responsible for guiding students through experiments, problem-solving and/or readings and also instructing students on new and/or difficult concepts (Gardner & Jones, 2011; Pentecost et al., 2012). In SCIE 113, the small class sizes and focus on interactive teaching methods permit TAs to interact with the students in additional ways each class. During group work, the TA and faculty instructor often circulate the classroom to monitor and engage in students' conversations. These small group interactions not only help to build community within the classroom, but allow a TA to monitor group dynamics among the students. As the term progresses, TAs can watch for and intervene with dominant, quiet and/or disengaged students to help create a more inviting atmosphere.

As the semester progresses, I take notice of how the students are participating within both large and small group discussions. In my experience, there tends to be about five students who dominate the conversation, and others who rarely speak. To mediate this situation, I chat one-on-one with the dominant-speaking students, acknowledge their informed participation, and ask them to be a group mediator during the small group discussions. As the mediator, they monitor that every student has the opportunity to share their ideas with the group and that each time, a different person reports their ideas to the whole class discussion. In

addition, if I hear quiet students mention or write something interesting about our discussion topic, I walk over and encourage them to share this thought with the whole class. I have noticed that over time, these strategies help the discussion to change from a few dominant voices to a variety of voices. – *SCIE 113 TA*

B. Marker

Marking assignments, laboratory reports, and/or midterms is a common task for most science TAs (Gardner & Jones, 2011; Pentecost et al., 2012). In SCIE 113, a key duty of TAs is to track and assess students' participation during class time and their homework completion; components (15%) of the final mark. The participation grade is determined at the end of the semester so throughout the semester, the TA offers personalized formative feedback to the students about their progress and how they can improve their participation and grade.

Midway through the term I give each student an index card with a grade that reflects their current level of participation in the course. The card also contains written comments that acknowledge students' current contributions and that provides suggestions to improve their participation and grade. Upon receiving the cards, many students approach me and ask for elaboration and clarification on my comments and grading. This process opens up a dialogue about how students can enhance their current participation and engagement in the class. – *SCIE 113 TA*

In addition to the participation grade, TAs also mark and comment on worksheets (7% of final grade) that students complete prior to and during a Speaker Series that occurs bi-weekly throughout the semester. Weekly homework assignments also allow TAs to regularly monitor students' progress and understanding of the course material, providing feedback and building a positive rapport between students and TAs within each section.

C. Liaison

Each TA works with two different faculty members, over two sections of the course that are scheduled consecutively. This leads to an additional collaborative effect where TAs can relay successful strategies from one section to the next, avoiding or reworking for maximum effect. Faculty find this to be very helpful and come to ask their TA "So, how did it go last section?"

As a new instructor of the course, I found it invaluable that my TA could relay tips and ideas on what worked best from the section of the class they TAed immediately before mine. – *SCIE 113 Faculty member*

SCIE 113 TAs have the unique ability to share their challenges and the successful strategies they used to overcome them not only in the next section, but with other TAs in concrete ways, through discussions at team meetings and creation of shared materials.

D. Mentee with faculty

In addition to the hard copy and electronic course material, SCIE 113 supports TAs through a network of faculty from whom TAs can observe and learn. TAs receive mentorship, guidance and strategies from the faculty members with whom they teach through informal emails or face-to-face discussions, by observing faculty in the classroom then reflecting on their methods, through supervised practice and peer evaluation, and in ongoing discussion with other TAs and instructors at team meetings.

From our experience with other courses, and within the literature, faculty members typically decide how the course proceeds with no or minimal TA input (Rosales et al., 2013). Bomotti (1994) notes that successful mentorship of TAs are more likely to occur “if the TAs and their supervisors are working from a basis of shared interests and understanding to begin with” (p. 289). The bi-weekly course team meetings, taking place throughout the term, are chances for both faculty and TAs to discuss curricular and day-to-day challenges. Everyone benefits by seeing how different teaching philosophies coincide and aid in the evolution of the course over the term. SCIE 113 TAs find these team meetings to be crucial in their understanding of the limitations, concerns and possibilities of post-secondary teaching. These ‘behind the scenes’ insights provide TAs with a much broader context of course development and academia in general, which is necessary if these ‘faculty of the future’ are to improve the quality of student learning.

TAs also benefit by observing faculty members from diverse scientific disciplines that have individual pedagogical styles. TAs can observe how faculty approach students with different backgrounds and interests, how they encourage critical thinking and how they deal with setbacks. Asking questions, offering ideas, and reflecting on their own teaching practice after each and every class is common in SCIE 113.

During the developmental process, it is important for TAs to have continual feedback and support with regards to their teaching (Gardner & Jones, 2011; Pentecost et al., 2012). As such, TAs can develop their teaching skills with collaborative, real-time feedback (Bomotti, 1994).

In my first term TAing this course, I very much enjoy working with the students and leading segments of class; it increased my confidence to teach first-year science students and allowed me to develop my own teaching skills. – *SCIE 113 TA*

I find in working with the TA that we are at times almost interchangeable. The TA is fantastic and I don’t know what I would do without them. – *SCIE 113 Faculty member*

E. Mentor for undergraduate students

By developing relationships with students, TAs play an integral role in many aspects of student development and learning. Even though smaller classes, like SCIE 113, are less intimidating than traditional first-year science courses, students often seek guidance from or interact more with their TA than their instructor (Bomotti, 1994; Gardner & Jones, 2011; Park, 2004). This happens in SCIE 113, perhaps because many students feel they “connect” most easily with their TA, and as graduate students,

TAs can relate to undergraduates' concerns as they may have recently experienced such issues themselves. Throughout the term, SCIE 113 TAs communicate regularly with students in class, through email, and during office hours.

Engagement with students throughout all aspects of the course helps TAs to see how individual students' learning and engagement develops and how best to support student performance and well-being. Students often express to TAs their difficulties with such things as transitioning to university, with language barriers, and with balancing their workload. Park (2004) states that:

a variety of practical issues have to be addressed successfully by any GTA (Graduate Teaching Assistant) intent on performing the role properly. Among the more obvious is the GTA's knowledge of and, thus, ability to advise undergraduates about the availability of campus resources such as study skills help, academic advisory services, special needs services, library and IT facilities, career advice and health services (p. 353).

This additional responsibility for supporting student success beyond an individual course however, requires further support and training to assist TAs with advising students. Ongoing discussions on ways to do this in the context of SCIE 113 take place during the team meetings, in one-on-one discussions with faculty and the course coordinator, and through resources developed by previous TAs. One TA created a list of support resources for other TAs to use when meeting with students.

F. Instructor

Hammrich (2001) notes the common perception that knowledge of the subject matter would be sufficient enough for teaching, but in reality, successful student learning involves assessment of undergraduates' prior knowledge, the importance of conceptual learning, and knowing that the role of the educator is not to transmit knowledge but to facilitate learning. It is difficult to convey this except through practice. In SCIE 113 TAs are encouraged to lead portions of class (e.g. leading discussions, facilitating exercises, and in some cases, team-teaching with faculty member). TAs also have the opportunity to teach an entire class with or without the faculty member present. This model allows both instructor and TA to offer and receive feedback on their teaching to help refine their approaches.

During interviews with prospective TAs, the course coordinator explains that we encourage TAs to take responsibility to plan and lead some classes themselves. The course director explains this to prospective faculty instructors as well.

When I told one of the instructors that I would be leading class in the section before hers, she suggested I also lead her class even though she would be there. I found this an excellent opportunity to receive feedback from a skilled faculty member and valued the opportunity to teach while she was in the room. –
SCIE 113 TA

In some classes, I would teach half the class and the faculty member would teach the other half. This tag-team method worked well for us, especially because I would have come right from the previous section and had figured out some difficult portions of that particular class. The real-time feedback would

occur right after class when we walked back to our respective buildings and discussed how things worked. – SCIE 113 TA

G. Mentor for faculty

Throughout SCIE 113, the faculty offers valuable, constructive feedback and advice to the TAs to enhance their teaching. TAs also act as mentors to the faculty in a reciprocal relationship, especially for faculty instructors new to SCIE 113. TAs offer feedback and advice from their prior experiences in classroom management and lesson planning, which may range from ways of keeping track of participation and homework, to strategies in helping weaker students and encouraging inclusivity. As an example, one use of technology in the course can be easier for experienced TAs to explain.

One of the assignments in SCIE 113 has students use a software program called Calibrated Peer Review (CPR; Russell, 2005). While this program is an excellent platform to test/support students to become more effective reviewers and to receive feedback on their learning, the students require training in order to navigate the system. As a returning TA to SCIE 113, I was familiar with the CPR system, however the faculty member I was instructing with had never used or heard of the program before. In order to get us on the same page, we met outside of class and reviewed the CPR system together. In addition to this, the faculty member asked if I would present the CPR system in class (via a 10-minute presentation) and field any questions the students had throughout the process. – SCIE 113 TA

As a result of experiences such as this, it has become the standard that all TAs are the main point person for providing a CPR overview in class and fielding questions.

H. Course Developer and Collaborator

Having TAs contribute to course development and pedagogy creates a supportive teaching community that enhances TA satisfaction and undergraduate learning (Milner-Bolotin 2001, Pentecost et al. 2012). SCIE 113 TAs are encouraged to incorporate new ideas and teaching approaches into the course on an ongoing basis both formally, for example, at team meetings, and informally through emails or during one-on-one conversations. Furthermore, as the primary contact for undergraduates in a given course, it is critical that TAs are included with the development and assessment of the course curriculum and pedagogy because they are most likely to observe where students need more support (Pentecost et al., 2012).

Besides providing feedback on course pedagogy, course development is an inherent aspect of TA development in SCIE 113. The course coordinator and director ask TAs to contribute not just feedback for leading classes, but also for their views and suggestions on the structure of the course and materials.

SCIE 113 course materials contain documents created by previous TAs and instructors, such as an overview of the tasks TAs do to help faculty.

As a new TA, I struggled to determine what my precise role in the class was due to the unorthodox, collaborative relationship between instructor and TA. Hoping to support future TAs who would likely encounter the same challenge, I created a

document entitled “What might my instructor expect of me as a TA?” which contained a discussion of the responsibilities that my fellow TAs and I had as SCIE 113 TAs and advice regarding instructor-TA communication strategies. – SCIE 113 TA

Other examples of activities developed by TAs that have become part of the course include student activities such as writing exercises and tips on writing abstracts, resources for students including a list of tutoring web links that TAs can share with students during office hours.

Over the years that I have TAed various courses, I have noticed that students often have difficulty citing their sources correctly in their essays, even with the numerous examples given in class, online, and in person. I designed a one-page assignment: the first part required students to cite and write bibliographies based on some references I provided, and the second part required students to rewrite some examples of citations and bibliographies with common mistakes. This exercise was originally developed after consultation with an instructor for only one section, but now it will be implemented as part of the course work for all sections. – SCIE 113 TA

I. Scholar

SCIE 113 integrates the scholarship of teaching and learning (SOTL) into the teaching and ongoing development of the course. A key attribute of SOTL is that approaches and findings are shared publicly. TAs have been involved in a number of SOTL-related activities including research, conference presentations and publications. While SCIE 113 is only entering its fifth year of instruction, there is a consistent representation of TAs within these various scholarly endeavours:

- Presentations at local and national conferences, e.g. Cassidy et al. 2013; Fox et al., 2013, Welsh et al., 2013; Cassidy and Fox, 2012; Friedman et al., 2012.
- Publications in peer-reviewed journals and collections, e.g. Birol et al., 2013; Fox et al. 2013, Cassidy et al., in preparation
- Contribution to data collection, entry and analysis, .e.g. Birol et al., 2014

Development of a Teaching Philosophy

The combination of roles that TAs play in SCIE 113 allows them to develop a more enriched vision of and experience with teaching. This experience has led several TAs to take the initiative to articulate and/or expand on their own teaching philosophy and in some cases, to share this on their personal or professional webpages.

Graduate student TAs who are interested in further pursuing teaching opportunities at the post-secondary level as professors, instructors, or in other capacities, ideally will formulate their own teaching philosophy statement as part of a Teaching Portfolio (Seldin et al., 2010). This document is not only an expression of one’s teaching style, but it is a venue for stating their goals and envisioning steps to achieve those goals. Moreover, it provides evidence demonstrating how one’s efforts have improved student learning (UBC Centre for Teaching, Learning and Technology <http://ctl.ubc.ca/resources/teaching/portfolios/>). Something that SCIE 113 provides that

teaching and learning workshops do not is a natural, collaborative, ongoing, continuously evolving, realistic, and unthreatening learning experience. In SCIE 113, TAs are an essential part of the educational team and are involved in nearly all aspects of the course on a regular basis. They experience routine mentorship and exposure to a myriad of different teaching methods. This gives them ample opportunity to develop their teaching philosophy through teaching itself, self-reflection, and receiving feedback and encouragement from their peers and their mentors, including members of the faculty and the staff. While we found little literature specifically addressing the impact of teaching experiences on a TA's ability to create a teaching philosophy, Park (2004) highlighted the benefits of mentoring, reflection, and professional development in graduate student TA programs in North America. We suggest that the same activities that inform TAs how to teach effectively inherently lead to the development of a teaching philosophy, which is a learning tool in itself.

The cyclical practice of reflection and hands-on experience, that SCIE 113 TAs engage in mirrors the theory of reflective practice and experiential learning summarized by Rodgers (2002) and Osterman and Kottkamp (1998), in the tradition of theorists such as John Dewey, and thus provides rich soil for TAs to cultivate their own teaching philosophy. For instance, Dewey (1944) theorized extensively on the process of systematic reflective thought and posited that explaining your ideas to another person forces you to see the strengths and shortcomings in your reasoning.

By contemplating and communicating the degree of success of particular activities and implementing suggested improvements, TAs can consider best practices, identify personal strengths and weaknesses, set goals for the future, and constantly refine their teaching philosophies. Indeed, Robinson et al. (1997) found that reflective practice helped GTAs reconcile their theoretical and actual teaching strategies, which ideally should be one and the same.

The content and process of the course also contributes to a highly specific aspect of a teaching philosophy, that being student-centered learning. Because assignments and discussions tackle issues that arise at the intersection of science and everyday life, the material is necessarily up-to-date and endlessly evolving. Being part of the kinds of conversations that arise during class underscores the inestimable value of designing course materials that are relevant to students thereby inspiring intellectual investment and student-driven inquiry. This observation echoes the work of Kember et al. (2008) who asked students what the primary motivators of their learning were and found that students were strongly motivated by subject matter that was relevant to them.

Conclusion

SCIE 113 encourages staff, faculty, students, and TAs to engage collaboratively and actively. Together, they evaluate the importance of the nature of science, scientific argumentation and writing, and their views of science in society. TAs' personal observations of and frequent interactions with students (both inside and outside of the classroom) help to create a positive space for teaching and learning in a first-year science course. During team meetings, TAs provide fresh and thoughtful feedback about course activities and related student perceptions and attitudes, insights that inform and improve current and future iterations of SCIE 113.

The emphasis on collaboration, mentorship, teaching, and learning within SCIE 113 supports an engaging teaching environment where TAs are integral in course development and pedagogy. As discussed by Bomotti (1994):

The higher education community is encouraged to refine its thinking about teaching assistantships. Most immediately, teaching assistantships should be upgraded from the level of convenience or necessity to the level of opportunity – an opportunity to improve undergraduate instruction and to nurture future professors (p. 372).

In future work, we aim to describe the suite of TA experience and development during SCIE 113 in terms of skills, knowledge and attitudes in a model and develop related survey instruments for TAs self-assessment at various stages of their teaching careers.

In SCIE 113, TAs wear many hats: they act as facilitator, liaison, marker, mentee, mentor to both undergraduates and faculty, instructor, course developer and collaborator, and scholar. The multiple and unique opportunities that SCIE 113 offers engages TAs and encourages them to reflect upon and further develop skills, knowledge and attitudes during their time as a TA. Multiple roles offer TAs different perspectives. Their development of a teaching philosophy comes from reflecting on these multiple roles. The result is practical solutions to the realistic challenges of curriculum development and communication with staff, faculty instructors and other TAs to come up with the best teaching strategies, helping TAs in their current and future teaching endeavors. This approach is applicable to courses in a variety of disciplines, levels, wherever one or more TAs are involved. We look forward to reporting on two such examples at UBC, as SCIE 113 is being adapted for a first-year course in the Faculty of Land and Food Systems, and for the new Vantage College for international students, both to start in the 2014-2015 academic year. We are happy to collaborate with colleagues who teach or coordinate courses regardless of discipline.

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Biographies

Alice Cassidy is Course Coordinator for Science 113 in the Faculty of Science and is developing a new course based on it for the Faculty of Land and Food Systems at the University of British Columbia. She is a science educator and educational developer.

Jaclyn Dee is a Ph.D. student in the Department of Botany at the University of British Columbia. She is investigating the genetic bases of major transitions in fungal evolution. While she has been a Teaching Assistant at UBC since 2008, Jaclyn had her first taste of the SCIE 113 experience in 2012.

Joanne Fox was the inaugural Director of First Year Seminars in the Faculty of Science at the University of British Columbia. She co-designed Science 113 and is a

Senior Instructor at the Michael Smith Laboratories and in the Department of Microbiology and Immunology. She is currently working with UBC Vantage College to design a new first year International Program that incorporates SCIE 113.

Vivienne Lam is a Ph.D. student in the Department of Botany at the University of British Columbia. Her research interests include the phylogenetics and plastid genome evolution of mycoheterotrophic plants. She has been a Teaching Assistant for over five years for 1st through 3rd year biology courses. She has TAed SCIE 113 for three terms since 2012.

Ashley Welsh is a Ph.D. student in the Department of Curriculum and Pedagogy at the University of British Columbia studying undergraduate science students' metacognition, learning, and experience. She has been a Teaching Assistant for SCIE 113 three times since 2011 and an active contributor to research on teaching and learning on SCIE 113.

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