

Professional Obligations of Graduate Student Instructors and Undergraduate Learning Assistants in Partnership within Active Learning Mathematics Classrooms

Molly Williams¹
Murray State University

Rachel Funk¹
University of Nebraska-Lincoln

Learning Assistants (LAs) are undergraduate students who support active learning classrooms by acting as a second instructional figure in the classroom. Although research has shown a variety of benefits from the integration of LAs, little is known about the nature of the LA-instructor relationship and its impact on instruction. We present preliminary findings from a comparative case study of how graduate student instructors of record (GSIs) and undergraduate learning assistants (LAs) work together within an active learning classroom. Specifically, we focus on how the interactions between GSIs and LAs relate to the professional obligations felt by GSIs and LAs, both of whom are positioned as mathematics instructors, albeit in different ways. This preliminary report highlights initial findings and suggestions for further investigation.

Keywords: Learning Assistants, Graduate Student Instructors, Active Learning, Obligations

Research suggests that undergraduate students who are hired as near-peers can support students' academic, social, and emotional well-being (Barrasso & Spilios, 2021; Dawson et al., 2014; Whitman & Fife, 1988). There are many different near-peer models, including supplemental instruction, tutoring, peer-led team learning, and the learning assistant (LA) model. However, institutions are increasingly relying on the LA model, or variations of it, to support change efforts centered on the use of active learning pedagogies in STEM classrooms (Learning Assistant Alliance, 2023; Otero et al., 2006). Although there has been much research conducted about the LA model in other STEM disciplines, there is a dearth of research on the integration of LAs in mathematics classrooms (Barrasso & Spilios, 2021). Furthermore, existing literature suggests that implementation of the LA model varies considerably across different institutions and contexts, such as lectures, recitations, and online courses (Hill et al., 2023). Literature is also scant on the nature of the partnerships between LAs and instructors (Barrasso & Spilios, 2021). Although some researchers are investigating these relationships (Davenport et al., 2017; Jardine 2020; McHenry et al., 2010; Sabella et al., 2016), instructors are typically faculty. Some research has compared self-perceptions of the roles of graduate teaching assistants, learning assistants, and professors (Becker et al., 2016), but there is little known about LAs working with graduate students acting as instructors of record (GSIs). Given the increasing prevalence of LA programs and the large proportion of mathematics departments that hire GSIs to teach mathematics courses, it would benefit our community to investigate the nature of this relationship and its influence on instruction.

To that end, we investigated how GSIs and LAs described their interactions in and outside of an active learning mathematics classroom, focusing on the conditions (e.g., professional obligations) that influence those interactions. We asked the following research question:

RQ: To what extent did GSIs and LAs of an active learning mathematics classroom interact with each other in and outside of the classroom, and how does this relate to the professional obligations they felt in their roles?

¹ Williams and Funk contributed equally to this work.

Theoretical Background

Instruction involves interactions between students, teacher(s), and content, but is also constrained by the environmental conditions in which these interactions take place (Cohen et al., 2003; Hawkins, 1974). These environments act as a source for the professional obligations felt by those positioned as mathematics teachers, which are in turn used to justify what teachers do in mathematics classrooms. Herbst & Chazan's (2011, 2012) theorize that four professional obligations influence the decision making by individuals who take on the position of mathematics teacher: disciplinary, individual, interpersonal, and institutional. See Figure 1 for definitions of these obligations.

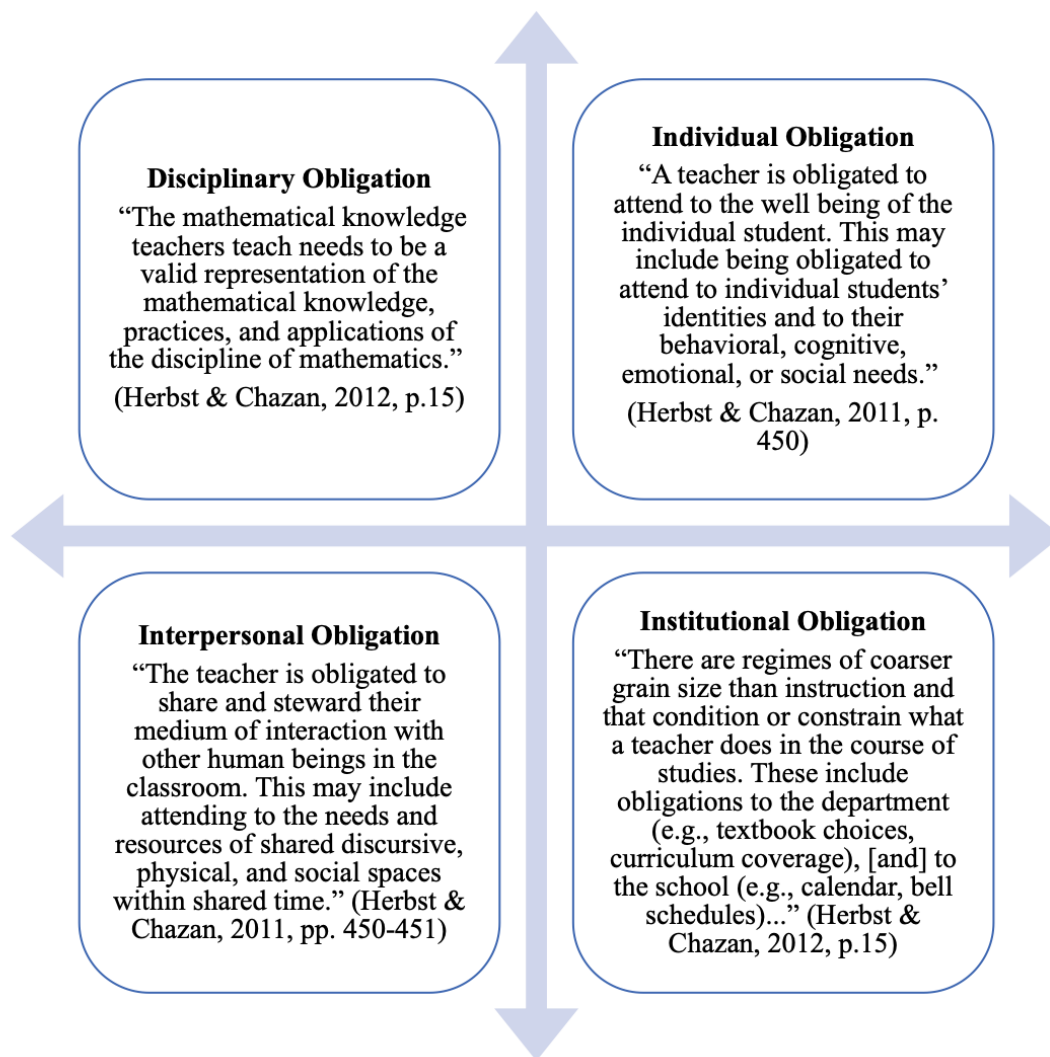


Figure 1. Herbst & Chazan's (2011, 2012) professional obligations

Instructors may feel these obligations acutely or be relatively unaware of them, nevertheless these obligations exist for every mathematics teacher. Furthermore, instructors who use active learning may become more aware of these obligations as obligations come into conflict. For example, instructors may feel an obligation to cover prescribed content (an institutional

obligation) competing with an obligation to let students engage deeply with mathematics (a disciplinary obligation) (Mesa et al., 2020). Using the LA model could change what these obligations look like. Specifically, the obligations felt by GSIs and LAs may shift depending upon how GSIs and LAs are positioned in the classroom and in relation to one another. Although at times LAs may be positioned as mathematics teachers, and thus are subject to the same four professional obligations as that of an instructor, LAs take on additional positions in the classroom given their status as undergraduate students (Funk, 2023; Jardine, 2020). As such they may feel different obligations or feel these obligations differently. For example, LAs and GSIs may feel an individual obligation to students, but LAs might feel a stronger obligation to connect to individual students on a personal, friendly level, whereas the GSI may not feel that similar obligation because they are assigning grades.

These professional obligations are not the only obligations that teachers may feel in a classroom, however they provide a basis for understanding the decisions that teachers make in a classroom (Herbst & Chazan, 2012). We contend that integrating LAs into a classroom adds additional complexity related to the interpersonal obligation - how are LAs and GSIs sharing discursive, physical, and social spaces? Do instructors feel obligated to interact with one another? These are important questions to consider, as they influence how GSIs and LAs navigate their roles and relationship within an active learning environment, ultimately influencing the decisions they make as instructors.

Methods

This report draws from a larger multiple case study (Kaarbo & Beasley, 1999; Stake, 2006) to examine how the roles of GSIs and LAs may shift in a mathematics department involved in change efforts to improve their courses. The larger study includes data collected from two separate dissertation studies, both occurring within the same mathematics department but at different points in time. The first study occurred in Fall 2015, at the start of the mathematics department's efforts to transform their precalculus courses using an active learning, coordinated model. This study focused on the relationship and evolving beliefs of a GSI-LA pair across a semester, who had previously worked together in Spring 2015. The second study was conducted once the department's change efforts had been sustained for multiple years, but involved changes to instruction due to the COVID-19 pandemic. For this study, data were collected from Summer 2020-Fall 2021, and involved a total of 18 GSIs and 9 LAs, including 4 GSI-LA pairs.

Although multiple forms of data were collected in these dissertations, for this report we draw on interview data to examine how GSIs and LAs described their relationship. Despite being drawn from two separate studies, interview questions focused on similar concepts, including beliefs about the role of mathematics instructors and the GSI-LA relationship and changes to that relationship (e.g., "Did you notice any changes in [LA/GSI] over the course of the semester?" - Fall 2015 Interview Question; "What are the major roles and responsibilities for LAs that support your class? How do these roles and responsibilities differ from yours?" - Fall 2020 Interview Question).

We began analysis by reading the dissertations to identify specific instances of GSIs and LAs describing their interactions. Importantly, we operationalized interactions as encompassing direct conversations, as well as observations or noticings of each other's teaching. We then traced these pieces of evidence back to individual transcripts to examine the raw data. These instances were open coded (Miles et. al, 2014) by each author individually, then they were compared and discussed to generate preliminary themes. Through this analysis we identified variations in how participants interacted with one another in and outside of class, noting differences in the

obligations felt by participants in these interactions. We use the findings sections of this proposal to elaborate on this theme. In future data analysis, we plan to analyze the entire corpus of interview data for evidence of professional obligations using Herbst and Chazan's framework as an a priori analytic framework.

Preliminary Findings

We found evidence of three different levels of obligation felt by the GSI and LA to interact: a definite sense of obligation, some obligation, and no obligation to interact. These different levels sometimes depended on whether interactions occurred inside or outside the classroom. In the following paragraphs we share evidence from each level of obligation.

Some GSIs felt a definite sense of obligation to interact with their LAs. This was evident from their insistence on the importance of communicating with or observing their LA in or outside of class. For many, this sense of obligation was tied to an obligation to ensure active learning methods were being used by LAs. GSI Jay said that for them to be an effective teacher, their LA's teaching "approach and philosophy" had to align with their own "at least in practice, if not necessarily in belief." Jay intentionally observed LA Jessie early in the semester to ensure that Jessie was using active learning. They said, "I know that my LA is not going into rooms and just giving students answers, right? That my LA is not undermining the structure [of the active learning course]." GSI Jay also hoped to treat LA Jessie as a "colleague" and a "peer" outside of class; they met frequently outside of class time to discuss student dynamics and approaches to teaching content. This related to their desire that during class the LA and themselves presented a "united front." Similarly, GSI Sally intentionally had "several quite long conversations about what it means to teach, what's the most effective way to teach, and what I want to happen in the classroom" with her LA. Sally admitted, "when we first started teaching together last semester, LA Cara stressed me out more than the students did" but Sally had come to trust her. Both GSI Jay and GSI Sally proactively interacted with their LAs to fulfill an obligation that the course be taught using active learning methods. Furthermore, their LAs sought-out interactions with the GSI to learn how to teach the course. For LA Jessie, this was in part inspired by an obligation to ensure they were presenting mathematics in a way that was aligned with the instructor. They described observing GSI Jay so that they were using "the same wording that [they do] in class." Further, they said it was important to communicate with the GSI to make sure "you're always on the same page, cause you don't want to split the class into two."

GSIs and LAs who had a less definite obligation to interact often described feeling constraints on their ability to interact, particularly in class. GSI River identified being a novice teacher as one such constraint, saying that "there is a cognitive overload" when one first starts teaching that prevents an instructor from paying attention to the LA. They elaborated by saying that "paying attention to what my LA was doing was a lower priority" for them, as they were trying to make sure they did "a good job" teaching. River believed that, as a more experienced instructor, they would now be able to "manage paying attention to what [their] LA is doing." However, other more experienced GSIs described feeling constrained by the dynamics of an active learning classroom. As GSI Aiden stated:

I always had a really hard time knowing whether my LA was doing a good job because I was just very focused on teaching and trying to go to all of the groups and get a sense of how class is doing. So I just completely ignored my LA basically all the time until we reconvened at the end of class.

For GSI Aiden, the obligation to interact with each student group took precedence over an obligation to make sure the LA "was doing a good job." They did, however, reconvene with their

LA at the end of class, suggesting that they felt an obligation to interact with their LA beyond class time. Similarly, Instructor Blake felt an obligation to “hit every group so I don’t miss anyone” and described not knowing what their LA was doing because they were “focused on the student.” Unlike GSI Aiden, Blake interacted very minimally with their LA outside of class time, suggesting that Blake operated relatively autonomously from the LA.

Like Blake, GSI Poppy talked about ignoring their LA because they were busy “personally knowing the students.” However, they also questioned the appropriateness of monitoring LAs during group work, suggesting that LAs are meant to “support us [GSIs] monitoring the [group] work.” GSI Harper shared similar sentiments, but with a stronger statement. They felt no obligation to their LA during the class session and further felt this was in line with the views of the department. They said:

I guess just sort of the general advice, or attitude I inherited from the department...they're [LAs] there to help you, they're there to help students. I don't know if this is advice or just a statement about how my classroom works, but don't focus on the LA. Assume that they're off doing good work on the other side of the classroom and instead just work with the students.

Thus, Harper did not feel the need to have any focus on the LA beyond assuming the LA was there to support the GSI and the active learning environment.

Discussion & Questions for Audience

Our findings highlight that participants felt different levels of obligation to interact with one another, and further that these differences can in part be accounted for by the context of the interaction (in or outside the classroom) and other professional obligations. For example, some GSIs prioritized having conversations with their LAs outside of class time to ensure that LAs explained content in ways faithful to the discipline (from their perspective) or to support LAs in using active learning methods. Likewise, one LA felt an interpersonal obligation to keep the classroom from splitting into two, and thus prioritized being on the “same page” as the GSI through conversations outside of class time. Some GSIs used in-class observations to ensure that LAs were using active learning strategies to engage students. However, one GSI felt no obligation to interact with their LA in the classroom, and furthermore described their view as being “inherited” from the department, suggesting that they felt an institutional obligation to not “focus on the LA” during class time. Several GSIs remarked on the difficulty of attending to students and observing the LA, suggesting that while they felt an interpersonal obligation to interact, this took less precedence than their obligation to interact with students. This brings up several questions: How do GSIs and LAs prioritize competing professional obligations? How does department culture influence this prioritization? Do GSIs and LAs prioritize competing obligations differently? Should GSIs feel an obligation to interact (or notice) LAs? Should LAs feel an obligation to interact (or notice) GSIs?

More work needs to be done to consider how Herbst and Chazan’s (2011, 2012) framework supports understanding of the GSI-LA relationship, particularly in active learning classrooms. For example, White and Smith (2023) suggest that the interpersonal obligation should be magnified to support inclusion in active learning classrooms; they argue that instructors should explicitly be encouraged to support student-student interactions. In what ways does integrating LAs into a classroom add additional possibilities for magnification of the interpersonal obligation?

References

- Funk, R. (2023). *Positioning undergraduate learning assistants in instruction: A case study of the LA role in active learning mathematics classrooms at the University of Nebraska-Lincoln*. (Doctoral dissertation). <https://digitalcommons.unl.edu/mathstudent/119/>
- Barrasso, A. P., Spilios, K. E. (2021). A scoping review of literature assessing the impact of the learning assistant model. *International Journal of STEM Education*, 8(12). <https://doi.org/10.1186/s40594-020-00267-8>
- Becker, A. P., Goldberg, B., & Jariwala, M. (2016). Self-perception of teaching fellows and learning assistants in introductory physics classes. *Physics Education Research Conference Proceedings*, 48–51. <https://doi.org/10.1119/perc.2016.pr.007>
- Cohen, D. K., Raudenbush, S. W., & Ball, D. L. (2003). Resources, instruction, and research. *Educational Evaluation and Policy Analysis*, 25(2), 119-142. <https://doi.org/10.3102/01623737025002119>
- Davenport, F., Amezcua, F., Sabella, M. S., Van Duzor, A. G. (2017). Exploring the underlying factors in learning assistant—faculty partnerships. *Cincinnati: Proceedings of the Physics Education Research Conference*. Retrieved June 5, 2023, from <https://www.compadre.org/Repository/document/ServeFile.cfm?ID=14579&DocID=4756>
- Dawson, P., van der Meer, J., Skalicky, J., & Cowley, K. (2014). On the effectiveness of supplemental instruction: A systematic review of supplemental instruction and peer-assisted study sessions literature between 2001 and 2010. *Review of Educational Research*, 84(4), 609-639. <https://doi.org/10.3102/0034654314540007>
- Hawkins, D. (1974). I, thou, and it. In *The informed vision: Essays on learning and human nature* (pp. 48-62). Agathon Press.
- Herbst, P., & Chazan, D. (2011). Research on Practical Rationality: Studying the justification of actions in mathematics teaching. *The Mathematics Enthusiast*, 8(3), 405-462. <https://doi.org/10.54870/1551-3440.1225>
- Herbst, P., & Chazan, D. (2012). On the instructional triangle and sources of justification for actions in mathematics teaching. *ZDM*, 44(5), 601–612. <https://doi.org/10.1007/s11858-012-0438-6>
- Hill, C.J., Barrasso, A.P., & Spilios, K.E. (2023). A mixed-methods analysis of perspectives toward learning assistant-faculty relationships. *Journal of College Science Teaching*, 52(3). 75-83.
- Jardine, H. E. (2020). Positioning undergraduate teaching and learning assistants as instructional partners. *International Journal for Students as Partners*, 4(1), 48–65. <https://doi.org/10.15173/ijsap.v4i1.4032>
- Kaarbo, J., & Beasley, R. K. (1999). A practical guide to the comparative case study method in political psychology. *Political psychology*, 20(2), 369-391.
- Learning Assistant Alliance. (2023). Retrieved May 25, 2023, from www.learningassistantalliance.org
- McHenry, N., Martin, A., Castaldo, A., & Ziegenfuss, D. (2010). Learning assistants program: Faculty development for conceptual change. *International Journal of Teaching and Learning in Higher Education*, 22(3), 258–268.
- Mesa, V., Shultz, M., & Jackson, A. (2020). Moving away from lecture in undergraduate mathematics: Managing tensions within a coordinated inquiry-based linear algebra

- course. *International Journal of Research in Undergraduate Mathematics Education*, 6(2), 245–278. <https://doi.org/10.1007/s40753-019-00109-1>
- Miles, M.B., Huberman, A.M., & Saldaña, J. (2014). *Qualitative data analysis: A methods sourcebook*. (3rd ed.). Sage.
- Otero, V., Finkelstein, N., McCray, R., & Pollock, S. (2006). Who is responsible for preparing science teachers? *Science*, 313(5786), 445–446. <https://doi.org/10.1126/science.1129648>
- Sabella, M. S., Van Duzor, A. G., & Davenport, F. (2016). Leveraging the expertise of the urban STEM student in developing an effective LA Program: LA and instructor partnerships. *2016 Physics Education Research Conference Proceedings*, 288–291. Retrieved June 5, 2023, from <https://www.compadre.org/Repository/document/ServeFile.cfm?ID=14250&DocID=4604>
- Stake, R. (2006). *Multiple Case Study Analysis*. The Guilford Press.
- White, N. & Smith, B. A. (2023). Understanding instructors’ beliefs and obligations within cultures of exclusion. In S. Cook, B. Katz, & D. Moore-Russo (Eds.), *Proceedings of the 25th Annual Conference on Research in Undergraduate Mathematics Education* (pp. 217-225). Omaha, NE.
- Whitman, N.A & Fife J.D. (1988). *Peer teaching: to teach is to learn twice*. ASHE-ERIC Higher Education Report No. 4. Association for the Study of Higher Education.