

Investigating student perceptions of learning assistants

by

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Abstract

Learning assistant (LA) programs have supported course transformations and active learning at more than 85 different institutions over the past 16 years. The Physics Department at Kansas State University initiated an LA program in its calc-based, introductory physics courses in 2017. Pairs of LAs began to replace one Teaching Assistant (TA) per studio section as secondaries, working alongside a primary instructor, usually a faculty member or instructor. This program is still in transition, so each semester some studios have LAs and some have a TA. We conducted interviews with students who experienced a combination of LAs and TAs in their two semesters of introductory physics. We wanted to know what their perceptions were of these secondary instructors in order to identify possible explanations for why LAs are successful in increasing student learning and identify areas for future exploration. We found that while students did not seem to be aware of an explicit difference between their TAs and LAs, they responded more positively to their LA's preparation and closeness to the course, to interactions that relate to LAs pedagogy training, and to an ease of building relationships with their LAs. Students also noticed that their LAs had less relative expertise and could sometimes be too laid back in their interactions.

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Dedication

This work is dedicated to my daughter, Kateri, who is my daily source of motivation.

Chapter 1

Introduction

Since the first learning assistant (LA) program came to be at the University of Colorado-Boulder (CU Boulder) in 2003, LA programs have spread to more than 85 institutions across the U.S. and worldwide¹. Originating from one Astronomy course, the CU Boulder program developed as a partnership between the School of Education and several science departments. In a 2010 paper, Otero, Pollock, and Finkelstein describe the goals for this program:

The program uses undergraduate courses as a mechanism to achieve four goals: 1) improve the education of all science and mathematics students through transformed undergraduate education and improved K-12 teacher education; 2) recruit more future science and math teachers; 3) engage science faculty more in the preparation of future teachers and discipline-based educational research; and 4) transform science departmental cultures to value research-based teaching as a legitimate activity for professors and our students.²

According to the LA Alliance website, an LA program “supports Learning Assistants, faculty, and students by transforming courses so that they are more closely aligned with research-based instructional strategies.”¹ These programs take place in many settings, from small classrooms to lecture halls, and across many STEM disciplines.

LAs are undergraduate students who have recently successfully completed the course in which they are assigned to help facilitate an active learning environment. Three central

aspects of the LA experience are content, pedagogy and practice. Content refers to weekly preparation meetings that LAs participate in. Practice covers the interactions between LAs and students in the classroom. Pedagogy refers to the formal course that all first semester LAs are required to take in conjunction with their duties as an LA. This last aspect of the LA experience is the major difference between an LA and a teaching assistant (TA). Another difference between LAs and many (but not all) TAs is the LA's relative closeness to the course they facilitate. It is a requirement for an LA to successfully complete that course and they are usually recruited during or quickly following completion. However, TAs may have completed other equivalent courses, possibly at other institutions.

There has been extensive research on the benefits of the LA experience for LAs themselves, for the departments they are in, and for the students who take LA-facilitated courses. Though students have shown increased learning gains on concept inventories in LA-facilitated courses, researchers have only explored the causes of these gains in terms of data points collected such as number of years an instructor has worked with LAs. Additionally, there is a limited amount of research on what the student experience of being in a class facilitated by LAs is like.

The purpose of this study is to discover more about the ways in which students experience LAs in the classroom and to identify areas to explore in the future as to what makes LAs effective. The situation at Kansas State University (KSU) presented a unique opportunity to study this, as some students encountered a two semester introductory physics course with one semester facilitated by a TA and another semester facilitated by two LAs. In this context we were able to interview students and ask them to compare their experiences across semesters and to reflect on their time in these courses. Through these interviews and a phenomenographic analysis, we investigated the students' perceptions of their TAs and LAs and identified differences they observed between their TAs and LAs.

Chapter 2

Background

The following sections summarize research on LA programs in relation to course transformations, students, and LAs themselves.

2.1 Course Transformation

LAs have been shown to be effective partners in course transformation efforts, especially in large enrollment courses. LAs help to sustain course transformation by providing a cost effective way to increase teacher-student ratio³ and acting as a bridge between students and faculty.⁴

Improvements to large enrollment courses are important because these courses often impact students' continuation in STEM. Another study showed that the addition of LAs increased student satisfaction with a large enrollment biology course.⁵ Webb et al. reported that the addition of LAs to a calculus course reduced the course's Drop/Fail/Withdraw rate.⁶

2.2 Students

Students have shown significantly increased learning gains in LA-facilitated courses.^{3;7;8} These significant increases are often entwined with the course transformations made pos-

sible in part by LAs. Several further studies have suggested that LAs can improve student learning above and beyond what course transformations explain. In 2015 the Learning Assistant Supported Student Outcomes (LASSO) study began collecting concept inventory data across a multitude of classroom types and settings, (including traditional, collaborative, and LA-facilitated) within lecture, labs, and recitations.⁹ Early results of this study indicate that learning gains are not isolated to the larger research universities that previous literature is associated with^{10;11}. They also show higher post-test scores in LA-facilitated courses vs. collaborative courses⁹ and present a positive effect of LAs on increased learning gains of underrepresented minorities (URM).¹² Another study showed that although the addition of LAs to an already reformed course did not increase student learning gains on a concept test, LAs did have an effect on student ability to engage with "higher-order cognitive skills questions" on course material and showed increased benefits for URM students.¹³

2.3 Learning Assistants

LAs also benefit from their experience. Multiple studies show further increases on learning gains for LAs on concept inventories over the course of a semester.^{2;3;7} LAs also exhibit positive attitudinal shifts toward more expert-like beliefs about physics over the course of a semester.² The LA experience has also been shown to strengthen an LA's "physics student identity" and "physics instructor identity", which combine to form a stronger overall "physics identity".⁴ A case study from Florida International University suggests that being an LA increases participation and connections in the physics learning community.¹⁴

At CU Boulder, the LA program has also been shown to de-stigmatize K-12 teaching as a career within STEM departments.¹⁵ The program has effectively increased the number and quality of K-12 physics teachers.^{2;16} Furthermore, former LAs who become K-12 educators show an increased tendency to use reformed teaching in their classrooms.¹⁶

2.4 Near-Peer Teaching and Learning

Near-peer instruction is a construct in which students are taught by fellow students who have recently completed the course in which they are teaching. The aspects of the near-peer relationship between student and instructor include a similar knowledge base and use of language as well as a similar social status.¹⁷ These characteristics allow near-peer instructors to understand students' point of view and to better communicate with them.^{17;18} Research on the benefits of near peer teaching mostly centers on undergraduate teaching assistants.¹⁸⁻²⁴ This research has found that near-peer teachers are effective role models for students¹⁹⁻²¹ However, students involved in peer learning can become concerned that they are not learning enough or that they could learn more from a professor, which may effect their satisfaction with the course or peer teaching methods.²⁵

Chapter 3

Methodology

3.1 The KSU LA Program

The KSU Department of Physics teaches a two-semester introductory physics course primarily to sophomore engineering and physics majors called Engineering Physics, commonly known as EP1 and EP2. In 2000, just before CU Boulder began developing their LA program as part of a course transformation effort, the KSU Engineering Physics course underwent its own transformation. The course moved from a traditional lecture/lab/recitation format to a twice per week lecture and a twice per week studio with an additional exam period several times per semester.²⁶

In the studio, students work in groups of four on a lab and either problem solving or individually on a quiz. Since it was implemented, the studio has been facilitated by a faculty member or senior graduate student known as the primary instructor or just the “primary”. Additionally, one TA, known as the secondary instructor or just the “secondary” helped to facilitate student discussion. The secondary may be a junior graduate student (GTA) or an upper level undergraduate student (UTA). From this point forward I will refer to the senior instructor in the studio as the primary and will use the term secondaries to collectively refer to the junior members of the instructor team in a studio.

The KSU Department of Physics implemented an internally sustained LA program in

Spring 2017. LAs are recruited based on their level of success in EP and their interpersonal skills as observed by their primary. Concurrent with their first semester as an LA, they enroll in a pedagogy seminar modeled off the CU Boulder course, where they read about research-based practices and reflect on the experiences of others and their own in facilitating group discussion. LAs were first incorporated into EP1 studios, where one TA was replaced with a pair of LAs. One year later, in Spring 2018, LAs were incorporated into EP2. See Figure 3.1 for a summary of the structure of the courses.

In the LA experience model of content-pedagogy-practice, the main difference between KSU LAs and TAs is the LAs' formal pedagogy training. All secondaries participate in weekly (content) meetings on Mondays to go over the studio material for the coming week, and all secondaries facilitate the same group work in the same environment (practice). Unlike TAs, LAs enroll in a full semester seminar alongside their first semester of studio facilitation. GTAs arriving in Fall '18 received 9 hours of training during the department's new graduate student orientation. This applies to two GTAs in my data. GTAs who arrived before Fall '18 and UTAs have had no formal training from the department. Another way that LAs differ from GTAs (but not UTAs) is that the GTAs in this study have not previously taken KSU's Engineering Physics course.

3.2 Theoretical Framework

The theoretical framework that informs this study is symbolic interactionism²⁷. This perspective relies on the symbolic meaning that people develop and rely upon in the process of social interaction. There are three premises of this theory. First, people act towards things (including other people) on the basis of meanings those things have for them. Second, people derive those meanings through social interaction.²⁷ Third, meanings are refined through an interpretative process used by the person dealing with the things in question. This meaning making through interaction is neither static nor individual. It is decidedly fluid and social in nature - meaning it is derived constantly. It is this derived meaning that forms the basis for how people interact with the world.²⁷⁻²⁹

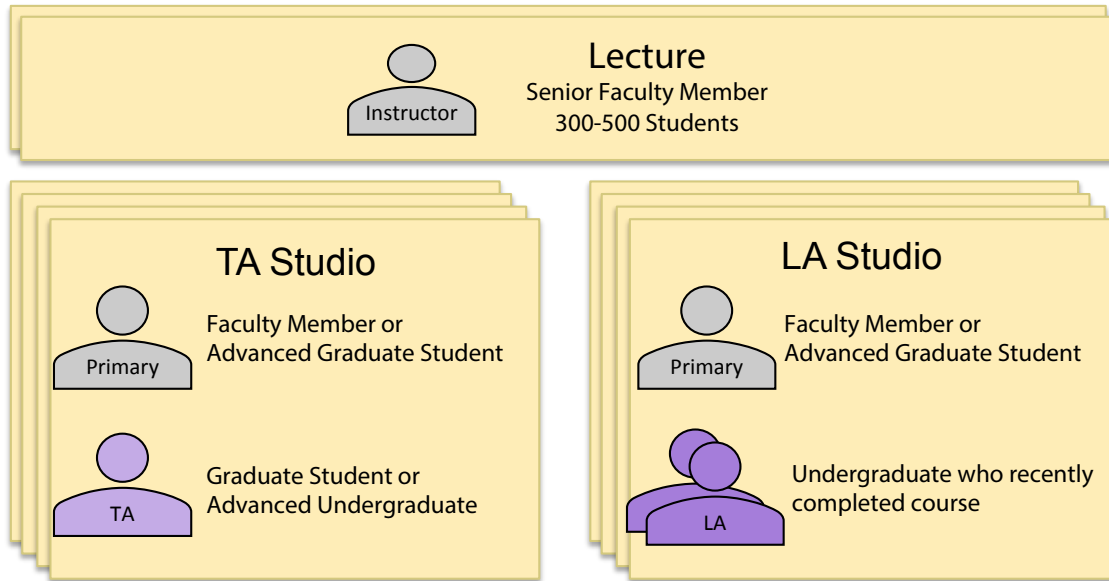


Figure 3.1: *The structure of each of the courses students have taken. All students are in one lecture section and one studio section per semester.*

This study seeks to discover students' perceptions and the meaning they make of interactions with their secondaries in the EP studio classroom through interviews. The studio is the social setting where students construct these meanings while conducting group work with the assistance of an instructor and either one Teaching Assistant or two Learning Assistants. Ultimately, we want to understand the studio environment through the lens of the students. Symbolic interaction indicates that the process of defining a situation is important and tells us that "human beings respond to a particular situation through how they define that situation, rather than how the situation is objectively presented to them."²⁸ Therefore it is not enough to define LAs, we need to better understand how and in what context students define their LAs. This goal of understanding the students' view informs the whole of this study, most especially research questions, interview protocol, and analysis.

3.3 Research Questions

This study attempts to answer two research questions:

1. What are students perceptions of learning assistants and teaching assistants?
2. What differences do students notice between their learning assistants and teaching assistants?

3.4 Research Design

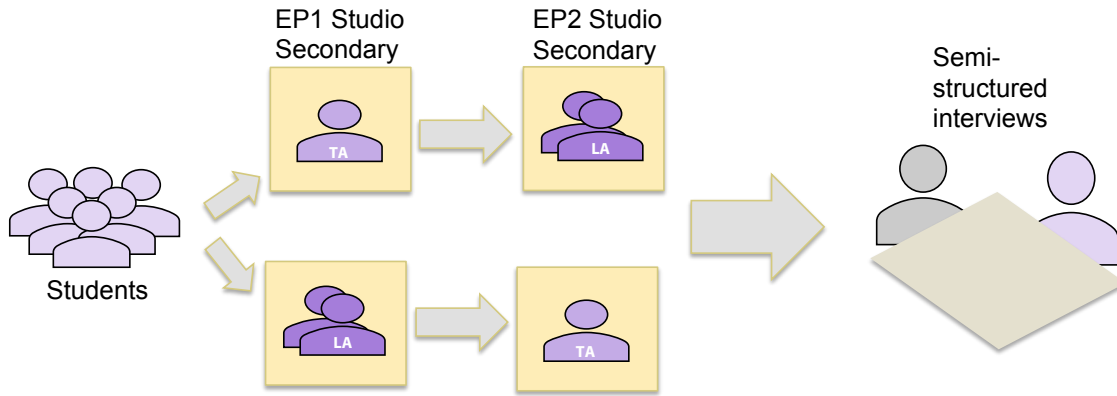


Figure 3.2: *Student population interviewed: students were recruited and selected for interviews based on their encounters with LAs and TAs in the classroom.*

To answer these questions we used semi-structured interviews^{30–32} to ask students about their experiences. This type of interview had the structure necessary to elicit student experiences in a consistent manner yet gave us the freedom to explore other topics of interest that the interviewee may bring up. Our target population were students who had encountered a combination of LAs and TAs in their studios and thus could speak on their experiences with both types of secondary. We recruited and spoke to these students at the end of their EP2 semesters, as depicted in Figure 3.2.

The first iteration of the interview protocol, located in Appendix A, was developed with the goal of understanding student perceptions of TAs and LAs situated within the context of the studio and within the overall course. After several interviews we noticed that students were speaking a good deal about topics that were not relevant to the research questions. This included commentary on course structure and comparisons of the lecturers. Students

were sharing their experiences of LAs and TAs, but it was not to the extent that we would have liked.

In an attempt to elicit more discussion of interest to this study, the second interview protocol, located in Appendix B, was changed structurally by rearranging the order of questions and refining existing questions to be more open ended. The main structural change was that rather than asking each question about EP2 and then asking a corresponding question about EP1, the protocol now stayed with EP2 experiences for all of the studio and instructor related questions and then shifted to EP1 for all the same questions. Despite the changes in structure, the content of the second protocol remained very similar to the first. This change successfully elicited more discussion about secondaries, as shown in the significant increase in quotes extracted from most of the second semester interviewees as seen in Table C.1.

3.5 Data Collection

Students were recruited on a volunteer basis in their studios, with a member of the research team visiting most EP2 studios in Spring '18 and Fall '18 to describe current research projects and request participation. Students were offered compensation in the form of a \$20 Amazon gift card for their time if they participated in an interview. If they were interested, they filled out a sign-up sheet with their name, major, and contact email.

The list of volunteer information was then reviewed against university data to identify or verify what sections each student was in for EP1 and EP2 respectively. Students were only considered if they took EP1 in the semester immediately prior to taking EP2. Then this section data was used to determine which students experienced a combination of TAs and LAs. In Spring 2018, there were 9 students who fit this criteria. All 9 students were contacted and 7 students ended up participating in interviews. In Fall '18, 32 students fit the instructor combination criteria. The goal in selecting which students to contact was to diversify the variation in instructor combinations. Ultimately, 15 students were contacted in Fall '18, and 7 students agreed to participate in interviews. The instructor combination summary is displayed in Table 3.1, and more detailed information can be found in Table

C.1.

Semesters	Secondaries	Stu.
F17-S18	TA \rightarrow 2 LAs	2
	TA \rightarrow LA	3
	2 LAs \rightarrow TA	2
S18-F18	TA \rightarrow 2 LAs	2
	2 LAs \rightarrow TA	2
	LA \rightarrow TA	1
	2 LAs \rightarrow LA + TA	1
	TA \rightarrow LA + TA	1

Table 3.1: *Instructor combinations by semester. “Stu” indicates the number of students whose secondaries in EP followed the given pattern.*

Interviews took place in the last two weeks of Spring ’18 and the last four weeks of Fall ’18. Interviews continued until I felt that I was not hearing anything new, which happened during the 13th interview. I then conducted one more interview to validate saturation^{30;32}.

3.6 Analysis

Phenomenography is a method of analysis that seeks to describe the way people experience the world and the themes and variations within that experience.^{33;34} To answer the research questions, we used this type of analysis to discover the themes and variations within students’ lived experience with LAs and TAs in the studio. We followed the guidelines for phenomenography outlined in Ference Marton’s 1986 work “Phenomenography: A research approach to investigating different understandings of reality.”

After the first seven interviews were complete, I went over the data, noticing general what general theme emerged. Once I collected all of the data, I analyzed audio files, with these themes and the research questions in mind. I annotated these instances in the data in the form of quotes and context. I extracted quotes as they related to the research questions as students spoke about their perceptions of their LA or TA. These annotated quotes were transcribed in full until the student was no longer speaking to the research question. Through the analysis process there were times when larger quotes were segmented into two quotes

which contained different ideas. I did not extract quotes of students describing the job responsibilities of their LAs or TAs. For example, one student mentioned that the TA in EP1 had to get up in front of the class and introduce the labs and LAs in EP2 did not have to get up in front of the class. Additionally, I observed a small number of other students talking about the LAs introducing the lab. This was not within the scope of the research goals or research questions and not something I followed up on.

This process resulted in 147 quotes and associated context which I then grouped together and looked for ways to categories. As I categorized my segments of data, I removed some quotes for lack of meaningful contribution to the research questions. Some examples follow of quotes that were removed along with a brief explanation:

Q: What is the most helpful aspect of the studio?

A: Easy access to your professor and like the TA. - Greg

This implied comparison of studio to lecture does not provide any insight into student perceptions of, or differences students notice among, their secondaries.

*I think technically we had a primary instructor and a TA I think he was called,
and we only had one. - Margaret*

I removed this quote because it was about nomenclature, which was not a part of my overall phenomenographic analysis.

Thus the final total of quotes was 132. These quotes were then sorted into 4 broad categories through repeated organization and reorganization alongside a series of discussions with other members of the research team. These 4 categories were then organized through a similar process into 12 more specific subcategories which described variations within the broader categories.

The 4 categories are designed to be exclusive and are ranked in order of importance in relation to the definitional differences between LAs and TAs. The biggest difference between LAs and TAs is the pedagogy preparation of the LAs, so the category that most closely relates to this became the most important category. The next two categories contain mostly

near-peer related data, and familiarity with material outweighs relatability due to its more academic nature. The codebook scheme for handling a quote which seemed to relate to two categories was to sort it into the category to which it contributed the most meaning. If that did not clarify, it was sorted into the higher ranking category. The order of categories can be seen in Figure 4.1.

I then partnered with another researcher to conduct inter-rater reliability (IRR) checks on the coding of the 4 categories. I provided her with a codebook consisting of definitions of my codes and examples from the data, both protocols, and a randomized set of 20 percent of the data which amounted to 27 unsorted quotes. This set of quotes was randomized with excel, though I deliberately skipped over the quotes that were used in the codebook as examples. The other researcher independently coded this data and we found that we had 81.5 percent initial agreement (22/27). After discussing the quotes we disagreed upon, we came to 92.6 percent agreement (25/27). We then repeated the process with 11 percent more data, or 15 quotes. We were in agreement with 93.3 percent of these final quotes (14/15).

3.7 Nomenclature

As I conducted the interviews, analyzed the data, and later transcribed the quotes, an important theme emerged. Students tended to call their secondaries all by the same title. Only 2 students accurately distinguished between their TA and their LAs. Of the remaining 12 students, 8 called their secondaries “TAs”, 2 called their secondaries “LAs” and 1 student each used “the lab people” or “assistants”. Of the 4 students who used “LA” either properly or as a name for all secondaries, 2 students later became LAs and it is possible that they had already been recruited for this by the time of the interview. Another student who used the term “LA” encountered LAs in all of his classes, with 2 LAs in EP1 and a mix of 1 LA and 1 TA in EP2.

Students were not prompted by the interview questions to call secondaries by any such term. I started out by asking students to describe their EP2 “instructor group”, and subsequently used only the terms that the students used. When asking about EP1, I asked again

about their “instructor group”, and again followed the students’ language from there. This was true of both interview protocols detailed in Appendices A and B.

This was not a problem for analysis since our conversation was situated within timeline of the course, and I knew which secondaries were associated with which semester. Therefore, I could use context to note which type of secondary the students were discussing later. In the case of the mixed classroom with 1 TA and 1 LA, one was female and the other was male, so students using pronouns coupled with use of proper names allowed me to distinguish between the two.

Due to the variety of ways students named their secondaries, as well as the need to maintain anonymity of all instructors and interviewees, quotes were edited slightly during the analysis and before they were provided to the researcher who conducted IRR. I did not change a quote if the student was referring to a TA or LA by their proper title. However, I did change the quote if the improper term was used or if the student used a proper name, other descriptor, or exclusively used pronouns. These changes are summarized in Table 3.2

If student said...	... and person was...	...quote was edited to say...
TA	TA	no change
LA	LA	no change
TA	LA	[LA]
LA	TA	[TA]
Proper Name or Descriptor	TA	[TA]
	LA	[LA]
	Primary	[Primary]
Pronoun	TA	[TA] (first time only)
	LA	[LA] (first time only)
	Primary	[Primary] (first time only)

Table 3.2: *Framework for editing nomenclature in quotes*

Chapter 4

Results of Phenomenographic Analysis

The phenomenographic analysis resulted in four broad categories: Interactions, Familiarity with Material, Relatability, and Preference of Instructor. These categories contained a total of 12 more specific subcategories distributed among them. A summary of these categories, subcategories, and their distribution in the data can be found in [Table 4.1](#). The following sections explore each category and subcategory in more detail with a description of the category or subcategory, explanation of the range of student responses, and example quotes from the data.

4.1 Interactions

Students in this category describe the approach a secondary takes in responding to student questions, specifically in ways that students perceived to help them learn (or not). Student observations manifested themselves in four subcategories in which secondaries were described 1) encouraging students to answer questions on their own, 2) engaging in dialogue with students, 3) giving brief guidance, and 4) offering different perspectives. Eleven students contributed 47/132 quotes to this category. [Figure 4.1](#) depicts the variety in student

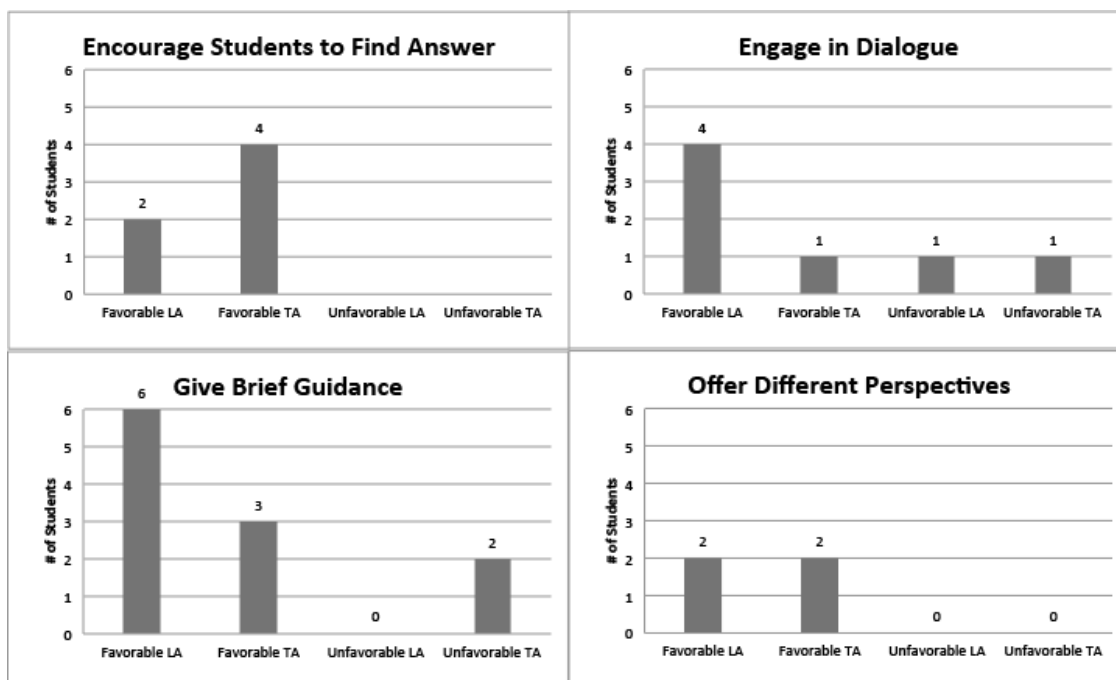


Figure 4.1: *Distribution of student responses in each subcategory within the interactions category.*

responses within the subcategories.

4.1.1 Encourage Students to Answer Questions on their Own

Students talk about their secondaries pushing them to come to an understanding on their own. There were five students in this subcategory who made positive comments about the encouragement of both TAs and LAs. More students gave examples of TAs engaging in this subcategory than LAs.

Definitely it's challenging when - because [LA] doesn't like to give us the answer which is good um so like when he tries to set it up and he also does the same thing as [the other LA] maybe a little bit more trying to get us to explain it ourselves like he pushes us really hard towards like us understanding it rather than just him telling us the answer. - Margaret

[TA] was pretty helpful in the way that he would nudge us along and not give

us the answer cause if you're given the answer you don't really learn it but if you're nudged along and you figure it out yourself then it forces you to actually learn which is helpful. - Peter

4.1.2 Engage in Dialogue

In this subcategory, students describe secondaries engaging in two sided dialogue with students to come to a shared understanding of the problem. Engaging in dialogue is distinguished from other subcategories by the implied length of time that the secondary spends helping students work through the problem. Eight students described interactions with their secondaries in terms of a dialogue. Students were mostly positive about their secondaries in this subcategory and more students gave examples of LAs engaging in dialogue than of TAs.

A lot of times lately if we're stuck on something like we don't know how to explain what we're stuck on so we'll kind of try and explain it and he [LA] uses the chalkboard and like works with us and we bounce back and forth trying to explain what each of us are trying to understand from each other and then eventually we normally come to an understanding of what the problem was and we figure it out. - Margaret

One student in this subcategory expressed frustration with attempts of his secondaries to engage in dialogue, seeming to prefer instead a more direct approach taken by the primary instructors he encountered.

I find sometimes people don't answer my questions. Like I'll ask "what is this asking me to do?" and they'll give me a very roundabout - like that didn't really answer my question. But usually the studio instructors are better about it than like the TAs cause I guess [inaudible] come from experience. - Joseph

4.1.3 Give Brief Guidance

Students in this subcategory described secondaries asking leading questions or giving clues that help students move forward in their understanding. This subcategory is distinguished by its implied quickness in interaction. Secondaries are described as providing either a clue or an answer and leaving students to process it. Nine students described interactions in this category. More students noted instances of LAs giving clues or asking leading questions than TAs, although there are good examples of both. On the other hand, there was no mention of LAs giving direct answers, while two students recounted interactions in which their TAs gave answers. Although some students reported wishing that their secondaries would provide the answer, they also reported appreciating the clue/leading question approach in retrospect.

Sometimes it's frustrating because [LA] won't walk us through he'll just give us a clue - which in the end is better for us. - Patrick

Sometimes if the answer like kindof obvious [TA will] just ask us a question and then kindof just leave us to think about it on our own. - Timothy

Yeah the TA that we had the first semester didnt really care at all, he was just giving us the answer. - Bobby

4.1.4 Offer Different Perspectives

Students recall secondaries having a variety of backgrounds, sharing real world examples, and explaining concepts in a new way. Four students gave examples of both LAs and TAs in this subcategory.

[LA 1] is similar except slightly - [LA 2] is a physics major and [LA 1] is an architectural engineer so like that kind of, the difference in like how you think between those two is a nice contrast cause [LA 1] can like explain it in like more a down to earth or like try to use like more examples I think whereas [LA 2] will try to explain it more conceptually. - Frank

Q: What did the EP1 LA do that was helpful?

A: Yeah just kinda simplifying things down and putting it in different terms than how we learned it before. - Joseph

4.2 Familiarity with Material

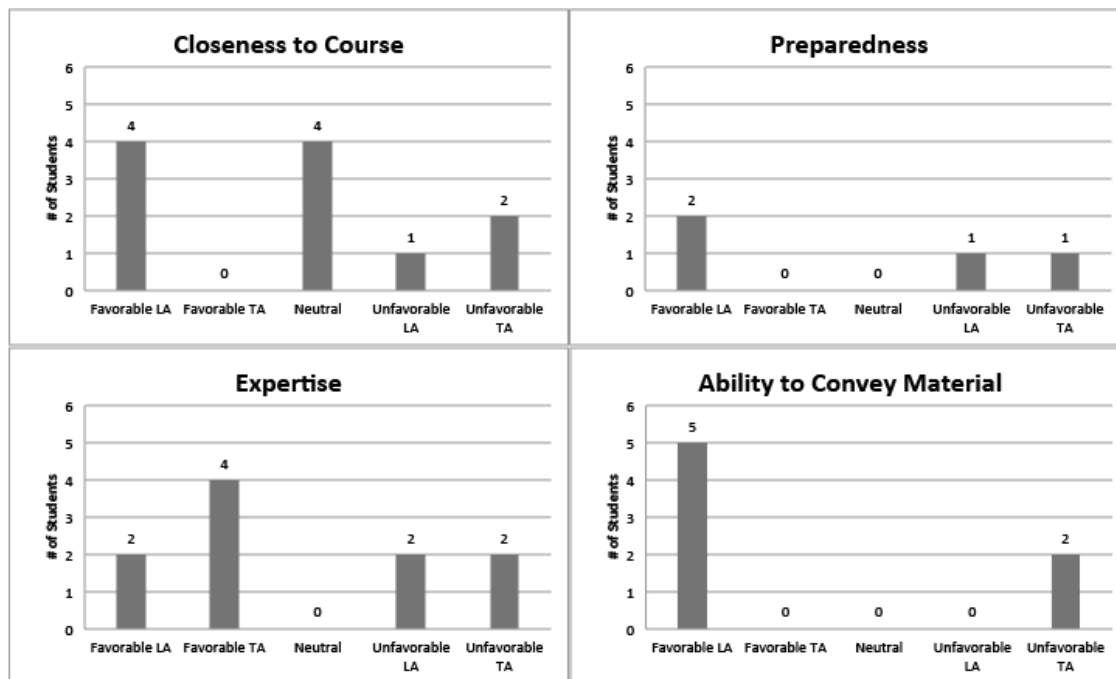


Figure 4.2: *Distribution of student responses in each subcategory within the familiarity with material category.*

Students' statements in this category describe their perception of secondaries' experience levels, knowledge, and ability to convey their knowledge of EP1 and EP2 topics to the students. This category is separated into four subcategories: 1) closeness to the course, 2) preparedness, 3) expertise, and 4) ability to convey material. Thirteen students contributed 37/132 quotes to this category. Figure 4.2 depicts the variety in student responses within the subcategories.

4.2.1 Closeness to Course

Students in this subcategory perceive that their secondaries are familiar with the course material because they had completed the course before. This is particularly apparent for the lab activity and material. Students placed only the LAs close to the course, but only a few specifically placed the TAs further removed from the course. There are eight students in this subcategory.

[The LAs are] like really helpful and they have studied what it is that we're doing. - Marcia

If anything I feel like [LA] remembers more than [TA or Primary] from his like doing the lab. - William

Although students appreciate secondaries' experience with the labs, they don't tend to make claims that any of their secondaries had not taken EP before. The following student's TA was a GTA who had not specifically taken EP.

I know that the [LA] I have in EP2 took EP2 before, um I assume the TA in EP1 took it before but he didn't mention it. - Bobby

4.2.2 Preparedness

In this subcategory, three students described secondaries who were prepared to help students learn in the studio, to the point where it improves their interest in attending class. There were positive and negative comments about LAs and one contrasting negative comment about TAs in this subcategory.

Definitely I think just the preparation of the TAs sets the tone for the studio, like last semester I dreaded going to the studio because I would be there forever... at least my instructor and my TA, I felt like I wasn't going to get much help from them. This semester...I don't dread it as much because I feel like my instructor and my [LAs] are more prepared to help me learn. - Marcia

I don't know if like he [LA] hasn't been TA-ing as long so he doesn't know the labs as well but it's fine. He usually has his computer out and he's like looking at the lab. - Jan

4.2.3 Expertise

Students in this subcategory perceive secondaries' expertise and experience in physics. Seven students talked about this, and they were generally more favorable to their primaries than to their TAs and LAs, especially in the area of problem solving. Additionally, more students mentioned positive encounters with their TAs in this subcategory than they did LAs.

A typical interaction would be like you'd ask [LA] a question and like half the time she would know and then half the time she wouldn't so I would try not to ask her. - Lawrence

Of all the three, [Primary] was always the person that seemed the most expert but [LA] still had a pretty good knowledge base of the material. - Lawrence

When [TA] doesn't know very much about the problem solvings he can't really help us too much so that kinda sucks. - Timothy

4.2.4 Ability to Convey Material

In this subcategory, six students describe secondaries who are able to convey material to students in a way that they can understand. This category included only descriptions of either LAs being able to or TAs not being able to speak on the students' level.

I think [LA] was able to simplify it down a little bit, simplify all the topics down a little bit more, he didn't use as many of like the technical jargon as much and so yeah I think he just might have broken it down better. - Joseph

I think he [the TA] had a hard time explaining things to us that we didn't understand in a way so that we could understand. - Cindy

4.3 Relatability

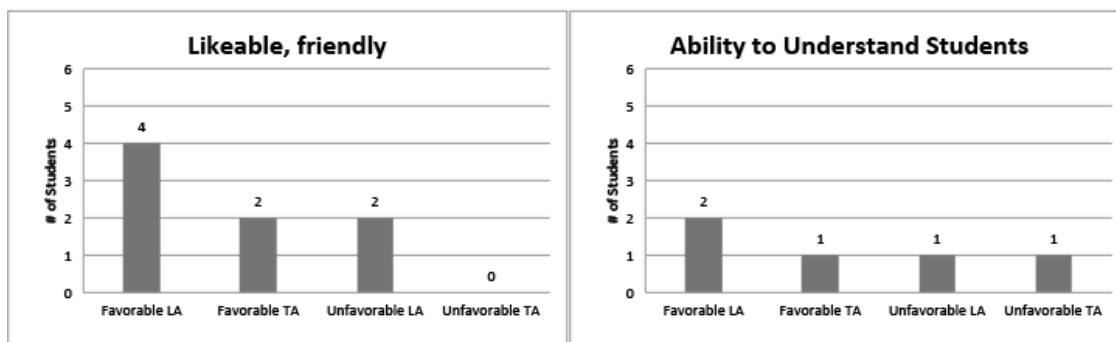


Figure 4.3: *Distribution of student responses in each subcategory within the relatability category.*

In this category, students indicated their relationship with one or more secondaries due to the way that the secondary interacts with students. Quotes in this category are less about academics and are more descriptive of the dynamics between students and secondaries. The two subcategories in this category were 1) likeability and friendliness and 2) ability to understand students. Seven students contributed 16/132 quotes to this category. Figure 4.3 depicts the variety in student responses within the subcategories.

4.3.1 Likeable/Friendly

Students describe how secondaries make studio fun because they can relate to students and “joke around” with them. Six students talked about their secondaries in this subcategory. Most students gave positive commentary in this category, with more students mentioning their experiences with LAs than with TAs. One student reported negative experience with one of his LAs lacking seriousness some of the time.

Definitely like [LA] and [TA] since they're like really close to our age, we ask questions and stuff but it's not like super serious, we joke around sometimes which makes studio a lot more fun and like bearable because it is a long period of time so if we're able to joke around and have some fun trying to explain things

it's definitely a good experience. And that's definitely like any interaction I have with them. - Margaret

Sometimes [LA would] joke around way too much. Like you want to be friendly and stuff but you know not to the point where it's like are we still in studio or are you just like hanging out. And she would kinda approach it that way. It's not like every interaction was like that. - Lawrence

4.3.2 Ability to Understand Students

Students perceive that secondaries are able to understand what they are asking and why. Two students made statements in this subcategory. These students reported positive connections with LAs and one TA who were closer to their age. One student had an older LA who she perceived a lesser ability to connect with.

I think [LA] was really good and [TA] just cause they were more relatable because they're closer to our age I feel like they're good at understanding what we're asking. - Margaret

I just feel like I was able to connect better with my EP1 learning assistants, if I had a question they understood what and why I was asking the question. - William

4.4 Preference of Instructor

This category covers statements of outright declaration of preference for one instructor over another or for a certain number of instructors. Eleven students contributed 32/132 quotes to this category.

4.4.1 Number

Students in this subcategory indicated that there should or should not be more instructors rather than less. There was a slight preference for having more secondaries in the studio among the seven students who made these statements.

Some students said that number of instructors doesn't matter. One student said the following about both studios he encountered, EP1 with one TA and EP2 with both a TA and an LA.

They're typically always busy but that forces you to really think so I think [the ratio of instructors to students is] a good balance. - Patrick

A student who had one TA in EP1 and two LAs in EP2 remarked that two LAs were needed for the more difficult material in EP2 but not for EP1.

I would say EP1 [having only two instructors] wasn't that bad because that stuff you can visually see while a lot of EP2 is just understanding what's happening like you can't see it with your eyes like you have to look at the numbers and know what they mean so it wasn't that bad in EP1 but in EP2 I would definitely need the three people in the room. - Margaret

Some students said it was helpful to have more instructors.

Um in EP1 we had one more um like TA [LA] and so it was nice like cause usually the lab the groups like there's 10 of them and so usually like everyone like either gets it or like a lot of people struggle and so like when a lot of people struggle it's nice to have that extra person. - Greg

4.4.2 Preferred Interactions

Students in this subcategory made comparisons of secondary vs primary and LA vs TA. There were a range of preferences among the eleven students in this subcategory. The

largest number of students in this category stated a preference for LAs, followed by students who had no preference.

For EP1 it definitely was whoever was available. For EP2 it's more, we try to ask the [LAs]. With our instructor, we'll ask him a question and he starts from the basics of stuff we already know, and sometimes he'll call a [LA] over anyway to fix the equipment. - Cindy

Normally we want to ask the [LAs] because our instructor will leave us like even more confused. - Marcia

Category	Description	Stu	Qu
Interactions	Description of the approach a secondary takes in responding to student questions	11	47
Encourage students to find the answer on their own	Secondaries push students to come to an understanding on their own	5	10
Engage in dialogue with students	Secondaries engage in two sided dialogue with students to come to a shared understanding of the problem	8	16
Offer different perspectives	Secondaries have a variety of backgrounds or real world examples to share	4	7
Give brief guidance	Secondaries ask leading questions or give clues that help students move forward in their understanding	9	14
Familiarity with Material	Description of secondary experience level, knowledge, and ability to convey their knowledge specifically of EP1 and EP2 topics	13	37
Closeness to course	Secondaries are familiar with the labs because they have completed them before	8	13
Preparedness	Secondaries are prepared to help students learn in the studio	3	4
Expertise	Secondaries have expertise in physics	7	12
Ability to convey material	Secondaries are able to convey material to students in a way that they can understand	6	8
Relatability	Indicate their relationship with one or more secondaries due to the way that the secondary interacts with students	7	16
Likeable, friendly	Secondaries make studio fun because they can relate students and joke around with them	6	11
Ability to understand students	Secondaries are able to understand what students are asking and why	2	5
Preference of Instructor	Outright declaration of preference for one instructor over another or for a certain number of instructors	11	32
Number	There should/should not be more instructors rather than less.	7	10
Preferred interactions	Preference of secondary over primary or LA over TA, or TA over LA	11	22

Table 4.1: *Description of categories and subcategories. “Stu” and “Qu” refer to the numbers of students and quotes in each category and subcategory.*

Chapter 5

Discussion and Conclusion

5.1 Discussion

The first thing to note from these results is that most students don't seem to notice an explicit difference between their LAs and TAs. A super-majority of students used a single term to refer to both LAs and TAs. There also is some evidence that students who did notice may have already been recruited to be LAs themselves, and so had been introduced to the concept outside of the classroom. Some students who noted that their LAs had taken EP before did not seem to be able to identify a difference in their GTA's experience when asked a follow up question. We argue that because the students did not seem to be aware of the structural difference between TAs and LAs, any differences that emerge in how TAs and LAs were described by these students should be considered significant.

What they did notice was that sometimes LAs were more approachable. Students overall observed that LAs were more able to meet them at their level, better understanding students' questions and answering those questions on a more relatable level than TAs. They also noticed that some LAs were more prepared than some TAs.

Students perceived LAs in several positive ways. Most notably, students noted several aspects of a near-peer relationship discussed previously. They highlighted the social proximity by indicating that a light-hearted relationship with their LAs allowed them to have fun and

enjoy the studio more. Many noted the cognitive aspect in indicating that LAs had recently taken the course and were able to understand student questions and to be understood by students. Students noted these aspects more consistently with their LAs than with their TAs.

They recounted a variety of situations in which LAs engaged with them in active learning, using leading questions and dialogue to draw out their ideas. Many of the interactions these students describe tie closely back to the LA pedagogy training. Surprisingly though, they noticed very similar positive interactions with their TAs. This suggests that the pedagogy course either does not have a differentiating effect or that perhaps the LAs are sharing their knowledge with the TAs.

Students also noted some negative interactions with LAs. One student perceived an LA as being too informal, becoming frustrated with the LA “just hanging out” rather than helping the group with studio work. This is an important cautionary note for LA programs that a near-peer relationship need to maintain a reasonable focus on learning.

Students also noted that LAs lacked expertise, usually commented on in relation to their primary and problem solving. This could be mitigated by extra LA practice with problem solving in the weekly prep meetings, but it is important to note that LAs are not experts.

Overall, students preferred three instructors over two in the in the studio, with one student indicating a desire for a primary and three secondaries. This larger teacher:student ratio is made possible by the LA program.

This study does not address which type of instructor is “better”, and any differences students noticed between the UTAs and GTAs is also outside the scope of the study. The intent here is to highlight the things students notice about their LAs and to find possible areas to study further about what makes an LA program successful.

5.2 Conclusion

This study provides a view of student perspectives the LAs and TAs they interacted with in the studio classroom. It first establishes that students use the same nomenclature to describe

LAs and TAs. Then it identifies four categories that are descriptive of students' experiences of LAs and TAs, and twelve total subcategories that are further descriptive of the variations within these categories.

Overall, students didn't seem to notice an explicit difference between their LAs and TAs. Twelve students did not identify the difference in identity between LAs and TAs, repeatedly using the same term for all secondaries. Only two students out of fourteen accurately distinguished between who was a TA and who was an LA.

Students described ways in which their LAs respond to their questions. They observed LAs "nudging" them to discover their own answers, engaging in productive dialogue, offering a variety of perspectives including those of different majors, and giving brief guidance like clues or leading questions which helped students move forward. Students only mentioned positive interactions specific to LAs in this category. Some students did state that they often wished LAs would give the answers, but most of these students also spontaneously acknowledged that a more thoughtful approach was better for them.

Students described LAs who were familiar and prepared with the studio material, especially the labs, due to their recent experience in the course. They also noted that LAs were easily understood. On the other hand, students noted that LAs lacked expertise and were less helpful than primaries in the problem solving portion of the lab.

Students indicated their relationship with LAs and found LAs to be more relatable overall. Students reported closeness in age and an ability to joke with LAs as a reason to enjoy studio. However, this joking relationship was not received positively by all students. There was one instance in the data of a student who was frustrated because their LA was too casual. They also reported that LAs were able to understand their questions, possibly because LAs could relate to the questions due to their proximity to the course.

Several students indicated that they preferred three instructors in the classroom over two. There were also more students with preferences for LAs. However, several other students had neutral preferences and were pleased with the studio and combination of instructors as they experienced it.

Students' perceptions of learning assistants have a number of positive aspects relating

to the LAs' pedagogy training, near-peer status, and weekly content meetings. However, students also sometimes viewed their LAs in a negative light, particularly when LAs were seen as less expert and too informal.

5.3 Future Work

One avenue for future work would be to use the categories and subcategories described here to develop a survey in order to explore the prevalence of these ideas with a larger group of students. Alternatively, the protocol could be refined again to produce more in depth interviews. This could also include delving into some of the differences students notice in their UTAs and GTAs.

Future research could also investigate how working alongside LAs trained in facilitating active learning affects the practices of untrained TAs. This could be investigated through observations of LAs and TAs in the weekly prep meetings, observations of interactions with students over the course of a semester, or interviews with LAs and/or TAs, although in all of these situations it could be difficult to observe without influencing the results.

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Appendix A

Interview Protocol (Spring 2018)

Explain the interview/project:

You will fill out a consent form first and then we will conduct a video recorded interview. During the interview we will have a conversation about your experiences in EP1 and EP2. This should take about 45 minutes.

We will go through the consent form, which will explain your rights and your control over participation in this research.

[Go through consent form.]

Do you have any questions?

[Give consent form –sign]

Do you have any questions before we begin?

I will be turning on the cameras now.

[Turn on cameras]

It is [date] at [time]

Thank you for agreeing to participate in this research. My name is Ginny Coghlan and I am a graduate student in Physics at Kansas State University

This interview is designed to investigate student experiences in Engineering Physics 1 and 2. You have been asked to participate in this survey because you are enrolled in one of these courses. Your candid responses will help us gain a better understanding of the classroom

environment. Your participation in this interview will not affect any current or future grades in your courses, and your responses will not be shared with any of your instructors unless they are part of the research team. If this is the case, that instructor will not be able to see the interview until after you have completed that course and the grades have been turned in. If you wish to not answer a question for any reason just let me know.

Do you have any questions before we begin?

Intro Questions:

- So tell me a bit about yourself, how old are you, what is your background, what classes are you currently studying, what is your major?

- Why did you choose that major?

- Has that always been your major?

- What prior experience do you have in physics?

- How big a part of your overall workload is engineering physics?

How is the class going?

- How is EP2 going? What happens in a typical studio?

- What do you do to prepare for class?

- How did EP1 go? What similarities or differences did you notice between the two?

- Did you prepare for class differently in EP1? If so how?

- Why did you choose to take physics in this section?

- Were the studios what you expected? What were your expectations?

- What is your experience with groupwork in the past? What is your opinion of groupwork? Has your opinion changed?

- Could you accomplish studio work without a group? What do you feel your role is in your group?

EP2 Studio

- Describe a typical studio in EP2. What happened?

- What is/was the most helpful aspect of the studio?

- What is/was the least helpful aspect of the studio?

- Describe your experience with groupwork in the studio.

- During groupwork, what did your group do when you got stuck?

EP1 Studio

- Describe a typical studio in EP1. What happened?
- What was the most helpful aspect of the studio?
- What was the least helpful aspect of the studio?
- Describe your experience with groupwork in the studio.
- During groupwork, what did your group do when you got stuck?

Instructor groups

- You had two different instructor groups in EP1 and EP2. Can you describe each instructor group?

- Describe a typical interaction with your EP1 studio instructor. What did he/she do to help you learn? What didn't help?

- Describe a typical interaction with your EP1 studio [assistant 1/2]. What did he/she do to help you learn? What didn't help?

- Who did you interact with most in EP1?

- Did you or your group have a preference? [Approachability]

- Describe a typical interaction with your EP2 studio instructor. What did he/she do to help you learn? What didn't help?

- Describe a typical interaction with your EP2 studio [assistant 1/2]. What did he/she do to help you learn? What didn't help?

- Who did you interact with most in EP2?

- Did you or your group have a preference? [Approachability]

- Did you notice any significant differences between the instructor groups?

Overall

- If you could build a perfect studio, what would it consist of?
- If you could build a dream team of instructors who would be on it?
- How helpful are the studios to your overall understanding of the course?

[Ask any other questions I need to ask.]

Is there anything else you'd like to add, mention, talk about before we finish?

Thank you so much for participating in my research, I appreciate it very much. If you have any further questions about the research dont hesitate to contact me.

[Turn cameras off]

Appendix B

Interview Protocol (Fall 2018)

Explain the interview/project:

You will fill out a consent form first and then we will conduct a video recorded interview. During the interview we will have a conversation about your experiences in EP1 and EP2. This should take about 45 minutes.

We will go through the consent form, which will explain your rights and your control over participation in this research.

[Go through consent form.]

Do you have any questions?

[Give consent form –sign]

Do you have any questions before we begin?

I will be turning on the cameras now.

[Turn on cameras]

It is [date] at [time]

Thank you for agreeing to participate in this research. My name is Ginny Coghlan and I am a graduate student in Physics at Kansas State University

This interview is designed to investigate student experiences in Engineering Physics 1 and 2. You have been asked to participate in this survey because you are enrolled in one of these courses. Your candid responses will help us gain a better understanding of the classroom

environment. Your participation in this interview will not affect any current or future grades in your courses, and your responses will not be shared with any of your instructors unless they are part of the research team. If this is the case, that instructor will not be able to see the interview until after you have completed that course and the grades have been turned in. If you wish to not answer a question for any reason just let me know.

Do you have any questions before we begin?

Tell me about yourself.

What is your experience of physics so far?

What makes physics important to you?

How is the semester going? EP1/2?

Tell me about EP1/2 Studio

How is the class set up?

Spatial describe the layout

Timeline what happens in a typical studio?

Hierarchy who is who? Who does what? How do groups work?

What do you do when your group gets stuck?

EP2 Instructor Group

Use the name student provides for first TA/LA. Repeat for each secondary, then primary.

What does [name] do during a typical studio? Describe a typical interaction.

that helps you learn? Can you give an example?

that challenges you? Example?

that doesnt help you? Example?

Do you have a preference for whom you approach for help? Did others in your group or class seem to have similar preference/lack thereof?

Now I would like you to reflect on your time in EP1

How was the studio set up?

Hierarchy who was who? Who did what?

Was the timeline any different?

What did you do when your group got stuck?

EP1 Instructor Group

Use the name student provides for first TA/LA. Repeat for each secondary, then primary.

What did [name] do during a typical studio? Describe a typical interaction.

that helps you learn? Can you give an example?

that challenges you? Example?

that doesn't help you? Example?

Did you have a preference for whom you approach for help?

Did others in your group or class seem to have similar preference/lack thereof?

In which studio did you have a better experience? Why?

Best/worst interaction with secondary?

Did you prefer one instructor group over another? Why?

If you could design the perfect studio, what would it consist of?

Who would be on your instructor dream team?

What could the people who run the studios do to make it better?

[Ask any other questions I need to ask.]

Is there anything else you'd like to add, mention, talk about before we finish?

Thank you so much for participating in my research, I appreciate it very much. If you have any further questions about the research don't hesitate to contact me.

Turn cameras off

Appendix C

Student Data

Pseudonym	Gen.	Major	Semesters	EP1	EP2	Quotes
Marcia	F	Industrial Engineering	F17-S18	TA	2 LAs	7
Cindy	F	Industrial Engineering	F17-S18	TA	2 LAs	8
Mike	M	Computer Engineering	F17-S18	2 LAs	TA	3
Greg	M	Civil Engineering	F17-S18	2 LAs	TA	4
Bobby	M	Chemistry	F17-S18	TA	LA	7
Jan	F	Civil Engineering	F17-S18	TA	LA	3
Peter	M	Mechanical Engineering	F17-S18	TA	LA	6
Joseph	M	Biomedical Engineering	S18-F18	LA	TA	13
Timothy	M	Computer Engineering	S18-F18	2 LAs	TA	9
Lawrence	M	Mechanical Engineering	S18-F18	2 LAs	TA	22
Margaret	F	Architectural Engineering	S18-F18	TA	2 LAs	19
Frank	M	Mechanical Engineering	S18-F18	TA	2 LAs	16
William	M	Computer Science and Math	S18-F18	2 LAs	LA+TA	6
Patrick	M	Biomedical Engineering	S18-F18	TA	LA+TA	8

Table C.1: *Background information of research subjects and number of quotes extracted from each in the data set.*