Introduction / Problem Statement

Many universities rely on graduate teaching assistants (GTAs) to teach college courses or their components (e.g., laboratories, recitations, seminars). For example, for doctoral institutions, Belnap and Allred reported that 75.5% of mathematics GTAs had such duties [1]. However, despite the wide use of GTAs, their preparation to teach remains a concern. Indeed, the amount of training GTAs receive varies greatly across universities and departments. In some cases, training is not provided to them at all; when it is provided, it can take several forms. Most commonly, GTAs receive a short-term training prior to the beginning of the semester in which they are assigned with teaching responsibilities [2,3]. Sometimes these trainings are accompanied by workshops conducted throughout an academic year [4]. Another type of GTA preparation is course-based [5–7]. Here, GTAs are invited or required to complete a course on teaching basics – essentially, an expanded version of short-term trainings. One variation of a course-based preparation is a course not on teaching per se but on action research in the classes GTAs teach [8]. In such a course, students are required to conduct an educational research project.

Overall, Ellis, Deshler, and Speer found that long-term courses or seminars are implemented by 37% of participating institutions, multi-day workshops by 23%, and one- to four-hour long workshops or orientations by 17% [9]. Combinations of these formats also exist. For example, in a study of calculus GTA preparation programs, three models were identified [10]. The Apprenticeship model is a one-time seminar followed by faculty mentorship in a course that the GTA will be teaching. The Coordinated-Innovation model includes a weeklong seminar on innovative teaching followed by teaching a course; a faculty member provides coordination of major class components and also conducts classroom observations and holds meetings with the GTA. The Peer-Mentor model consists of a seminar prior to the beginning of the semester and ongoing seminars during the semester; all seminars are developed and conducted by experienced GTAs. Besides these most common forms and their variations, GTA preparation is also conducted through GTA learning communities [11] or faculty learning communities (FLCs) [12] with the latter receiving little research attention. In this study, we aimed to address this gap and explore GTAs' experiences in a FLC.

Literature Review

FLCs are fairly common in the area of faculty professional development. Across the U.S., a number of FLCs have been implemented with a primary goal of improving instructors' teaching [12–24]. A typical FLC organization includes regular meetings during which members discuss teaching and learn from each other, a facilitator, the literature, and/or other sources. FLC members are often strongly encouraged to try in their courses what they have learned in an FLC, whether while they are part of the FLC or at a later time. Participation in FLCs is typically voluntary; however, sometimes members are provided with a stipend or a completion certificate. FLCs also range in size from several participants to several dozen participants, though smaller FLCs are more common. FLCs differ in a delivery format (face-to-face vs. virtual), as well.

Research on FLC effectiveness has identified both pros and cons of FLCs. The pros include learning gains [13,15], appreciation of having teaching conversations with peers [12,14], reforming members' attitudes toward innovative teaching [19], and motivating members to make changes to their teaching [17,20,22,23]. The cons include faculty's time constraints [12,14] and scheduling issues [13,16],

as well as the lack of university value for teaching [14] and priorities different from teaching [19]. Despite these challenges, FLCs tend to be more effective than workshops or other types of develop-disseminate models in improving teaching [25]. One of the main reasons for favoring FLCs is the need for professional development to provide ongoing support for instructors in their teaching efforts [26], a need supported by the research in K-12 [27].

While common in faculty professional development, FLCs are rarely used for GTA professional development, especially in a combined (faculty and GTAs) form. The FLC of Zemke and Zemke included one GTA, but their study did not focus on his/her experience in it [12]. Thus, in this study we aimed to explore GTAs' experiences in a FLC that included both faculty and GTA participants. Specifically, the following questions guided this study: Who were the GTA FLC participants? How did their involvement in the FLC occur? Did they benefit from their participation in the FLC, and if so, how? What concerns and suggestions did they have?

Methods

Context

The project: Supported by an NSF WIDER grant, the project on which we report focuses on scaling the SIMPLE Design model for teaching development to be active in several STEM departments at a large public institution. At the heart of the SIMPLE model is the idea of ongoing learning communities in which instructors learn about evidence-based teaching practices, try new evidence-based strategies in their courses, and receive feedback and support in that process [28,29]. The conceptual framework for the groups is built on the five SIMPLE principles: Sustainable, Incremental change, Mentoring, People-driven, and Learning Environment focused, which were discussed in detail in a previous paper [28]. Because SIMPLE group activities were driven by participants' needs, some groups' activities included elements beyond teaching innovation, such as curriculum design and educational research. Groups range in size from 4 to 10 people with some members more active than others. Group members include both tenure-line and teaching-only faculty. The group described in this paper is unique in that it also includes graduate teaching assistants as integral members of the group.

The Design element of the SIMPLE Design model emphasizes that improving teaching is viewed as an iterative design process. The ideal vision of a SIMPLE group is that members identify needs in their teaching and/or student learning, select an approach to addressing the needs, implement the approach, assess the result, and make modifications before implementing it again. (The extent to which members are implementing techniques that are new to them varies, but the model also encourages instructors to reflect on their existing teaching practices.) SIMPLE group members are asked to write design memos that document their process in implementing a new strategy. Design memos typically describe the strategy itself, why it was chosen, the type of course in which it was used, if/how new activities were graded, how students responded, and lessons learned for future implementations. Design memos serve both as a means to share strategies and insights with other instructors and to provide a structure for reflecting on one's teaching.

The group: The group in question included a group leader, faculty member participants, and graduate students. The number of participants varied across the two years during which the

group was studied, typically not exceeding 10 participants at a given time. In this study, we focused on four graduate students, all of whom were doctoral students and experienced GTAs. Three students participated during the first year with one continuing in the second year. The fourth student joined the group during the fourth semester. Three students were female; one was male.

The functioning of the group differed in years one and two of the study. During the first year, the group had two directions of work. First, it aimed to help members improve their teaching by providing them an opportunity to discuss their teaching and to learn about new teaching practices they might like to try. In addition to sharing their teaching experience, participants read and discussed educational research literature. Second, the group aimed to support participants in learning about and conducting educational research; participants' educational research projects were frequently discussed as part of the group meetings. During the second year, the group's focus shifted toward work on curriculum development for a new concentration in the department. In both years, there also was a significant emphasis on the creation and discussions of design memos.

Data Sources

The primary data source was interviews with graduate student participants; these interviews were conducted after each year of the project. A total of five graduate student interviews were used for this study; the student who participated in the SIMPLE group for two years was interviewed twice. Supplementary data included interviews with a group leader and faculty participants (a total of five). Only first year faculty interview data were available at the time this paper was written. In all interviews, participants were asked about their teaching and their experience with the SIMPLE group. Prior to the analysis, all interviews were transcribed.

Data Analysis

We conducted two cycles of data coding [30]. During the first cycle – initial coding of data – we split the transcribed data into segments and summarized those segments in words or short phrases. Those labels were later grouped into categories during the second cycle – pattern coding. Following the two cycles of coding, for graduate students' interviews, we developed a matrix display for a cross-case analysis – a partially ordered meta-matrix [30]. The columns of this matrix contained pseudonyms of graduate students; the rows contained developed categories. The cells consisted of initial codes from particular categories assigned to data segments in interviews of particular students. The matrix then was analyzed for commonalities and differences among cases within each category. The categories and codes related to graduate student participation were also retrieved from faculty interviews. This information was used to supplement and/or verify the data collected from the students.

Results

GTAs who participated in the SIMPLE group described above were invited to participate either by the group leader or by GTAs already participating in the group. All four GTAs joined the group as a result of their interest in teaching. They considered participation in the group to be an opportunity to improve their own teaching and/or STEM teaching in general, though most of them did not have specific expectations for the group. These GTAs were interested in teaching because they recognized the importance of teaching excellence in undergraduate education. As

GTAs, they were required to teach courses during their Ph.D. studies. All four students expressed a strong interest in pursuing a career in academia after graduation. As teaching would play a significant role in an academic career, the students strived to do it well and provide their current and future students with high quality learning experience.

Participating GTAs taught courses at varying levels during their PhD studies, though the most common assignment was to laboratories and lectures in introductory-level courses. All participating GTAs taught their courses in an innovative way, focusing on providing students with opportunities to engage with each other and with the course material. These GTAs aimed to embed in their courses as much active learning and discussion as the class allowed. Particular active learning strategies included whole-class discussions (prompted by iClickers in large lectures), group discussions, presentations, quizzes, and other activities. One GTA also developed a distance-learning version of a course s/he had taught previously in a face-to-face format. Notably, the distance-learning version also included active learning components (e.g., questions embedded in lecture videos).

Despite the integral role the GTAs played in undergraduate teaching, these students noted that they did not receive extensive preparation to serve as GTAs. Some of them completed a training at the beginning of their program, while others did not, as department-level training was not provided on a regular basis. In addition, the GTAs reported that, before joining the SIMPLE group, they did not often have opportunities to interact with fellow GTAs and faculty members to talk about teaching. Some of the courses they were teaching had weekly meetings with a faculty member (a lab/course coordinator or a course lecturer) and the GTAs teaching other sections of the course. However, those meetings were focused more on the content to be covered rather than on teaching methods. In contrast, the SIMPLE group provided them with opportunities to interact and learn about teaching.

As part of their participation in the SIMPLE group, the GTAs attended group meetings that included the group leader and faculty participants. During some of the group meetings in the first year, they discussed educational research literature. These meetings were called “journal clubs,” and GTAs had a specific role in these meetings. Each GTA was assigned a journal club meeting to organize; s/he was responsible for finding an article that would be of interest to the group and sharing it with the group. At the meeting, the organizer was responsible for leading a discussion of the article.

In addition to leading journal club meetings during the first year of the SIMPLE group, GTAs were also involved in conducting educational research. This was not a command given from outside the group but rather a choice of the group and the group leader. Each GTA identified a faculty mentor within or outside of the group and worked with him/her on an educational research project. Some of the group meetings were dedicated to discussing these projects, e.g., students’ ideas for projects, the IRB process, project updates, and challenges encountered. All projects were survey research studies and included the following topics: assessment of GTA preparation to grade writing assignments, determining the relationship between student mathematics placement scores and their achievement in core classes in their major, and investigating effects of a peer review component in laboratory reports. After the first year, one of the GTAs finished his/her project and presented the results at a conference. Other students were at the stage of data collection and data analysis.

During the second year of the SIMPLE group, much of the meeting time was dedicated to discussing curriculum development for a new concentration in the department. The GTAs took part in those discussions, though the level of their involvement varied. One of the students chose

to conduct another educational research project rather than take an active role in the curriculum conversations. Additionally, in both years, the students were expected to write design memos, discussions of which also took place during group meetings. Overall, three GTAs wrote design memos about activities they implemented in their courses; the fourth GTA wrote a design memo about her educational research project.

GTA members of the SIMPLE group identified several benefits to participation. Three of the four GTAs mentioned the value of becoming familiar with the educational research literature that was discussed during the journal club style meetings. GTAs also saw benefit in teaching-focused interaction with other instructors and in learning from their insights. Notably, the participating GTAs were uniformly positive about writing reflective design memos; those who wrote design memos about their own teaching saw the benefit in being prompted to think more deeply about the new strategy they chose to use in their class. Three GTAs identified a need for more sharing of the design memos, particularly beyond the group so that a broader group of instructors could benefit from design memos. GTAs were also interested in having access to a database of design memos created outside the group so they could learn about a broader range of teaching strategies from others' design memos.

In discussing what they learned from participation in the SIMPLE group, all GTAs reported that they collected ideas to try in their future teaching efforts. Several named specific strategies (e.g., using Twitter, mapping course content) that they planned to try moving forward. Beyond specific strategies for a particular class, one GTA emphasized the benefit of becoming familiar with the broader concept of curriculum mapping via the group.

In addition to seeing benefits to group participation, the GTAs also identified challenges to participating and made suggestions for how to address these challenges in future groups. The most common challenges mentioned were related to meeting scheduling, organization, and participation. GTAs suggested that more structured meetings with specific topics for each meeting, as well as a meeting schedule that was established well beforehand, would likely improve participation. They also suggested having a timeline to guide their work on their educational research project. One GTA noted that while many people expressed interest in being part of the group, only a small number participated consistently in the community. S/he felt it was important to "...make sure that people who agree to do it understand and respect the time commitment and involvement." Another challenge identified by the GTAs was making time for teaching and educational research efforts, and balancing those efforts with their disciplinary research. They noted that it was difficult to allocate time for reading the literature, conducting educational research studies, completing design memos, etc., in addition to their primary disciplinary research.

Discussion

Information obtained from GTA interviews suggests several potential improvements for future SIMPLE groups involving GTAs. Because the GTAs were looking for a more structured group experience, a group of participating faculty could create a fixed meeting structure with a syllabus and a set of topics that is dynamic and informed by the needs of the group. Such an implementation could form a model for department-supported ongoing GTA training that more closely mimics a course but allows for the flexibility indicated by the people-driven principle. Finally, our GTAs found a combined faculty-GTA learning community beneficial for them. Differing from the structure of existing GTA preparation courses presented in the literature [5–7], we suggest retaining mixed groups of faculty and GTAs in departments that are open to the idea.

GTAs also identified the challenges of balancing SIMPLE group time commitments with research and other demands, which are consistent with the challenges faced by faculty [12,14,19]. A participation incentive for GTAs might improve their active involvement in the group. The incentive could take the form of a stipend or, for example, the opportunity to be assigned more challenging or independent GTA responsibilities. Finally, GTAs emphasized the importance of sharing their design memos broadly and having access to others' design memos. Design memos are now publicly available on the SIMPLE Project website [31], providing access for any interested instructor. As a means to share strategies and design memos across the university, the SIMPLE project hosted a poster session at the annual university-wide conference on teaching and learning. Members from across the teaching development groups participated, including two GTAs from the group we discussed here.

Conclusion

The overarching goal of the project was faculty development, and we included GTAs in the original proposal as their own group, independent from faculty groups. However, the faculty participants took that idea a step further and integrated GTAs into their faculty learning communities. This unexpected outcome has raised questions for faculty development and for GTA teaching development. As demonstrated in the literature review, much of the focus has been on GTA teaching development opportunities that are created independent of faculty activities (e.g., courses for GTAs). This case of an integrated teaching development experience brings teaching development for graduate students into the same kinds of department-based mentoring experiences that are used for their research. In this case, GTAs worked closely with a faculty member on a discipline-based education research project. We recognize that GTAs at some institutions may be benefitting from mentoring from faculty about their teaching. In this case, however, we explored a formal structure in which both GTAs and faculty were learning about teaching and about discipline-based education research. Exploring how the graduate students pushed the faculty to learn more is an area for future investigation. Understanding how graduate students can be better incorporated into department-based experiences for teaching development is another area for future investigation. Many graduate students will go on to positions in higher education with a focus on teaching, so exploring opportunities for them to develop their skills as teachers and as discipline-based researchers is a growing imperative.

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