Exploring Learning Assistant Beliefs in the Context of Pedagogical Training and Instructional Practice

by
Brandon Jeong

A THESIS

submitted to
Oregon State University
Honors College

in partial fulfillment of
the requirements for the degree of

Honors Baccalaureate of Science in Chemical Engineering (Honors Scholar)

Presented August 17, 2021
Commencement June 2022
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Abstract approved:__________________________________________________________

Milo Koretsky

Learning assistant (LA) programs are gaining increasing popularity as a means to shift instructional practice in STEM classrooms. In these programs, trained undergraduate students join the instructional team and support student-centered active learning pedagogies. Their professional development is typically supported through a seminar. In facilitating small group collaborative learning, LAs need to make many in-the-moment decisions. These decisions draw from the fundamental beliefs that LAs bring to their practice about teaching and learning.

This study examines the instructional beliefs of LAs in a unit where LAs have been incorporated throughout the core curriculum. We have collected free responses from 26 LAs, both at the beginning and end of the mandatory professional development course regarding the strong beliefs that guide them in their instructional practice. We analyze this data using a qualitative methodology to uncover these beliefs and coalesce them to identify a set of the salient phenomena. These identified phenomena are: positive instructional climate, LA positionality, a negotiation of objectives regarding answers, different types of pedagogical questions, varying tolerance for student confusion, and asset vs. deficit-based approaches to feedback. We anticipate these findings will be helpful in guiding the steady improvement of the LA professional development courses as well as provide information to instructors and administrators who work with LAs. Findings suggest encouraging practices that promote metacognition in LAs and facilitate a shift towards a more respectful view of LAs and their varied epistemological beliefs.

Key Words: Learning Assistant, Learning Assistant Program, Peer-led education

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Brandon Jeong, Author
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1 Introduction and Background

While higher education practices worldwide are expected to rapidly adapt to spontaneous or unforeseen circumstances that may affect their quality, education professionals continue to seek out and make steady improvements to the field’s body of understanding and execution. One such improvement is the implementation of Learning Assistant (LA) programs in higher education. The LA Model was developed by Otero et al. (2010) at the University of Colorado, Boulder and has emerged as a national initiative through the Learning Assistant Alliance that informs the development of many recently emerging LA programs across the United States, including at Oregon State University (OSU). This thesis seeks to examine the salient aspects of LA beliefs in order to facilitate the program’s development.

1.1 Learning Assistant Programs

Since the LA program’s initiation in 2003, more and more colleges and universities have adopted its principles, creating similar versions in their own institutions. Research studies have supported the adoption of such programs, citing the benefits of evidence-based pedagogical practices and active learning that the LAs support (AAU Reports on Efforts to Improve Science Teaching at Research Universities, n.d.; Barrasso & Spilios, 2021; Freeman et al., 2014). As programs are instated, evidence shows that these efforts lead to better student performance on higher-order assessments (Sellami et al., 2017).

The LA program began at OSU in 2014 in the Department of Integrative Biology and has since spread to other departments in the Colleges of Science and Engineering (Cao et al., 2018). The effort was part of a larger initiative to increase the efficacy of student learning by promoting active learning (Fisher et al., 2019), while also providing an opportunity for interested students to gain insights to the role of an educator (About OSU’s Learning Assistant (LA) Program, n.d.). The four primary goals of the LA model are: (i) to improve the learning experience of students; (ii) get more students interested in becoming educators; (iii) involve faculty in the process of training future educators (iv) facilitate a pedagogical shift towards evidence-based pedagogical practices (Otero et al., 2010).
While LA programs vary across implementations at different universities or programs, at their core there are three elements in the LA Model which allow differentiate it from other peer instructor programs. First, LAs participate in a professional development (pedagogy) course (typically during their first term in the program) alongside other LAs in a formal classroom setting. Second, LAs engage as a member of the instructional team on a weekly basis to aid in preparation and inform class design decisions. Third, LAs engage in the classroom to facilitate active learning in ways they see fit. (Barrasso & Spilios, 2021; Otero et al., 2010)

LAs are positioned similarly as conventional graduate teaching assistants (TAs) because both work as part the core instructional team to further enhance the educational experience of students. However, LAs differ in that they are exclusively undergraduate students who have already taken the relevant course and demonstrated satisfactory mastery of the material (Otero et al., 2010). While LAs frequently teach in large lecture sections, in the LA program under study here LAs teach in smaller studio and lab sections with enrollments typically of 24 students or less. In addition, the activities of pedagogy course the first-time LAs took included weekly readings, online reflections, and guided conversations with other LAs.

Since the use of LAs is recent, there is still need for better understanding of how LAs integrate into classroom instruction, such as the best ways to deliver the LA professional development course. By examining the beliefs LAs cite as the basis for their practice, the research presented in this thesis seeks to help inform the pedagogy course design as well as provide information for instructors and LA program administrators.

1.2 Research Context

This study is based on the paper by Goertzen et al. (2010), who describe beliefs as “declarative knowledge about teaching and learning in the context of” the relevant course (p. 2). We build on declarative knowledge in the research conducted here by limiting our analysis to the LAs’ stated beliefs rather than trying to extrapolate an implicit belief from the LA responses.

According to Goertzen et al (2010), there is limited research that can inform the design of the professional development courses for TAs and LAs. The suggested methodology for doing so entails examining common aspects in LA beliefs, where they come from, and how they can be
built upon. This thesis seeks to fill this gap in research. A recent literature review of the LA Model found that most research conducted in this area was done on physics education programs, thus calling for more research to be done in other programs to diversify the body of current knowledge (Barrasso & Spilios, 2021).

To address the gap in research, we have created the following research question to guide our work:

- What are the common beliefs that LAs bring to instruction? How do LAs differ in the ways their beliefs are expressed? What aspects of these common beliefs focus on
  - The instructional climate and the LAs role in it?
  - The instructional objectives and practices?

2 Methodology

2.1 Data collection

The qualitative data analyzed for the purposes of this study was collected through a virtual platform, AIChE Concept Warehouse, from 26 undergraduate engineering students participating in a recent Chemical, Biological, and Environmental Engineering (CBEE) LA pedagogy course at OSU. The pedagogy course was held in person and administered by one of the collaborating researchers, specifically the mentor. The 26 participating students were all either first-time LAs actively engaging with the program at the time of their participation in the study, or LAs training for their first serving term to come. For the sake of brevity, all student participants will be referred to as Learning Assistants or students in this thesis regardless of their engagement with the program.

Each week, students read a paper about teaching and learning and were given an open-ended reflection prompt related to their role as an LA. The specific readings and topics addressed in the class are provided in the appendix (Section 10.4). In this study, the research team analyzed responses to the first and last reflection prompts, which were designed to be essentially identical. The reflection prompt for Week 1 is as follows:
In this week's reading, Goertzen, Scherr, & Elby, argue that responsive TA (or LA) professional development should center upon the beliefs you bring to this work. Think about teaching and learning in the environment that you are working in as an LA (e.g. studio, lab, ...). Identify two or three strong beliefs that you have about your role to support learning in that environment.

For comparison, the reflection prompt for Week 10 is provided here:

Over the term, many of you have had opportunity to interact with students in class and we have all had a chance to discuss and reflect on this aspect in the pedagogy class. Think about teaching and learning in the environment that you are working in as an LA or as a student (e.g. studio, lab, ...). Identify two or three strong beliefs that you have about your role to support learning in that environment.

It is important that these two prompts are near identical in order for our cross examination to prove credible when assessing the changes in LA beliefs before and after intervention.

Students responded on their own time during the week when the online portal, AIChE Concept Warehouse, was available to collect them. Typically, the reflection prompts were available immediately after seminar on Friday and due by the following Wednesday, although students who did not submit were reminded on Thursday and allowed to submit late. The software gave the students computer-generated anonymous identifiers to prevent any potential breaches in confidentiality. Students were aware that their submissions would be kept anonymous and consented to their responses being examined in this study.

These weekly responses were not graded, but students received a written response from a member the instructional team within the next week. This feedback is not meant to influence a change in student responses, but instead provide additional contextual information relative to the rest of the course and catalyze further independent thought. Students would then have the opportunity to discuss their thoughts and reflections from the week with the other students to further develop them, potentially gaining insights that would contribute to their professional development. These were the conditions under which the data was collected.
2.2 Qualitative analysis

Given the open-ended nature of the research questions proposed, the research team elected to proceed with a grounded theory qualitative methodology. Grounded theory qualitative methodology is one which derives theoretical constructs from the qualitative analysis of data (Corbin & Strauss, 2008). Through this methodology, the team used an iterative, emergent coding process to identify aspects of student responses that could answer the research questions. Over the course of the analysis, qualitative coding was conducted iteratively and with multiple phases which allowed the research team to gradually become accustomed to this methodology and frequently refine it. Perhaps the most important aspect of this methodology was the regular research team meetings.

Qualitative analysis was conducted primarily by the author, with regular hour-long weekly meetings held to share progress, address concerns, refine coding, and discuss trends in data. For each iterative phase of analysis, the meetings were used as a time for collaborative work to establish common coding practices and examine levels of inter-researcher agreement by discussing student responses and the associated codes to have productive discourse regarding the LAs’ beliefs and how well the associated codes captured them. By regularly scrutinizing the work, the research team maintained a high level of quality and reliability. Discussion during meetings occasionally also identified the need for a shift in coding practices. For example, one week’s discussion concluded the level of inference required from responses to warrant codification was too high and thus sparked a reexamination of previous codes. Some meeting discussions prompted major shifts in the team’s research approach which are succinctly portrayed in Figure 2.1.
Figure 2.1 - Major phases in the qualitative analysis process. This figure illustrates the major steps in the research team’s approach to analyzing the data and which phases inform which. The background color indicates which software was used during each phase and the title of each phase is the major outcome.

For the first phase, we took a very broad approach whereby responses were examined and any notable ideas kept in bulleted-list format. The objective of the first phase was for the research team to familiarize themselves with the data while simultaneously taking notes to facilitate later analysis. By taking notes, the team was able to identify common elements and ideas in the LAs’ responses. This phase was taken slowly, with progress mostly made collaboratively between the mentor and author to account for the author’s relative lack of experience with emergent coding. Once the two felt comfortable, the author began to work on the analysis independently between meetings to speed up the process.

The next phase used the notes and familiarity gained in the first phase to inform the creation of idea codes. These codes marked common ideas LAs stated in their responses and allowed us to encode multiple phrases in the data with the same code if they shared similar ideas. For example, the code “Goal: support group collaboration” was assigned when a student indicated that their role as an LA includes supporting or facilitating the social processes of the student studio groups. The codes created during this phase were not final. As mentioned before, the regular meetings gave an opportunity to iterate and modify the codes. These coding iterations
were closely tied to what we have labelled as the “Categories” phase in Figure 2.1, forming a cyclical relationship between the two.

The “Categories” phase is where the idea codes were grouped according to their common elements, creating categories to represent the different types of ideas. This resulted in our major code categories of goals, actions, and justifications. Goal codes were codes that revealed what the LA set out to accomplish for the purposes of “supporting learning in that environment”. Action codes were codes that described what steps an LA takes to achieve their goals. Justification codes were those that justified another of the LA’s ideas, providing context for their ideas by illustrating a path of reasoning. These three categories are referred to as “belief elements” since they constitute the major elements of the LAs’ responses. This methodology allowed us to perform cooccurrence analyses to find which ideas were frequently associated with one another.

The final phase took place once a stable set of codes and categories had been identified. For this phase, the idea codes were categorized again into themes according to the elements of learning environments they addressed. From this process, we identified five themes: instructional climate, student thinking, feedback, course content, and groupwork. A few codes fell under multiple themes, and the themes served mostly to facilitate the final analysis.

Finally, using these themes, an in-depth analysis was conducted to identify the significant phenomena that emerged. By revisiting the original responses according to their associated themes and codes, we were able to compare and contrast similar ideas. This final step led to the identification of six major phenomena across the LA responses that form the heart of this study.

2.3 Researcher positionality

In qualitative research, it is important to identify the positionality of the primary data analyst and thesis author. While integral systems were put in place to guarantee the trustworthiness of the research, it is impossible to provide a fully objective qualitative analysis devoid of biases. It is also unreasonable to expect this thesis to concisely provide all potential interpretations of the data and give equal weight to potential findings. Simply by choosing to include and discuss some aspect of the analysis we must choose to exclude others, which may be
reflective of our positionality. This is not to say the findings of this study are not trustworthy, but this section serves to provide the perspective from which the author analyzed the data.

There are multiple facets to the author’s positionality, especially as an active undergraduate student attending the university under study. The author is a 4th year chemical engineering student with 3 years of experience attending in-person studios and labs where LAs were present at OSU. The author has no personal experience as an LA or other similar instructional position but has participated as a member of an OSU educational research team for about 1.5 years. As a member of the Honors College, the author also has a history of being a high performer in educational contexts and has been placed in some studios sections exclusively attended by other high-performing honors college students. The author is also a male Asian-American student. These aspects of the author’s positionality contribute to the potential tint in the lens this study provides into the beliefs of LAs. Of course, the research teams has taken steps to minimize the biases from this tint.

2.4 Trustworthiness

To establish and maintain the credibility of our analysis, we made use of a form of peer review. About one third of the way into the project, Deja Preusser, an undergraduate CBEE student at OSU, joined the team for weekly meetings to provide an independent perspective. Similarly, Harpreet Auby, an undergraduate chemical engineering student and later a graduate student, joined the team to provide another independent perspective as a longstanding member of a similar program at the University of Illinois at Urbana-Champaign. With a total of four researchers discussing findings at the regular meetings, disagreements regarding the coding were frequently addressed and resolved by consensus, leading to many iterative changes in the codebook and interpretations.

In addition, the major decisions and concerns raised during weekly meetings were kept in a personal log by the author. This included accomplishments since the previous meeting, important group decisions made during the meeting, and objectives for the next meeting. A few example entries are provided in the appendix.
2.5 Limitations

As with any research project, there are limitations regarding the methodology. First, we neglected to ask participants for demographic information to ascertain the level of diversity in our participant pool. It can, however, be inferred that the female population in the study is about 22% and the population of students of color is about 28% if the College of Engineering demographic data for Fall 2020 is assumed to be reflective of the LA programs demographic data (Sims, 2011). This is, of course, only an estimate made in the absence of data.

The participant pool is also entirely comprised of chemical engineering, biological engineering, and environmental engineering undergraduate LAs at OSU who all attended the same pedagogy course. In addition, not all participants served as LAs for the same class. While the relevant courses were all under the same School and thus relatively similar in discipline, the larger classes recruit more LAs and thus may disproportionately skew the data towards representing the beliefs of LAs serving in those classes. While this study has found interesting trends in data for the purposes of improving this pedagogy course, one should be cautious when extending the findings of this study and applying them to other programs.

3 Quantitative Findings

3.1 Belief Elements, Categories, and Codes

In this section, an overview of coding frequency is provided. Our analysis yielded a total of 97 instances of justification codes, 138 instances of action codes, and 172 instances of goal codes. Supposing each instance of a goal code necessitates an action to achieve it and a justification to support it, this data suggests the LAs may not always include all these elements in their response. This slight skew may be the result of the wording of the prompt, the students’ desire to minimize their time spent writing, or the incomplete, emerging nature of their stated beliefs. Regardless, the abstract goals of LAs supporting student learning were the most common element of the beliefs the LAs cited.

One way to address the first research question is to examine the most common action and goal codes. The five most common of these are as follows: “Goal: Mutual trust, respect, and
“Approachability” (21), “Goal: Elicit student reasoning” (17), “Action: Do NOT give answers to assignments” (15), “Action: Ask questions” (14), and “Action: Guide student thinking/problem solving” (13). These code frequencies suggest that two of the major goals of an LA, according to LAs themselves, is to maintain a trusting and respectful relationship with their students, and eliciting student reasoning. While this straightforward analysis reveals the most common goals and actions LAs believe are appropriate, it does not reveal the most common connections LAs make between their goals and the actions necessary to achieve them.

By the nature of our categorization of belief elements into actions and goals, cooccurrence tables can be used to find how frequently the existence of one code coincides with another. Doing so reveals some interesting aspects of an LAs thought process and how they connect the goals which they hope to achieve with the actions they believe will help them. Table 3.1 highlights the heavily correlated codes where half of the code instances have cooccurrences with another code. These correlations can be used to make a variety of conclusions, but one example would be to conclude that if an LA believes their role in the classroom includes adjusting the complexity of the information presented in the course, they commonly use their previous experience in the class to do so.
Table 3.1 – Cooccurrence table of strongly correlated actions and goals. Rows represent the goal codes being examined and columns represent the action codes. “Gr” is the number of instances of the given code and the tabulated values are the number of cooccurrences of the two codes within an identified belief. Values which suggest a potentially strong relationship between two codes have been highlighted green.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Action: Ask questions Gr=14</td>
<td>Action: Be open to learn / humble Gr=4</td>
<td>Action: encourage teamwork Gr=7</td>
<td>Action: Guide student thinking / problem solving Gr=13</td>
<td>Action: have students verbalize Gr=5</td>
<td>Action: leverage previous student experience in class Gr=8</td>
<td>Action: NOT give answers to assignments Gr=15</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>1</td>
<td>8</td>
<td>2</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

So far, the common elements of LA beliefs have been explored, but the different ways in which these beliefs are expressed has not. This is where the five themes discussed earlier become particularly helpful. As shown in the first section of our findings, LA beliefs have been found to form around five themes: course content, group work, student thinking, instructional climate, and feedback. Some LA responses form almost entirely around a single theme but most often, they
are a combination of multiple themes. By reexamining the aggregate data in the context of these themes, general trends in the LAs’ beliefs became apparent.

One way to examine the differences between how belief themes are expressed is by observing the code frequencies within each. It would be simpler to simply compare the quotation frequency of actions and goals, but the research team elected to normalize the data and account for the unequal number of action and goal codes. Table 3.2 below provides the frequency of each theme and the number quotations per goal or action codes associated with the theme.

Table 3.2 - Action and goal code frequency separated by theme. Columns represent the five themes found during analysis. Rows represent the code frequency of action codes, goal codes, and total codes. The average code frequency for both code categories is provided for reference.

<table>
<thead>
<tr>
<th></th>
<th>Instructional climate</th>
<th>Student thinking</th>
<th>Feedback</th>
<th>Course Content</th>
<th>Group work</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average instances per</td>
<td>3.50</td>
<td>8.75</td>
<td>7.33</td>
<td>3.50</td>
<td>4.00</td>
<td>4.75</td>
</tr>
<tr>
<td>action code</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average instances per</td>
<td>9.88</td>
<td>7.43</td>
<td>4.00</td>
<td>4.33</td>
<td>7.50</td>
<td>6.41</td>
</tr>
<tr>
<td>goal code</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average instances per</td>
<td>7.14</td>
<td>7.91</td>
<td>6.00</td>
<td>4.00</td>
<td>5.17</td>
<td>5.63</td>
</tr>
<tr>
<td>code (both)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total instances</td>
<td>100</td>
<td>87</td>
<td>60</td>
<td>40</td>
<td>31</td>
<td>318</td>
</tr>
<tr>
<td>Total codes</td>
<td>14</td>
<td>11</td>
<td>10</td>
<td>10</td>
<td>6</td>
<td>51</td>
</tr>
</tbody>
</table>

First, there is a clear inclination towards beliefs related to instructional climate with 100 quotations followed by student thinking with 87 quotations. Similarly, they also have the most distinct codes associated with 14 and 11 respectively. With their above average code pool and total code frequency, “instructional climate” and “student thinking” are the most common and the most diverse themes.

In addition, this form of analysis reveals that some themes may be more goal or action oriented than others. Compared to the overall code frequencies, “instructional climate” and “group work” are goal-oriented themes. On the other side, “feedback” and “student thinking” are action-oriented themes.

Ideally, none of these themes would be action or goal dominant so recognizing these inequalities helps us understand the potential gaps in an LA’s beliefs. For goal-oriented themes,
the student recognizes an intended outcome of performing well as an LA but does not have specific means of obtaining those outcomes. For action-oriented themes, the student identifies an intended behavior, but is not explicit in what they intend to achieve related to their actions or they connect those actions to goals within other themes. For example, students may suggest a feedback-related action but may connect it to an instructional climate-related goal.

3.2 A Shift in Justifications

The findings from Table 3.3 show a change in the proportion of LA responses. It was likely that inexperienced LAs drew upon their experiences as a student in the 25 responses collected in the first week, with learning models also commonly identified. However, after only 9 weeks of instruction in the pedagogy course and experience as LAs in practice, this reliance on the LAs’ personal student experiences decreased significantly in favor of learning models, which became the primary source of justification. This result provides evidence that LAs’ thought processes were influenced by participating in the LA pedagogy course. Knowingly or not, the LAs do not reference their ideas from their student experience as much as they did before.

Table 3.3 - Shift in frequency of belief justifications, actions, and goals. This table displays the number of quotations of the three major types of belief justifications LAs use to back up their actions and goals. The columns divide this data according to when the responses were collected: before the pedagogy course (Week 1) or afterwards (Week 10). Note that quotations are not instances. The maximum number of learning model quotations any belief can have is one, even if multiple learning models are present.

<table>
<thead>
<tr>
<th>Justification</th>
<th>Week 1 quotations</th>
<th>Week 10 quotations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructor experiences</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Student experiences</td>
<td>24</td>
<td>8</td>
</tr>
<tr>
<td>Learning models</td>
<td>27</td>
<td>29</td>
</tr>
</tbody>
</table>

Below is an excerpt from one LA’s Week 1 response in which they describe how their previous experiences on the learning side have led them to recognize a problem they believe other students are facing.

*Though I am not currently an LA, I feel that being able to constructively help students without getting allowing them to get lost in small details or circular*
patterns of thought is key, as I know from personal experience that becoming frustrated with unfamiliar concepts makes it exponentially harder to actually learn and work with them. [Quotation 1:78]

In this case, the LA has recognized a negative aspect of their learning experience and consequentially believes that part of an LA’s role is to minimize or prevent such an experience. By contrast, this is an excerpt from the same student’s response eight weeks later:

> Additionally, It is very important to illicit ideas from all individuals in a group. This allows for all perspectives to be considered, and gives students who may perceive themselves as lower status a chance to give their input and participate. Encouraging this kind of behavior can help foster learning in a studio setting, and can help groups reach conclusions more fluidly. [Quotation 3:52]

In this response, they start with outlining the actions an LA should take, followed by what they hope to achieve, and finally why they hope to achieve it. This short explanation at the end shows how the LA believes a highly inclusive group dynamic aids the group’s learning and cohesiveness. This identified relationship between group learning and group inclusivity is what informs the LA’s beliefs regarding what an LA’s role is in a studio setting as the next two sections in this thesis discuss.

4 Qualitative Findings I: Instructional Climate and the LA’s Role in it

4.1 Overview

In our analysis, we have found several reoccurring concepts among the LAs’ beliefs across both weeks of data collection. Of these, six of them were particularly interesting as they had a variety of different LAs coming to different conclusions about the same concept. We use the term “phenomenon” to describe these concepts with diverse takes from the LAs. In this set, we have grouped together the phenomena which are related to the beliefs LAs had about the instructional climate and their role in influencing it to address the first part of our research question. Our research question was:
What are the common elements of the beliefs that LAs bring to instruction? How do LAs differ in the ways their beliefs are expressed? What aspects of these common beliefs focus on the instructional climate and their role in it?

The phenomena we identified are positive instructional climate and LA positionality.

4.2 Positive Instructional Climate

After participating in the PD program, many LAs aimed to foster a positive instructional climate; cultivating climate was viewed as an important aspect of their role. Responses used words such as personable, gaining trust, honest, genuine, open, comfortable, positive, welcoming, and inclusive. While the term “positive instructional climate” is subject to personal interpretation, our analysis found four common characteristics consistently reappeared: (i) that all students have a sense of belonging in the classroom; (ii) that students develop confidence to complete the work; (iii) that communication and help are accessible; and (iv) that the LAs themselves exhibit empathetic and inclusive practices. The following response encapsulated these characteristics:

*As a LA, I want to create a welcoming environment for my students. I'll be working with first year students this year, and I want to do everything I can to introduce them to engineering as well as OSU in general. I believe in being positive with students. I don't want them to feel bad for having the “wrong” answer; I want them to learn to problem solve and be confident in their ability to think critically. I also believe in being honest and genuine with the students I work with. I want them to feel comfortable asking me questions and coming to me for help.* [Quotation 1:116]

4.2.1 Sense of Belonging

Many LAs believed a positive instructional climate should foster students’ sense of belonging. One LA stressed this idea for engineering because “upon entering college, many parts of life can seem daunting, and engineering classes sound very scary” [1:125]. They emphasized that this is even more critical when students are in their first year because, in their experience, they “subconsciously allowed this class to set the precedent for [their] confidence in future engineering courses” [1:125] and believed other students feel the same. Another recounted her
personal experience as a woman studying STEM as a major driver for the need to foster a sense of belonging in students. In their opinion, “half the battle in engineering is believing that you belong there” [3:68], and the “battle” for women can be exacerbated by the scarcity of female leadership. By being a role model and mentor to their students, they can develop the security necessary for them to continue to pursue their education. [1:156]

4.2.2 Confident Students

The second characteristic of a positive instructional climate we found was confident students with high levels of self-efficacy. By confident students, we do not mean students who believe that they are always correct. Instead, we mean students who believe that they are capable of being correct, and even if they are wrong or slow, their social standing is not threatened. To cultivate this confidence, LAs must “create a welcoming environment that allows students to feel comfortable with their own learning process” [3:92]. One LA recognized the importance of students’ confidence because they believed “a student with lower self-confidence in academic ability is more likely to doubt themselves and even remove themselves from group participation” [3:76], thereby limiting their learning opportunities. Another LA described the struggle some students experience when their grades do not offer positive reinforcement and aimed to fill in the gap by “[encouraging] students to continue to work hard” [3:78]. By cultivating a space students can feel confident in, LAs believed they can create a learning culture that allows students to fully engage in the classroom.

4.2.3 Communication and Help are Accessible

The third characteristic of positive instructional climates LAs cited was facilitating communication. The most common code was “Action: trust, respect, and approachability,” with 21 instances, showing the LAs’ desire to minimize the barriers to communication is widespread. The environment LAs sought to cultivate is one where students “feel comfortable talking… about the course” [3:17] and “strong bonds” [3:17] are formed between students. One LA described the importance of communication for learning (underline added for emphasis): “I feel it is very important to be approachable and personable enough that students feel free to talk to you about the components of their work that they don't understand. It can be very difficult to fully flesh out what the problem is and how to resolve it when one or both parties are not fully
comfortable with speaking.” [1:79] Another LA described how their experiences as a student has led them to a similar conclusion:

> In the past, I have seen in different recitations that when there are LA’s teaching alongside TA’s, the environment is completely different from when a graduate TA teaches. In these classes, it seems like students are able to interact with the material better than an environment that may be harder to ask questions. It seems that not only myself but my peers, feel more at ease to ask an LA a question than their graduate TA. [Quotation 3:88]

By comparing their experiences in different learning environments, some with LAs and some without, they have connected LAs with an environment where questions are welcome, which is then connected with a higher level of interaction with course material resulting in more learning.

### 4.2.4 Empathetic and Inclusive Practices

The fourth characteristic we identified was empathetic and inclusive practices. Empathetic and inclusive practices are the recognition of students’ individual circumstances and needs and the actions an LA takes in order to compassionately respond. These practices arise from their recognition of the diversity in students’ personal backgrounds and difficult circumstances. The relevant responses were accompanied by some statement recognizing that students have lives and concerns beyond the scope of their class, and that the students’ individual circumstances requires that they behave compassionately in the classroom.

Several LAs acknowledged the diversity in their students’ personal circumstances and wanted to act accordingly. One LA described how they try to “[keep] in mind that each student is taking other difficult courses, and could be dealing with other extremely difficult personal situations” [3:16]. Others voiced similar acknowledgements that “not everyone is going to be having a great day when they walk into my [class]” [1:45]. In a similar vein of thought, some LAs expressed a level of inherent respect for students and their efforts. One LA stated that although “all students are very different,…that doesn’t make any of them any less valid as learners than any of the others” [3:82]. Another said it is “important to acknowledge the intelligence of the students” [1:122] and yet another believed students are “smart people who are
trying hard to do their best at the work they’re doing” [3:94]. These beliefs about students led to the adoption of compassionate practices.

Some examples of compassionate practices included learning students’ names [3:56], reaching out to students [3:92], and being positive in the feedback given [1:116 & 3:15]. These practices were commonly mentioned as a means of propagating the positive instructional climate that has already been fostered, such as ensuring the LA remains approachable [3:15]. One LA went so far as to negatively compare typical LAs and TAs to “robots” [3:24] and expressed their desire to act differently by engaging in casual conversation with students. By choosing these compassionate practices, LAs seek to maintain a positive environment where the instructor is empathetic to the wide span of class and life challenges that students commonly face.

4.3 LA Positionality

LAs commonly were aware of their social position as near peer instructors in the classroom. While interpretations varied, they commonly articulated that they were socially positioned differently than the professor, or even the graduate teaching assistants (TAs), relative to the students in the class. Their instructional practices were then derived from their identified position. While the term “near peer” was common, this term could take different meanings. We identified three aspects in which LAs distinguished their role from other instructional team members. Some LAs emphasized their approachability, while others focused on their recent student experience, and still others identified their position as an intermediary between the students and the professor. Responses mentioned at least one of these aspects, if not more, when describing the LA positionality.

As previously discussed, many LAs seek to maintain a positive instructional climate where they are viewed as highly approachable (see Section 4.2.3). This phenomenon is distinct because approachability is described as a defining characteristic which distinguishes LAs from professors. As an LA, they provide a more available source of knowledge which remedies the difficulty students may have with approaching the professor. One LA wrote “As an LA I feel my place is to provide a non-intimidating source of knowledge… Often students feel intimidated by professors and don’t want to be wrong in front of them; they’d rather be silent than wrong. So myself as an LA let's me be less intimidating that is just as much of a resource” [3:100]. These
differences applied to graduate student instructors as well. As another LA said “It seems that not only myself but my peers, feel more at ease to ask an LA a question than their graduate TA” [3:88]. Another LA elaborated on power differences between students and the professor:

*I believe that an LA has a different role from the professor, and should serve as an informed peer rather than an authority figure. When there is a great power difference between the LA and the student, it becomes difficult for the student to ask questions and feel that their responses are valued. It's important that the LA provides separate resources from the instructor. Working with an LA allows for a different experience for the student than does going to lecture or office hours. An LA should create a comfortable environment for brainstorming and problem-solving.* [Quotation 3:95].

These LAs recognized “professors can occasionally seem unapproachable” [1:102] and seek to fill the gap to provide instructional access.

The second aspect of positionality is that the LA plays the role the experienced student. This positionality has multiple facets, but at its core is the belief that LAs have little separating them from their students aside from their previous experience in the course. To some recognizing this small gap in positionality meant they should “maintain no sense of superiority over [their students]” [3:81] and “treat students as equals” [1:122]. As one LA elaborated, “An LA is like that friend you had growing up who was a year or two ahead of you in school. The student doesn't feel bad about asking them questions, the LA doesn't pass judgement, and tries to help a student who is seeking it.” [3:70]. The logical backing is that since LAs have only a bit more educational experience over their students, they must be open to learning more about the course material and respect the students’ ideas just as much as their other peers [1:122, 3:81, 3:96]. This thought process, of course, does not mean the LA feigns ignorance when faced with course material questions. It means that when answering these questions, the approach is more similar to that of a peer teaching another peer than a professor teaching a student [3:67, 1:98]. To one LA taking this approach meant “[finding] common ground” and “[sharing] study strategies” [1:98] with their students.
The third aspect of positionality we identified is that of the middleman, which serves to bridge the gap between students and professors. The type of gap varies between the LA and response, but in all cases, they identify some sort of disconnect between the students and professors. For example, one response follows: “I understand that my position acts as an easy middleman between teaching from a professor to student learning, who has knowledge of what students are going through to provide them with better ways to learn the material or focus on what truly matters for the rest of their classes and after graduation” [3:59]. This response gives the impression that the information presented by the professor is difficult to immediately learn from, and thus the LA can intervene by providing this information in a form easier to understand. Another LA echoed this belief, stating that professors often lecture in highly technical terms that are difficult to learn from and LAs are therefore meant to “explain those concepts in a more easily understandable way because [they are] much closer to the students own conceptual understanding than the professor” [3:20]. For these two responses, the gap they serve to bridge appears to be a large disparity in course material mastery. A third quote interpreted the middleman role as more of a negotiator than a translator. In their mindset, the students and professor are in conflict, and their role is to “equally favor both the professor and student’s opinions on the coursework and grading” [3:60].

5 Qualitative Findings II: Instructional Objectives and Practices

5.1 Overview

The second group of phenomena more directly relate to LAs’ beliefs about instructional objectives and practices. These are phenomena which dictate what an LA’s instructional responsibilities are, and how they seek to accomplish them. The phenomena discussed here are also closely tied to the identified themes of student thinking and feedback. As with the other set, we found LAs had a wide variety of beliefs, specifically about the negotiation of objectives, the types of questions LAs can use, the role of student confusion, and approaches to feedback.

5.2 Negotiation of Objectives

When discussing how to best provide feedback, a common decision LAs faced was whether to directly provide students the answers to the assignment. Almost all LAs in favor of
withholding answers did so out of concern for their students’ long-term understanding or fostering “deeper understanding.” The activities in these studio classes are often designed to elicit scientific reasoning and sense-making as students work towards a solution in a group. Providing answers directly short-circuits these reasoning processes and counters this aspect of the instructional design. On the other hand, some LAs advocated for providing the answers. These LAs cited concerns about students’ confidence and self-efficacy, the trust in the student-LA relationship, or the short-term objective of successfully completing assignments to earn a good grade. Commonly, LAs related these concerns to their experiences as a student.

With assignments or coursework designed to develop conceptual, procedural, and social skills by having students work through challenging problems, these objectives can come in conflict. The conflict is more compounded since the LAs draw from differing perspectives and experiences as both an instructor and student. This tension has led some LAs to refer to an internal negotiation, choosing to prioritize long term conceptual development, the students’ in-the-moment experience, or some sort of compromise.

5.2.1 Objective: Promote Deep Thinking

Interestingly, our coding process yielded only one action code which explicitly sought to avoid an action: “NOT give answers to assignments”. On 15 different occasions, an LA’s response specifically articulated that they would either not provide answers, or that their role does not serve the purpose of giving answers. This code’s existence suggests that the LAs are aware of an idea to the contrary: that LAs are expected to provide students the answers to their assignments. In this section, we will explore the ideas these LAs embrace and their thought processes when choosing to avoid giving students answers.

One LA weighed the benefits and drawbacks of giving students the answers to coursework, describing it as “the easy option,” since it allows students to finish the work sooner than otherwise. The large drawback, however, is that it “does not encourage them to think deeply… and will harm them in the long-run” [3:26]. Out of concern for their students’ long-term understanding, this LA decides that the completion speed is not worthwhile, even if both students and instructors would appreciate the extra time. The LA would rather engage the
students in a longer process in order to encourage them to “think deeply about the material,” a benefit slightly more obscured from the students’ perspective.

Another LA generalized this idea to further describe the scope of an LA’s role.

_As an LA I feel my place is to provide a non-intimidating source of knowledge. I specifically say knowledge, because I am not a source of answers. Sometimes I may not even have an answer, but I do have a [general] understanding that students can bounce ideas off of or use to help confirm a logic process._ [3:100]

By contextualizing LAs as a “source of knowledge,” they positioned the interaction for a more complex back and forth conversation as opposed to a quick exchange where assignment answers are given. This LA and others believed it best to direct their attention towards confirming and understanding the student’s thought process which still allowed them to address the student’s concerns while stimulating deep thought. This desire to stimulate student thinking for the sake of long-term benefits and understanding is loudly echoed in many other responses.

Among the 15 instances of the “Action: NOT give answers to assignments” code, there are 8 cooccurrences with the “Action: Guide student thinking/problem solving” code. For example, quotation [3:67] describes the purpose of an LA is “not to give answers,” but instead “guide learning” and to “help students draw from their own knowledge bank.” In a similar vein, there were also 7 cooccurrences with the “Action: Ask questions” code. In quotation [1:91], the LA stated that their job is to get student to think by “guiding students (not tell them) to the right answer… by asking ‘leading’ questions.”

5.2.2 Objective: Cultivate Student Relationships

An important facet of LAs as an instructional staff member is their unique position as a former student for the class they are instructing. As an active undergraduate student, they have a number of different experiences that their professor and TAs do not, which then inform how they behave toward their own students. These experiences, of course, apply to the subject of whether or not to give students the answers to assignments when requested.
Many LAs complained about their student experiences interacting with LAs. One LA described how, as a student, they’ve “often found the lack of straightforward answers… more confusing than inspiring” [1:34], a sentiment shared by another LA [1:90]. Both wanted straightforward confirmations of the assignment answers because their student experiences left them “feeling very self-doubting” [1:34], which they did not want to instill in their own students. In this case, the LAs recognized that students desire to be confident in their work by being free of confusion, and thus they responded to this student objective. Another LA recognized the consequence should they not help satisfy the students’ objective is that “[they] may become so frustrated that they no longer trust me to help them” [1:110]. These LAs believed students want a quick, reliable way to get answers that will clear up confusion and give them the confidence to continue their work. Their responses suggested these LAs are particularly sympathetic to this desire.

5.2.3 Negotiation and Compromise

LAs are in a particularly interesting position, as they have had both experience as a student and are now gaining experience as an instructor. From these different positions, different objectives are more or less apparent, and can come in conflict. Prioritization and negotiation of these objectives becomes a large factor in how an LA decides to interact with their students, and is subject to change over time. Below is an example of one LA who, over the course of a week of instructional experience, has chosen to prioritize long-term understanding over their students’ discontentment.

As a student myself, I have often just wished that a TA or LA would simply tell me the answer, rather than giving me the “guidance” that I have referred to, but long-term learning is not usually the result of this kind of interaction. Even after one week of studio, I have gathered that students progress more when I ask them to tell me what they already know and how they think they could approach the problem, rather than telling them the specific theory or formula they need to use. [1:27]

Many LAs recognized this tension and offer their solutions and potential compromises. One interesting solution was to position themselves such that students would not expect LAs to have the answers. We believe this is helpful because by mitigating the expectation that LAs have
the answers, students do not get the impression that LAs are withholding information, and the student relationship is not in danger. One LA wrote “if you want a quick answer, you go to the professor. If you want to really argue and understand the basis of something, you go to a… near peer. My job is to fulfill that role” [3:72]. Similarly, another LA defined the LA role as a peer who may or may not know the answers as opposed to a teacher, who always does [3:67].

An innovative instructional practice to address the tension between objectives was suggested in two week 10 responses. These LAs described a process of leaving the table and allowing students time to process and grapple with ideas within groups, so long as the LA returns before time is up (A third response was also found but was less explicitly connected to this negotiation). As one of the LAs described:

_One belief that I stated at the beginning of the term is that if a student asks a question, you should answer it. I said that it might involve a discussion with both the student who asked the question and their group mates, but before you leave their table, they should have an answer. This was due to some poor studio experiences in the past where I felt like I wasted my time because my group got stuck and the TA/LA wouldn't answer our question. I have since reformed this belief because some questions could be more conceptual that they will have to work through in the class period. Now I would say that my belief is if a student asks a question, you should make sure they have the answer by the end of the studio. This requires being mindful because you have to remember who asked what question, but studio sections aren't that big._ (Underline added for emphasis) [3:55]

As this LA indicated, their week 1 response highly favored immediately providing students answers due to their own negative experiences as a student. However, after 9 weeks of instructional practice and participating in the pedagogy course they modified their approach. Their new position doesn’t fully dismiss the students’ objectives and gives space to complete the instructors’ objectives. For context, their week 1 response is shown below (underline added for emphasis):

_I've often found the lack of straightforward answers to questions I've asked in studio to be more confusing than inspiring. After some classes, I would leave feeling very self-doubting because I didn't believe in either my knowledge of some
principles/concepts or my skills in coming to those conclusions. Therefore, one of my beliefs is that you should answer a question asked. One of the ways my instructors framed it is that practice does not make perfect but it does make permanent. If you practice an incorrect method of reasoning too much, you will have a hard time grasping the concept. I am a firm believer in being part of a conversation to discuss the answer, but before you leave a table, the team should have the correct answer to their question. This also leads into having the answers for studio worksheets, because students should be able to practice the concepts correctly. [1:34]

LAs possess experiences and perspectives of both an instructor and undergraduate student, making them valuable additions to the classroom. When these perspectives lend themselves toward revealing different objectives, a sort of tension occurs which the LA must resolve when deciding on an appropriate course of action.

5.3 Types of Questions

LAs frequently cited asking students questions as an instructional practice. These questions, however, could serve different purposes. We identified two distinct questions types: processing questions and assessment questions. Processing questions stimulate student thinking, giving the students a higher sense of authority over the thinking process that follows. LAs also advocated for “leading questions,” a subset of processing questions with a side goal of leading students to a desired answer. Alternatively, other LAs use questions as a means of assessing the students’ current understanding. Compared to processing questions, the answers to assessment questions are more direct, give less authority to the students, and set the stage for the LA to transfer their own knowledge to the student according to the perceived level of understanding.

5.3.1 Processing Questions

Processing questions are intended to stimulate students’ thinking processes and potentially guide that thinking. Of the 14 instances of the code “Action: Ask questions,” six cooccurred with the code “Goal: Elicit student thinking.” One LA wrote their plan was to “[use] open questions to allow the students to better analyze their thinking” [3:94]. Another LA planned to use “guided questions that will hopefully teach students how to problem solve themselves”
[3:80]. For some, this use of open-ended processing questions was justified by their learning models or personal experience. The following response provides an example of how an LA used their personal experiences to guide their approach to helping students.

*Personally, my thoughts when working on complicated new material are often very messy. I'm turning things over in my brain and trying to fit everything into place in a way that makes the concept make sense for me. This makes it very hard for me to explain my line of thinking to people, which can make it challenging to get help. I believe this is a problem many students face and is something I, as an LA, want to be good at handling. I've found that I can usually get myself unstuck if the person helping me asks conceptual questions that I can then use to understand how the math works.* [1:19]

In this LA’s experience as a student, when another LA asked them conceptual questions about the material, they were better able to understand and organize their complicated and messy thoughts. Compared to other instructional practices where an educator explicitly provides the organized thoughts that take the place of the students’ own ideas, this approach lends itself to preserving the students’ sense of authorship and develops their reasoning skills.

We identified a subset of process questions, which we labelled “leading questions.” These are questions that are also meant to stimulate students’ thought processes while also leading them to a desired answer. The language used differs between LAs, but this subset of processing questions can be identified because they are often mentioned as a sort of alternative to directly giving students the answers (See Section 5.2 for our findings on LAs’ beliefs regarding giving students the answers). One LA wrote “I need to ask probing questions to teams that are struggling with concepts. I will not give them the answers, but instead I will ask them questions that should allow them to continue working on the worksheet” [3:16]. This approach, while under the umbrella category of processing questions, gives less authorship to the students than other processing questions since the language and nature of questions are more explicit and asked with a desired answer in mind.

One LA summarized both aspects of processing questions which they termed clarifying and leading questions, respectively (underline added for emphasis):
I think my job is to get students to think. I intend to do this by asking clarifying questions. I also think it is my job to guide students (not tell them) to the right answer. I intend to do this by asking “leading” questions. These are my two really strong beliefs which I will bring into the room. [1:91]

5.3.2 Assessment Questions

Assessment questions provide information to the LA about their students’ current understanding and, thereby, support their teaching. Relatively less authorship over the ideas is given to the students as it typically sets the stage for the LA to transfer the accurate knowledge to the students. One response described the LA role as one meant to “[assess] what students are thinking about the problem and guide it in a productive direction” [1:4]. Here, the questions they first asked to assess what the students are thinking would be the assessment questions, allowing them to know what productive direction to guide the students in.

To further examine this phenomenon, we will revisit a quotation discussed in the “Negotiation of Objectives” section. It lays out a very familiar situation where students ask for confirmation, but the LA doesn’t want to directly provide the answer. This LA’s solution was to ask an assessment question to make sure the student actually knows what they did.

Another common situation arises when a student seeks confirmation that their answer is correct so they can confidently move on to the next step of the problem. Here, it is tempting for me to simply confirm their answer, but I need to learn to realize the reason they are asking: they are unsure, and require the means to verify their answer, rather than a direct verification from me. In this case I need to ask them why they did what they did to reach their conclusion, and ensure their understanding is as complete as their work. (Underline added for emphasis) [1:110]

Once the LA verified that the students’ answers reflect their work and comprehension, they can decide whether to confirm or deny their answer and work with them to build up that understanding through their other instructional strategies. The assessment question is the first step and leads into the LA being able to appropriately respond to their students.
5.4 Tolerance for Student Confusion

Many LAs addressed ideas about the role of student confusion in learning. Responses ranged in their level of tolerance for student confusion. Some LAs argued that despite the discomfort it may cause, confusion is necessary for continued effective learning. Other LAs suggested that their role serves to resolve student confusion whenever possible. The examples shown below were selected to show these different positions, but there were other responses which place LAs closer to the middle ground than these.

For those who have a high level of tolerance for student confusion, the benefits of confusion appear to outweigh the disadvantages. These benefits were typically educational outcomes such as a “deeper and better understanding” [1:13] or “long-term learning” [1:27].

I also think that struggling is a very good thing when learning a new subject. In my experience, the subjects I have struggled the most with are the subject that I [now] have a deep understanding in and the subjects that were easy are what I [now] struggle to remember when they come up later on [1:13]

With this instructional style, the LA took the job of a guide, allowing the student to struggle to “figure things out” [1:13] since that confusion will lead to positive educational outcomes. This logic was frequently cited by LAs as a reason not to directly provide students the answers to assignments.

On the other side of the spectrum, some LAs were very uncomfortable with allowing students to remain confused. In the context of giving students answers, this disposition means LAs may choose to provide them as requested, or conditionally do so if the student already has the correct answer. The reasons for their discomfort varied, including a desire to maintain the students’ trust, an obligation the LA has towards students, concerns about students’ confidence to continue learning, and preventing misconceptions from solidifying. One LA even measured their success as an LA by the amount of confusion their students experience: “if I leave a table more confused about the material than they already were, to begin with then it begs the question ‘Am I really helping the students?’” [1:49] Others were more concerned with the negative effects of allowing student confusion to persist such as “lower confidence in academic ability,” [3:76] or
“[practicing] an incorrect method of reasoning too much” [1:34]. These responses showed that there are a variety of reasons LAs may be uncomfortable with allowing students to be confused. Whatever the justification, a low tolerance for confusion ultimately leads to very similar instructional practices.

5.5 Asset and Deficit-based Approaches to Feedback

In the context of providing feedback, LAs appeared to have a tendency towards one of two approaches. The first is an asset-based approach where the LA focused their and the student’s attention towards aspects of the student’s understanding which are sound, “start[ing] with what [the student] did correctly,” [1:22]. This asset-based approach appears well rooted in constructivist learning models. Conversely, the second is a deficit-based approach where the LA directed attention towards the areas where the student’s understanding is not sound “and help the students bridge the gaps” [1:106]. Deficit-based approaches are mostly rooted in misconception theory models of learning.

5.5.1 Asset-based approaches

As described above, in analyzing the feedback-related responses provided by LAs, we found a portion of LAs whose beliefs revealed an asset-based approach to teaching. This approach may mean stepping backwards in the work until the kernel of truth is found or finding the useful aspects of their thought process that may be assets in fostering correct understanding. For some LAs, this form of feedback is achieved on an individual basis where a student’s understanding must be built from their own personal assets in a similar manner to constructivist learning models. For others it is achieved by redirecting the students to their own group members, each bringing their thoughts and assets to form a combined understanding that contributes to the group’s success.

For those LAs who seek to provide individualized asset-based feedback, the onus is on them to identify what assets are in their student’s expressed thinking and then build upon them. One LA described their strategy where “if a student is lost on a problem and I see they had the right idea I can try to start with what they did correctly. That way they have a starting point that I know makes sense to them since it came from there [sic] own head.” [1:22] From this starting
point, the LA can then attempt to build further layers of understanding that connect to the assets of the student’s understanding. Another LA asked themselves “are there any assumptions the student made that are valuable?” and uses the answer to guide their practice because they also believed “thinking about where a student’s answer came from is crucial in understanding a student and helping them succeed.” [1:119]

Our research revealed another kind of asset-based approach which focused not on the individual student’s assets, but rather the group’s collective assets. These responses described the professor’s initial explanation as potentially “esoteric” [3:28], leading to confusion in one or more students. Then when those confused students request feedback on their understanding from the LA, they redirect the request to their work group rather than directly answering. This approach was used with the expectation that among the group members, there are enough pieces of understanding for the whole group to reach a complete understanding, whether from the professor’s initial explanation or after some prodding from the LA. Because of this perspective, encouraging group work may be considered an essential aspect of the LA role. As one LA put it, “It is important to hear everyone out though because pointing out that between all 4 students they were able to piece together the correct answer is so important to introduce the students to teamwork.”[1:51] Importantly, by redirecting the student’s confusion to their group and helping them find success with the assets of their groupmates, the students themselves may develop an asset-based approach to their professional engineering work after academia.

5.5.2 Deficit-based approaches

Other LAs described an approach whereby rather than looking for the correct elements of a student’s understanding, their deficits, or mistakes are identified and corrected. In some cases, the LA’s deficit-based approach to feedback stems from their conceptualization of how learning occurs, where students take their best shot and LAs come along to correct their aim. The responses which reflected a deficit-based approach also frequently used a learning model which resembled misconception theory.

Deficit-based approaches began with the conception that there are mistakes or deficits in a student’s understanding, which must be corrected in order for complete understanding to be achieved. As one LA put it, “each student’s understanding has gaps in it: some of these are
apparent to them…at other times, these gaps are hidden from them.” [1:106] From this initial conjecture, this LA went on to elaborate how best to address the various types of gaps and correct them such that they don’t occur again. Another LA described how in their instructional experience, they “have found that students who get stuck or get the wrong answer often are confused about or have misunderstood an important detail in the theory” [1:15] which, when corrected, allows students to proceed in their coursework. Bringing conceptions of learning that focus on finding and correcting mistakes, it is no wonder why these LAs took a deficit-based approach to feedback. Here, feedback and review served the purpose of allowing “mistakes to be reviewed by their creators to correct understanding,” [3:98] rather than more generally allowing students to learn by building upon their previous work.

6 Discussion

This thesis and its findings are the first step towards the shift Goertzen et al. (2010) identified as necessary to improve the LAs’ professional development course. By understanding the thought processes undergirding LAs’ instructional beliefs, instructors can shift towards viewing LAs as partners in education rather than inexperienced instructors whose beliefs must be corrected. By delivering a concise summary of the LAs’ beliefs they hold and how varied they can be, we illustrate how LAs, while relatively inexperienced, contribute interesting ideas that can be cultivated and built upon, rather than replaced.

While this study is one of few to examine the ideas LAs commonly grapple with when formulating their beliefs, research on these instructional phenomena has already been conducted. For example, Furtak, (2006) examined the instructional beliefs of three middle school science teachers who face a very similar negotiation of objectives and summarizes the various solutions each of them came up with that still allowed them to withhold providing direct answers. Furtak wrote that neither the instructional experience, depth of course material understanding, or curriculum-specific preparation allowed the teachers to circumvent this tension when deciding to withhold answers.

Similarly, research has already been conducted that draws parallels with the asset and deficit-based approaches identified in LA responses. As mentioned in Section 5.5, the asset-
based approach can be likened to a constructivist theory of education, while the deficit-based approach mirrors misconception theory. Both have their own advocates, but recent research has taken to combining the two. One such suggestion is the resources perspective, which “emphasizes how students can reason with different kinds of valuable knowledge to make sense of new situations and ideas” (Campbell et al., 2016). Campbell’s work also describes the positives and negatives that come with each approach, advocating for a reconceptualization of misconceptions and their usefulness for educating students. Similar work by John III et al. (1994) takes misconceptions and examines them from a constructivist perspective to advocate for a reconceptualization of misconceptions in order to reconcile the apparent contradictions between constructivist and misconception models.

7 Conclusion

This thesis sought to answer the following research question(s):

- What are the common beliefs that LAs bring to instruction? How do LAs differ in the ways their beliefs are expressed? What aspects of these common beliefs focus on
  - The instructional climate and the LAs role in it?
  - The instructional objectives and practices?

In doing so we have identified six phenomena in the LAs’ beliefs that shape and characterize their approach to educating as an LA. The first is the need to cultivate a positive instructional climate for students to feel comfortable. Second is the unique positionality LAs have, with three identified aspects. Third is the negotiation of objectives between promoting deep thinking and cultivating student relationships, which causes LAs to struggle to find a satisfactory compromise between their student perspective and instructor perspective. Fourth is the use of different types of questions as an instructional practice to achieve different learning objectives. Fifth is a wide range in how comfortable the LA is with allowing students to be confused. Sixth is the use of two distinct approaches to providing feedback: asset-based and deficit-based.

Across all these phenomena, LAs showed a variety of personal interpretations and beliefs. This diversity may signify a need to more thoroughly address these subjects in the pedagogy course and provide space for LAs to exchange their personal beliefs among each other.
Since these ideas are common and also diverse, doing so may provide students with a more holistic view of their chosen beliefs, leading to richer and more nuanced instructional practices.

This study may also provide a concise summary of the different ways LAs form their beliefs and facilitate metacognitive thinking within the pedagogy class. By providing an overall summary of what the majority of LAs believe, members of the pedagogy class may find an opportunity to reexamine their personal beliefs in the context of what the majority of LAs are divided on.

Within the scope of this study, the major phenomena and themes in LA beliefs have been examined to reveal common thought processes that reflect on instructional practices. This work, however, did not distinguish between the two data sets when examining the phenomena. Future analysis could be conducted to discern to what extent the 10-week professional development course and the associated instruction in a classroom influenced the identified phenomena and accomplished its goal of preparing LAs for their position.

This study also only reviewed the beliefs of 26 LAs, all of whom attended the same professional development course within the same unit and frequently exchanged pedagogical ideas with one another. Further research of a similar manner should be conducted to provide another set of salient phenomena and themes which can be compared to those of this study.
8 References


9 Appendix

9.1 Major Tables and Figures

Table 9.1 – Justification codes and their frequency, split between the two weeks responses were gathered.

<table>
<thead>
<tr>
<th>Justification: Exp general Gr=2</th>
<th>Wk1 Gr=94</th>
<th>Wk10 Gr=97</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Justification: Exp instructor general Gr=15</td>
<td>6</td>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td>Justification: Exp student general Gr=31</td>
<td>23</td>
<td>8</td>
<td>31</td>
</tr>
<tr>
<td>Justification: Learning models Gr=47</td>
<td>20</td>
<td>27</td>
<td>47</td>
</tr>
<tr>
<td>Learning model: connect to prior knowledge Gr=3</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Learning model: everyone learns differently Gr=9</td>
<td>3</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Learning model: gaps in knowledge Gr=1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Learning model: general Gr=10</td>
<td>5</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Learning model: learn more from other students than instructors Gr=1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Learning model: lower stress is better Gr=2</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Learning model: misconception theory Gr=1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Learning model: mistakes must be confronted by the student Gr=3</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Learning Model: procedural and conceptual learning Gr=8</td>
<td>5</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Learning model: social construction of understanding Gr=12</td>
<td>5</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>Learning model: struggling builds understanding Gr=2</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Learning model: student thinking/authorship builds understanding Gr=3</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Learning model: uncategorized Gr=1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Totals</td>
<td>78</td>
<td>73</td>
<td>151</td>
</tr>
</tbody>
</table>
Table 9.2 - Action codes and their frequency, split between the two weeks responses were gathered.

<table>
<thead>
<tr>
<th>Action Description</th>
<th>Wk1 Gr=94</th>
<th>Wk10 Gr=97</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Action: Answer questions directly</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>● Action: Ask questions</td>
<td>9</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>● Action: Be compassionate/understanding</td>
<td>3</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>● Action: Be honest and genuine</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>● Action: Be open to learn/humble</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>● Action: Confirm student correctness</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>● Action: connect to lecture materials</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>● Action: connect to prior knowledge</td>
<td>6</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>○ Action: context dependent</td>
<td>4</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>● Action: emphasize important concepts</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>● Action: encourage teamwork</td>
<td>4</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>● Action: facilitate group discussion</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>● Action: Guide student thinking / problem solving</td>
<td>9</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>● Action: have students verbalize</td>
<td>4</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>● Action: introduce different ideas</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>● Action: Learn student names</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>● Action: leave the table before complete understanding</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>● Action: leverage previous student exp in class</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>● Action: NOT give answers to assignments</td>
<td>8</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>● Action: observe group dynamics</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>● Action: prepare for class/OH</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>● Action: provide explanations / show procedures</td>
<td>7</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>● Action: provide resources and information</td>
<td>2</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>● Action: Reach out to students</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
Table 9.3 - Goal codes and their frequency, split between the two weeks responses were gathered.

<table>
<thead>
<tr>
<th>Goal Description</th>
<th>Wk1 Gr=94</th>
<th>Wk10 Gr=97</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Action: Relate personally with students</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Totals</td>
<td>77</td>
<td>61</td>
<td>138</td>
</tr>
</tbody>
</table>

- ● Goal: Accommodate individual needs Gr=11
  - ○ Goal: adjust information complexity Gr=6
  - ● Goal: administration of assignments Gr=1
  - ● Goal: conceptual understanding first Gr=3
  - ○ Goal: context dependent Gr=4
  - ● Goal: course-specific learning objectives Gr=9
  - ● Goal: Elicit student reasoning Gr=16
  - ● Goal: emphasize important concepts Gr=3
  - ● Goal: encourage/sense of belonging Gr=11
  - ● Goal: get students unstuck Gr=9
  - ● Goal: give students multiple perspectives Gr=6
  - ● Goal: Maintain group collaboration Gr=9
  - ● Goal: Mutual Trust, respect, and approachability Gr=21
  - ● Goal: near peer positionality Gr=11
  - ● Goal: prepare students for future work Gr=8
  - ○ Goal: Preserve student authorship Gr=7
  - ○ Goal: promote student engagement in class Gr=5
  - ● Goal: provide "good" feedback Gr=2
  - ● Goal: provide an approach to problems Gr=3
  - ● Goal: provide correct answers to assignments Gr=2
  - ● Goal: provide examples Gr=4
  - ○ Goal: Satisfy Students Gr=1
Table 9.4 - Change in frequency of belief elements. The columns in this table represent when the LAs’ responses were collected, Week 1 being prior to attending the pedagogy course and Week 10 after. The rows are the three belief elements identified during the categorization phase and how frequently these codes appeared in the respective weeks.

<table>
<thead>
<tr>
<th></th>
<th>Week 1 quotations</th>
<th>Week 10 quotations</th>
<th>Total quotations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Justifications</td>
<td>59</td>
<td>47</td>
<td>97</td>
</tr>
<tr>
<td>Actions</td>
<td>79</td>
<td>61</td>
<td>140</td>
</tr>
<tr>
<td>Goals</td>
<td>83</td>
<td>92</td>
<td>175</td>
</tr>
</tbody>
</table>
Figure 9.1 – Themes Network Diagram. This figure depicts the action and goal codes alongside their associated themes. No codes were excluded but a few codes do not have any themes associated.
9.2 Sample Coding

As discussed, the major iterative elements between codes and categories allowed us to summarize and compound the data in a clear manner as well as form a stable launchpad from which the crux of our analysis took off. The most significant element of our analysis is the presence of themes among “action” and “goal” codes. This paper will use the term “themes” to describe the primary element of the learning environment addressed by an action or goal. The five themes found through our analysis are: feedback, course content, instructional climate, group work, and student thinking. The network diagram depicting which codes fall under which themes can be found in Figure 9.1 in the appendix.

To illustrate how an LA’s beliefs are made of actions and goals and fall under themes, below is an excerpt from a response we received. This excerpt was chosen because it has almost solely “instructional climate” codes.

*My third strong belief is that it is my responsibility to find the students who are not comfortable asking for help and make sure that they are getting the help they need when they need it. Again, from experience, I have found that students will get stuck and won’t ask for help either because they are shy or because they don’t know what to ask. As a learning assistant, I feel like it is part of your job to recognize that and reach out so those students get the most out of their time in class.* [Quotation 1:17]

In the first sentence, the LA identifies assisting students on an individual basis as a central “responsibility” for one in their position, which fits into the “Goal: Accommodate individual needs” code. In the second, they describe how their previous experiences have informed this belief and why their logic is sound. This justification was similarly coded appropriately. Finally, the last sentence the LA describes the actions necessary to fulfill their previously identified responsibility. Specifically, they suggest reaching out to students as the appropriate means to achieve their goal, garnering the “Action: Reach out to students” code. To reiterate, the themes attached to each code were created after the codes were attached to quotations and the code categories were deemed stable enough. These themes are integral in addressing our research questions, the first one especially.
9.3 Theme Characteristics

We next describe findings for each of the five themes identified in the analysis. For each theme, we identify beliefs that are common across several LAs as well as some less common beliefs that we identified as useful for future LA professional development or their work in the classroom.

9.3.1 Instructional Climate

The most common theme we identified in our research is the theme of instructional climate. Similar to the two before it, this theme is comprised of the action and goal codes that describe how the LA interacts with the atmosphere of the learning environment they share with students. As before, the theme codes table, Table 9.5, is provided below for reference. By adding up the code counts in the table, we can see that the theme is very goal-heavy with an action:goal ratio of 21:78. While this may simply reflect the nature of beliefs related to the relatively abstract term of “instructional climate,” it may support the notion that LAs find themselves with many goals regarding the instructional climate they wish to produce, but ill-equipped with the actions necessary to see them through despite pedagogical training. This claim, however, cannot be supported by this research alone and may provide an opportunity for future studies.

Table 9.5 – Instructional climate theme codes. Table lists the codes associated with the identified theme of instructional climate in descending order of prevalence by category.

<table>
<thead>
<tr>
<th>Instructional climate codes</th>
<th>Definitions</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action: be compassionate/understanding</td>
<td>Action: taking actions that maintain and/or create a positive relationship between student and LA. Includes &quot;being positive&quot;</td>
<td>10</td>
</tr>
<tr>
<td>Action: Be open to learn/humble</td>
<td>Action: act humble and recognize that there is more to learn about the subject matter</td>
<td>4</td>
</tr>
<tr>
<td>Action: Be honest and genuine</td>
<td>Action: behavior that is genuine and forthcoming when interacting with students</td>
<td>2</td>
</tr>
<tr>
<td>Action: Reach out to students</td>
<td>Action: take the first steps to reach out to students who need it</td>
<td>2</td>
</tr>
<tr>
<td>Action: Relate personally with students</td>
<td>Action: find ways to connect to and talk a personal level with students</td>
<td>2</td>
</tr>
<tr>
<td>Action: Learn student names</td>
<td>Action: get familiar with and learn the students' names</td>
<td>1</td>
</tr>
<tr>
<td>Goal: Mutual Trust, respect, and approachability</td>
<td>Goal: achieve mutual trust and respect with students, making them more approachable than other instructional roles</td>
<td>21</td>
</tr>
<tr>
<td>Goal: encouragement/sense of belonging</td>
<td>Goal: make students feel as though they belong in the environment</td>
<td>11</td>
</tr>
</tbody>
</table>
Goal: near peer positionality  
Goal: for students to perceive the LA as a near peer  
11
Goal: Accommodate individual needs  
Goal: accommodate the variety of educational needs students have  
11
*Goal: Preserve student authorship  
Goal: preserve the students' sense of ownership over their ideas and solutions to problems  
7
Goal: understand/learn about students  
Goal: become familiar with and learn about student opinions, ideas, learning preferences, and so on.  
7
*Goal: promote student engagement in class  
Goal: get students engaged during class (not with the material)  
5
Goal: Student confidence in their answer  
Goal: get students to be confident in their answers to worksheets or problems. Occasionally a means to get students to keep talking and pursue their ideas  
5

*Code is associated with multiple themes and is present in multiple tables

The most common code both within this theme and among all actions and goals identified is the “Goal: mutual trust, respect, and approachability”. While one may point to the inherently broad nature of the first code as the reason for its high frequency, the research team chose to maintain its original list-like nature since the three key terms of mutual trust, respect, and approachability (TRA) are very strongly interrelated. The team could have chosen to separate this code into multiple, but this would have the effect of inflating the frequency of the “instructional climate” theme beyond what we deemed reasonable. With so many LAs considering the place of TRA in the classroom, there are a variety of perspectives on the idea.

While all these LAs agree that a goal of their work is to maintain TRA, their reasoning and value come from different places. Some LAs use language which simply identifies TRA as the elements of a good instructional climate or instructor. For example, one LA provided the following response:

*I feel it is very important to be approachable and personable enough that students feel free to talk to you about the components of their work that they don't understand. It can be very difficult to fully flesh out what the problem is and how to resolve it when one or both parties are not fully comfortable with speaking.*

[Quotation 1:79]

Here, the LA identifies a need for a comfortable environment to facilitate communication and thereby achieve higher levels of understanding in the students. Their belief in cultivating TRA stems from their general understanding of classroom dynamics as a whole and its effects on student learning. What is distinctly absent, however, is a connection to the positionality of an LA in the classroom. Similar quotations include 3:15, 1:83, and 3:11.
Meanwhile, other LAs view TRA as an explicit duty or strength of the LA position compared to those of other instructional team members who would also be in the room (TAs or professors). One LA discusses their “place” in the classroom and elaborates further to provide this juxtaposition:

As an LA I feel my place is to provide a non-intimidating source of knowledge...

Often students feel intimidated by professors and don't want to be wrong in front of them; they'd rather be silent than wrong. So myself as an LA let's me be less intimidating that is just as much of a resource. [Quotation 3:100]

The LA explicitly identifies TRA as what sets them and their goals apart from those of the other instructional figures. They have identified an issue in educational practices without them and how their presence helps mend it. Similar quotations include 3:69, 1:102, and 3:81.

Given the prominence of this one code, it is fairly clear that many LAs agree that trust, respect, and approachability are important aspects of a studio or lab learning environment. What these examples show, however, is that the degree to which LAs attach this important aspect to their positionality can vary. Designers of the LA pedagogy course may prefer to cultivate one perspective over the other, so this finding may inform potential modifications to how LAs are taught to consider instructional climate.

While examining the goal codes of instructional climate reveals some general patterns of thought regarding the most common beliefs LAs have, an analysis of the actions within the theme are even more revealing. As mentioned before, this theme is quite heavily characterized by its goals, so we can glean more information about LAs’ beliefs related to instructional climate by examining the most common action code, “Action: be compassionate/ understanding”. Our analysis suggests there are two major orientations an LA can have when implementing their actions.

One is to take action with the expectation or hope of reciprocal behavior from the students that would then allow the two parties to build the desired environment. This may mean showing understanding when students make mistakes so that they are more likely to dismiss the LA’s, and thus creating an instructional climate where mistakes are not a cause for scorn. One LA response connects acting compassionate and understanding to being approachable in the eyes of students:
All students have very different backgrounds. I must remember that not everyone is going to be having a great day when they walk into my assigned studio times. I can't get frustrated if someone does not fully understand concepts, or goes about a problem in the wrong way. I'm a resource to them, and I need to be approachable. [Quotation 3:15]

The second orientation leads to taking action without the need for reciprocity and is rooted in an implicit belief that the students are inherently deserving of such behavior. For example, one LA wrote:

First, I believe that an LA has to believe in the students. I recognize that the students are smart people who are trying hard to do their best at the work they're doing. I recognize that the students want to learn and understand the material, and it is my job to find a way to best deliver the material to them. [Quotation 3:94]

The way this LA describes the relationship between LAs and students carries a weight which the first does not have. A sort of unconditional responsibility guides their view of students as well as their understanding of them.

To clarify, the examples provided here are relatively exclusive in their orientations, but this is only meant to better illustrate the differences between the two orientations. The two we have identified here are not exclusive and can coexist in an LA’s reasoning. Nonetheless, understanding these two parallel approaches to the same action may reflect a fundamental shift that needs to occur in LA training in order to remedy the deficit of explicit actions aimed towards achieving an LA’s instructional climate goals.

### 9.3.2 Student thinking

**Table 9.6** – Student thinking theme codes. Table lists the codes associated with the identified theme of group work in descending order of prevalence by category.

<table>
<thead>
<tr>
<th>Student thinking codes</th>
<th>Definitions</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action: Ask questions</td>
<td>Action: asking the students questions relevant to the course material</td>
<td>14</td>
</tr>
<tr>
<td>Action: Guide student thinking / problem solving</td>
<td>Action: guide student thought processes. To provide direction for student thinking</td>
<td>13</td>
</tr>
<tr>
<td>Action: have students verbalize</td>
<td>Action: have students put their thoughts into words</td>
<td>6</td>
</tr>
<tr>
<td>Action: leave the table before complete understanding</td>
<td>Action: leaving the student(s) to process information without LA interjection after providing a prompt</td>
<td>3</td>
</tr>
</tbody>
</table>
The third most common theme we identified in our research is the theme of feedback. The feedback theme describes codes that are related to or describe how the LA interacts with students or groups in responding to their work in the classroom in order to transition their current thinking to the desired thinking. The codes, their definitions, and their frequencies can be found in Table 9.7. In sum, there are 43 action quotations over six codes and 16 goal quotations over four codes. Thus, LAs reflections were more oriented towards feedback as an action rather than feedback as a goal.

<table>
<thead>
<tr>
<th>Feedback codes</th>
<th>Definitions</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action: NOT give answers to assignments</td>
<td>Action: LA responses explicitly state that providing answers to problems is not how they achieve their goals. It may be done later in their process, but not immediately</td>
<td>15</td>
</tr>
<tr>
<td>Action: provide explanations / show procedures</td>
<td>Action: give students step-by-step instructions or explanations to solve a problem</td>
<td>8</td>
</tr>
<tr>
<td>Action: connect to prior knowledge</td>
<td>Action: modify the way they present information based on the students' prior knowledge</td>
<td>7</td>
</tr>
<tr>
<td>Action: provide resources and information</td>
<td>Action: give out information and where to find other resources, but not their personal thoughts</td>
<td>7</td>
</tr>
<tr>
<td>Action: Answer questions directly</td>
<td>Action: when asked a question by the student, LA recommends responding to directly address the student's concerns</td>
<td>3</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
<td>---</td>
</tr>
<tr>
<td>Action: Confirm student correctness</td>
<td>Action: confirming the correctness of a student's ideas or work when prompted</td>
<td>3</td>
</tr>
<tr>
<td>Goal: get students unstuck</td>
<td>Goal: get students unstuck on assignments or problems they face</td>
<td>9</td>
</tr>
<tr>
<td>Goal: uncover misconceptions</td>
<td>Goal: Use expertise to find where the student has made a mistake and fix it</td>
<td>3</td>
</tr>
<tr>
<td>Goal: provide &quot;good&quot; feedback</td>
<td>Goal: give students what they perceive to be good feedback on assignments</td>
<td>2</td>
</tr>
<tr>
<td>Goal: provide correct answers to assignments</td>
<td>Goal: provide student with the correct answers to assignments when asked</td>
<td>2</td>
</tr>
</tbody>
</table>

The codes of the feedback theme indicate that LAs wrestle with the question, “Should I directly provide students the answers to the assignment?” With multiple codes addressing this question when describing their core beliefs, we can conjecture that such actions related to this question are a concern of the LAs. Their answers to this question have been found in the three codes: “Action: Answer questions directly,” “Action: Confirm student correctness,” and “Action: NOT give answers to assignments.” Whether through experiences or learning model, different LAs have arrived at different conclusions regarding this concern.

The LAs differed in how they responded to this question. Some LAs believe in giving students what they ask for in a direct manner, which includes giving the answers when requested. One LA expressed their previous frustrations when receiving indirect answers to their questions and the potential to solidify mistakes in the understanding, including questions regarding the answers to studio problems:

*I've often found the lack of straightforward answers to questions I've asked in studio to be more confusing than inspiring. After some classes, I would leave feeling very self-doubting because I didn't believe in either my knowledge of some principles/concepts or my skills in coming to those conclusions. Therefore, one of my beliefs is that you should answer a question asked... This also leads into having the answers for studio worksheets, because students should be able to practice the concepts correctly.* [Quotation 1:34]
Another LA described a strategy of conditionally providing the assignment answers depending on whether the student’s proposed answer is correct:

*One thing I personally won't do (since I don't like it when it is done to me), is to not confirm student's correct answers. This is because as a student when I ask if my answer is correct it is so I can help my fellow classmates while making sure I am not steering them in the wrong direction.* [Quotation 1:90]

Finally, on the other end of the spectrum are LAs who explicitly express a belief that they should not or should avoid giving the answers. In contrast to the beliefs expressed above, these codes are more often accompanied by a learning model code rather than an experience code. For an example:

*I need to ask probing questions to teams that are struggling with concepts. I will not give them the answers, but instead I will ask them questions that should allow them to continue working on the worksheet.* [Quotation 3:16]

This code (“Action: NOT give answers to assignments”) is interesting in the context of the rest of the codebook as it is the only code suggesting the avoidance of an action rather than vouching for one. The prevalence of these three codes gives a clear indication that a critical concern for LAs is how they should interact with the answer sheet they have and how it is best used to help the students they assist.

9.3.4 Course Content

The fourth most common theme the research team identified in the data is course content. We have chosen to define the course content theme as the action and goal codes that describe how the LA interacts with the course material. The codes which fall under this theme as well as some of their data are provided below in Table 9.8. One of the most prominent and interesting of these is the “Action: leverage previous student experiences” code.

**Table 9.8** – Course content theme codes. Table lists the codes associated with the identified theme of course content in descending order of prevalence by category.

<table>
<thead>
<tr>
<th>Course content codes</th>
<th>Definitions</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action: leverage previous student exp in class</td>
<td>Action: LA makes use of their own previous learning experience in the same class they are assisting.</td>
<td>8</td>
</tr>
</tbody>
</table>
Group work

The least common theme we identified in LA actions and goals is group work. On occasion, LA actions and goals are tied to how they interact with student groups working together on the same or similar problems. The codes relevant to group work were placed within this “group work” theme. Interestingly, there were only 6 relevant codes compared to the 10-14 codes present in other themes. The action:goal ratio is also very even at a value of 16:15 and not far from the average of 138:172. The relevant codes and their definitions are provided in Table 9.9.

Table 9.9 – Group work theme codes. Table lists the codes associated with the identified theme of group work in descending order of prevalence by category.

<table>
<thead>
<tr>
<th>Group work codes</th>
<th>Definitions</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action: encourage teamwork</td>
<td>Action: encourage students to participate in and works as teams effectively</td>
<td>7</td>
</tr>
<tr>
<td>Action: facilitate group discussion</td>
<td>Action: spark or mediate a group discussion</td>
<td>4</td>
</tr>
<tr>
<td>Action: introduce different ideas</td>
<td>Action: introduce different ideas from the student’s either by providing their own or asking for other students’</td>
<td>3</td>
</tr>
<tr>
<td>Action: observe group dynamics</td>
<td>Action: keep an eye on how group members interact to monitor their overall team dynamics</td>
<td>2</td>
</tr>
</tbody>
</table>
Goal: Maintain group collaboration | Goal: get and keep students engaged in group work. Note this refers to the LA supporting the social processes of the students in the group rather than their relation as an “extra group member” | 9
Goal: give students multiple perspectives | Goal: expose students to a variety of different perspectives and thought processes | 6

Similar to the other themes, there exists some variation in the ways LAs express their beliefs despite holding agreement in their goals or actions. For this analysis, we examined the instances of the most common code, “Goal: maintain group collaboration” and found that different LAs have different perspectives on the value of the group collaboration they are working to maintain.

The first of these perspectives holds group work as a valuable contribution to student learning in and of itself. One LA wrote:

*I also believe that collaborative learning is important. The main thing I learned last year in college is that I learn more from my fellow students than I do from the professor. Being able to enforce that in the studio setting is one of my main priorities* [Quotation 1:51]

Here the LA cites their previous learning experiences as a student which has led them to consider group work in the context of improving student learning. Another LA shares this sentiment that “studio times should be more about learning from the classmates and less from the TA/LAs” citing their own learning model and experiences as a learner [Quotation 1:71]. LA responses like these demonstrate how the group work overseen by LAs can be viewed as a contribution to furthering student learning.

The second perspective found in our analysis suggests group work contributes to and is closely tied to the instructional climate overall. One LA spoke to the social benefits they received from their group work as a student:

*“It was hard not to feel disconnected from my peers given their comparatively ample experience in navigating the academic culture of OSU. The role of T/TA’s in studio to ask questions and encourage team communication was crucial in my ability to work with and eventually get to know my peers and the learning culture of OSU.”* [Quotation 1:94]
In this case the LA discusses how their positive experiences with group work contributed to their enculturation process at OSU. Another LA shared how they hope to “get [students] in the habit of sharing/refuting their ideas openly while maintaining an environment of respect” [Quotation 1:68]. They argue that this group problem solving skill is “an essential skill in almost any career,” drawing a connection between the practice group work done in class and the social climates they create.

9.4 A Shift in Themes

A similar analysis can be conducted on the themes found during study. By counting the number of instances of codes related to each theme, we can see how the LAs’ primary concerns shift over time. The results of this analysis are available in Table 9.10 below.

Table 9.10 – Shift in themes after pedagogical training. This table gives the number of instances of codes within a given theme during the given week or study. The rows depict the theme being examined, where “Gr” indicates the total number of beliefs with one or more codes with the theme, and “GS” indicates the number of codes associated with the theme.

<table>
<thead>
<tr>
<th>Theme: Course Content Gr=30; GS=10</th>
<th>Week 1</th>
<th>Week 10</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16</td>
<td>22</td>
<td>38</td>
</tr>
<tr>
<td>Theme: Feedback Gr=45; GS=10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>37</td>
<td>22</td>
<td>59</td>
</tr>
<tr>
<td>Theme: Group Work Gr=17; GS=6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>13</td>
<td>31</td>
</tr>
<tr>
<td>Theme: Instructional Climate Gr=64; GS=14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>42</td>
<td>56</td>
<td>98</td>
</tr>
<tr>
<td>Theme: Student Thinking Gr=53; GS=11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>49</td>
<td>38</td>
<td>87</td>
</tr>
<tr>
<td>Totals</td>
<td>162</td>
<td>151</td>
<td>313</td>
</tr>
</tbody>
</table>

9.5 Pedagogy Course Schedule and Design

CBEE LA Pedagogy Seminar
Course Organization and Assignments:
1. Class Discussions. The purpose of these discussions is to help us as individuals, and as a group, develop meaningful interpretations of the ideas conveyed by the readings and to make connections to the Learning Assistant experience. Active participation—voicing your opinions by regularly speaking in class, asking questions, sharing in-class writing and contributing to group activities is
essential. a. Each week a few students will be assigned the role of table leader and of table note taker. Those selected will be notified by Wed.

2. **Weekly reading reflections** will be submitted by Wednesday at midnight each week (before class meets) in the Concept Warehouse. Your reading reflections should be a reflection on the weekly reading and demonstrate your engagement with class readings, discussions, and your work as an LA. Feedback on your reflections will be provided to you weekly.

**Table 9.11 – Weekly course schedule for the pedagogy course under study**

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Required reading</th>
<th>Other reading if you are interested</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Metacognition &amp; Reflection</td>
<td>Handout on Josephina and Maya</td>
<td>Tanner, K., (2012). Promoting Student Metacognition. CBE: LSE, (11) 2, 113-120. <a href="http://www.lifescied.org/content/11/2/113.full">http://www.lifescied.org/content/11/2/113.full</a></td>
</tr>
</tbody>
</table>
9.6 Sample Methodology Journal Entry

10/14/20

During meeting:

- B + M reviewed notes taken by B during the past week, up to row 14
- B + M identified 3 potential categories for beliefs and responses to pull order
  a) Responses regarding LA roles/activities
  b) Responses on how students best learn
  c) Translations from experiences as a student

- Began to codify sections of type C in responses with light blue.

For next meeting:

- Continue codifying Week 1 responses and notify M which ones to review for discussion
- B will revisit previously codified responses and use blue text to denote beliefs of type C