Analysis of Learning Assistants' Beliefs of Status and Their Role as Status Interventionists

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Introduction

This study investigates how Learning Assistants (LAs) conceptualize their understanding of status. LAs are undergraduate instructional assistants who support active learning by facilitating small group interactions and assisting with challenging concept-based learning in studios, lectures, labs, and discussion sections [1], [2]. LAs also attend a pedagogy seminar where they learn about responsive teaching and active learning. Previous research has investigated LAs' impacts on improving undergraduate courses and student outcomes [3]. Studies related to LAs and their impacts on social justice have focused on applying quantitative critical race theory to evaluate the impact of LAs on reducing learning gaps between dominant and historically marginalized students [4] and on classroom equity [5]. A greater understanding of LAs' conceptions of status and how they navigate dismantling status differences in the classroom would support this work.

This study utilized thematic analysis [6] to characterize how LAs construct the idea of status within the classroom and what beliefs they specifically draw upon to create instructional moves for more equitable spaces. Fifty written reflections were analyzed from LAs from two institutions who taught various STEM courses, including: chemical engineering, biological engineering, mechanical engineering, environmental engineering, chemistry, and biology. These reflections detail their thoughts about a chapter in Ilana Horn's book [7], which discusses what it means to be "smart" in a mathematics classroom and ways to create instructional moves that promote more equitable learning environments and mitigate status differences. The concept of social status was originally defined by Max Weber as cultural capital or otherwise described as societal values [8]. Modern sociologists describe status as inequality based on differences in social esteem and respect [9]. These differences come from various social factors, which include, but are not limited to, occupation, education, race, gender, age, economic status, and ethnicity.

We use status characteristics and expectation states theory to conceptualize how LAs process and navigate status differences [10], [11]. Expectation-states theory discusses how, using status characteristics, individuals in task-driven, small groups produce performance-driven expectations of others, which defines how the group operates. Our central research focus hopes to address the overarching question, "How do LAs navigate status differences in the classroom space with equitable classroom environments in mind?" Through the lens of expectation states theory, we ask the following research questions:

1. What personal classroom experiences do LAs from a small, private university and a large public university draw from to inform their beliefs regarding status?
2. What are the prevalent status characteristics that these LAs identify in the classroom?
3. What associated expectation states do these LAs identify?
4. What instructional moves do these LAs describe regarding alleviating status differences and creating more equitable spaces?

This research advances the current knowledge base on how LAs conceptualize and operationalize status in the classroom. This study aims to look beyond the structural formation of

status and focus on the processes by which the LAs experience and react to social stratification in diverse settings. It contributes to scholarship on LA's impacts on classroom culture and student outcomes. More broadly, this work addresses how we continue implementing anti-racist and anti-oppressive pedagogy and praxis into STEM disciplines.

Background

Status

This study draws upon Max Weber's theory of status as the driving force of inequality. Weber's landmark work*, Economy and Society* [8], posits that social inequality arises from three fundamental ideas. The first idea relates status to factors associated with the economy and capitalism, which he deemed *social class*. The second idea relates status to cultural capital and what society values, which he called *social status*. The third idea combines social class and social status to impact what he termed *party*, or how power may distribute itself due to these economic and cultural factors. Social class, social status, and power are all **independent** driving forces of social inequality [12].

Understanding the formation of beliefs is necessary to know how inequality organizes itself among social groups and individuals [9]. Inequality can manifest in various ways, like the unfair and structured distribution of wealth, income, health, autonomy, prestige, power, opportunity, and other desired social goods [9]. Within the classroom and education spaces, inequality can be perpetuated by all the factors mentioned above as students go into the classroom with preconceived notions of one another due to their interactions with contexts outside the classroom.

In the 20th century, Weber's ideas about the importance of social class were popular. This idea's importance happened because social class's influence on power and inequality are measurable, tangible concepts to aggregate as they deal with the economy and capital [13]. Contemporary conversations around inequality have begun to emphasize social status as an independent driving force of inequality and is essential to study because of its cultural basis. Social status allows people to form conceptions of how competent others are due to cultural beliefs about respectability and what society values. Thus, modern sociologists describe social status as inequality based on differences in social esteem and respect [9], [14], [15]. Additionally, modern sociologists have grown from Weber's original ideas by doing more rigorous analyses of the impacts of gender and race/ethnicity on status [9]–[11], [14], [15].

Following the idea of social status as a driver of inequality, Cecilia Ridgeway [9] identified three qualities of status beliefs:

1. Both individuals who are advantaged and disadvantaged by the status belief accept it as a matter of social reality, whether they like it or not.
2. Generalizations are formed about the worthiness and competence of whole categories of people.
3. A type of social reputation is formed for the more advantaged group as a "third order" belief, meaning they are generalized assumptions about what "most people" think.

These three qualities are essential to consider how status is a relational concept formed by participants within a given context.

Status Interactions in the Classroom

The first line of research pertinent to our study involves work on how status roles form in heterogeneous classrooms. Cohen & Lotan [16] describe status characteristics and expectation states in the classroom intending to reduce the impacts of inequality caused by status differences. Based on this understanding, they created interventions that were shown to be impactful toward low-status individuals by promoting participation and helping equalize status in the classroom [16], [17].

Horn [7] discusses mathematical competence and status. Through this book, she outlines how schooling organizes ideas of competence in ways where not all students receive an equitable education. The idea of "equal-status interactions" are discussed, involving a teacher's use of multi-ability status treatments to increase the participation of low-status students and dismantle common expectations of whose contributions are valued. Horn mentions how teachers can establish status interventions by creating classroom norms and participating in multi-ability treatments that reposition what competence means in their classroom.

Learning Assistants and Near-Peer Learning in STEM Contexts

Near-peer learning models utilize more experienced peers to mentor and teach less experienced peers [18], [19]. These models have been utilized in medical and chemical education and have been shown to improve student confidence and create more welcoming environments [19]–[24]. What distinguishes LAs from other peer learning models is that LAs are required to take a pedagogy seminar focused on learning and inclusion [25]. LAs have been utilized in numerous institutions in biology, chemistry, physics, and engineering courses [26]. Implementing LAs has improved undergraduate courses, enacted departmental/institutional change, and positively skewed student outcomes [3].

Learning Assistants, Inequity, and Social Justice

Research regarding LAs, their conceptions of status, and how they navigate dismantling status differences in the classroom can support the use of LA programs toward social justice goals. Recent studies have focused on promoting more equitable learning spaces, including a LA's impact. In a quantitative study, Van Dusen et al. [4] used a LA Supported Student Outcomes (LASSO) online assessment tool to find broad trends in student outcomes with courses with LAs as instructional team members. They concluded that instructional teams, including LAs, are associated with removing learning gaps between dominant and historically marginalized students. However, their follow-up study [5], also using the LASSO tool, showed mixed results on how collaborative learning impacted equity.

Hernandez et al. [27] discuss how LAs can provide social support to elicit increased student engagement. They use social support theory to model how LAs engage in appraisal, emotional, and informational support. These findings ultimately led to the generation of a quantitative instrument to help others gauge the association of LAs and their role in social support theory.

Clements et al. [28] observed that classes where students had LAs typically reported a higher sense of belonging than classes where students didn't have LAs. Even more broadly, they saw that LAs, through being role models, helped students feel more accepted and helped students build confidence in STEM-related skills. They assert that this increase in students' feelings of belonging and acceptance was possible because LAs have ways to formulate supportive and interactive classroom climates based on their experiences as students. Cao et al. [29] illustrated the dynamic between the LAs' experiences as learners and their role in supporting classroom instruction.

Theoretical Framework

Status Characteristics & Expectation States Theory

Expectation states theory [10] can be used to describe status-organizing processes within small-group collaborative learning where students work together to solve problems. Expectation states theory and an expectation state are two distinct things, where the former represents the whole process of how individuals in groups respond to status characteristics while the latter is a step in that process. This process of expectation states theory is summarized in Figure 1. A **status characteristic** is a characteristic of an individual (e.g., gender, race, ethnicity, experience, beauty, etc.) that others differentially evaluate in terms of that individual's broader capability or credibility. These beliefs become stabilized and interpreted as to how individuals with those characteristics will behave or perform. Societal standards define status characteristics, so people formulate their beliefs based on differing contexts. In small-group collaborative learning**,** status characteristics held by individuals are used to produce an **expectation state** or a subconscious idea of the performance capability of others. Individuals then use this expectation state to evaluate the actions or assign perceived skills to others in their group. These expectation states then determine who has access to the conversational floor and leads the discussion, who leads the organization of the group, as well as other aspects of group interactions.

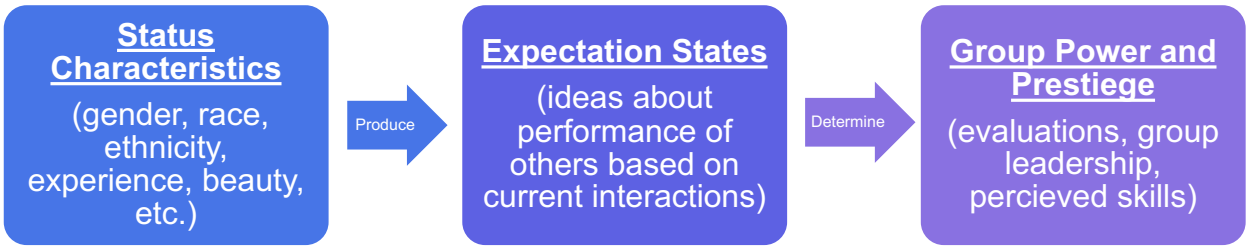

Figure 1. Expectation states theory: the production of group power and prestige from status characteristics and expectation states. Adapted from Webster Jr. & Walker [30, pp. 321–342].

Expectation states theory centers on the idea that expectations around the performance of individuals in a group arise out of the interactions in the group. Subsequently, these preconceived judgments of performance guide other interactions in the group. This framework has four distinctive features [10], [11]:

1. The process produces the effects and mechanisms **within the process itself**.
2. Expectations states are **relational**.

3. Social interaction produces expectation states; in other words, **social objects create socially constructed realities**.
4. Properties of status-organizing processes are **general**.

We define high-status individuals are those who have characteristics that have positive performance expectations associated with them, while low-status individuals are those that have negative performance expectations associated with them.

Methods

We solicited responses from two institutions in different contexts, a small private university, and a large public university, to explore LAs' experiences and ideas around status in the classroom. We provide information comparing the two institutions to give more context about the learning environments LAs were involved in. We use thematic analysis [6] to characterize LA responses and answer our research questions.

Setting

Table 1 describes the characteristics of the two institutions involved in this study. Both are 4-year universities with high research activity. The metrics of representation detailed below **do not** solely define diversity in these complex contexts. We only use these metrics to discuss possible race, class, or gender-based structural inequalities that may arise in an LA's experiences.

Table 1. Institutional demographic information.

		Private	Public
School Type		Private, not-for-profit	Public, Land-grant
Setting		Large Suburban	Small City
Total Undergraduate Enrollment		~10,000	~30,000
Average Class Size		20	18
Percent men		43	52
Percent women		57	48
Undergraduate Race/Ethnicity	**American Indian or Alaskan Native**	0%	1%
	Asian	15%	8%
	Black or African American	5%	2%
	Hispanic/Latino	9%	12%
	Native Hawaiian or other Pacific Islander	0%	0%
	White	48%	63%
	Two or more races	7%	7%
	Race/Ethnicity Unknown	4%	3%
	Non-resident alien	11%	5%
Undergraduate Students Receiving Financial Aid	**Grant or Scholarship**	~25%	~50%
	Pell Grants	~7%	~20%
	Federal Student Loans	~12%	~30%
Median Family Income		~$225,000	~$100,000

Data Collection

Qualitative data used in this study consisted of written reflections collected through the Concept Warehouse (CW), an online concept-based active learning tool [31]. These written reflections are responses to a book chapter [7] the LAs read that week in their pedagogy seminar that was used to guide class discussion on pedagogy and instructional practice. The prompt was:

> In this week's reading, Horn describes the role of status in small-group collaborative learning. Think to your experience as an LA or a student during small group work. Describe one case where status unproductively influenced a small group interaction. Describe the interaction, how you interpret the role of status, and what you think a more positive interaction might have looked like.

Participants in this study were LAs who consented to have their responses used as part of this analysis. Table 2 details the participants involved in this study. Fifty responses were analyzed.

Table 2. Participant information.

	Private	**Public**
Number of LAs	24	26
Discipline(s)	Chemistry, Biology, Chemical and Biological Engineering, Mechanical Engineering	Chemical, Biological, and Environmental Engineering

Data Analysis

Coding processes were followed according to [32]. The first iteration of coding was completed by Author 1 in the Fall of 2021. Emergent codes were generated by reading responses in-depth and then noting the salient concepts observed during the reading. The process of emergent coding was repeated several times to refine the coding scheme. Feedback about the coding scheme and themes was obtained to reconcile the codebook and settle disagreements. A second coding cycle was completed to better describe the data set on hand and generate more salient concepts related to status belief construction and navigation. This continued until a stable set of codes was developed, as shown in Table 3. In the third coding cycle, codes were separated into major themes and sub-themes reported in the Results. The findings and themes presented in the Results come directly from aggregating these codes. We order the themes in Table 3 using ideas from expectation states theory.

Researcher Positionality

The importance of positionality within qualitative research allows researchers to reflect upon their viewpoints when handling a research topic. Below we discuss some of our primary relations to the work.

Author 1 identifies as a South Asian American, first-generation, queer, cisgender male. He has a B.S. in Chemical Engineering, M.S. in STEM Education, and is pursuing a Ph.D. in Chemical Engineering. He served as an undergraduate teaching assistant in chemistry, chemical engineering, and first-year experiences courses at his undergraduate institution. This work affords him experience in understanding learning and assessment practices.

Author 2 identifies as an Ashkenazi Jewish, heterosexual, cisgender male. He is an advocate of LAs in the classroom and is interested in the broader ways LAs influence cultural practices in STEM. He incorporated LAs into the instructional team for many of his classes and has been a LA pedagogy seminar instructor for multiple terms. This study has allowed him to grapple with the broad experiences of the learners that he works with.

Validation

Qualitative research requires a methodology to ensure credibility and trustworthiness as the researcher acts as a sociohistorical interpreter who co-creates meaning within the context of the subject matter [33]. Disagreements regarding the coding or data analysis were addressed and resolved by consensus. This resulted in multiple iterations of the coding process with evolving

dialogue regarding the data to ensure that the analysis process maintained credibility and trustworthiness in the substantive validation process [33]. We continually engaged in self-reflection and conversations regarding our positionality to reinforce ethical validation. Through these conversations, we evaluated how our positionality influenced our data analysis and took steps to ensure the participants' voices were centered in our minds.

Table 3. Finalized list of codes organized based on the processes detailed in expectation states theory.

Theme	Code	Description
Experiential	LA Class Experience (Current)	LA describes a current teaching experience
	LAs Past Experience	LA describes a past learning experience.
Status Characteristics	Age/Seniority	Status-driven inequalities or beliefs that are defined by being age or seniority.
	Gender	LA notes experiences about gender-based status-driven inequalities.
	Meritocracy	Idea that 'hard work' is all it takes to succeed
	Race and Ethnicity	LA notes experiences about race or ethnicity-based status-based inequalities
Expectation States, Status Construction, and Impacts	Correctness	LA notes correctness as a form of competence that elevates someone to a higher-status position
	Credibility	The amount a student is believed or trusted
	Belonging	Feeling included within a group or learning context (or lack thereof)
	Inequitable Learning Experience	Idea defined by Horn which includes students being left out of being able to have excellent educational experiences
	Lack of Voice	LA notes how either they notice students (or themselves) have had instances where they felt a loss of their voice and felt that their ideas were not valued
	Perceptions of Others	How others may perceive a student due to identities, histories, etc.
	Loss of Confidence	Confidence or lack thereof (LA can be talking about themselves or students they observe)
	Respect	a feeling of deep admiration for someone or something elicited by their abilities, qualities, or achievements.
	Student Dominating	Experience notes situation where there is clearly a student dominating the group interaction
Actions (Instructional Moves)	Role	Mention of what LAs think their explicit role is in these status interventions.
	Building Confidence and Self-Esteem	LA notes ideas in which they elevate students in lower status positions to higher status positions

	Attempts to Engage Students	LA notes a way they have attempted to further engage students in a specified learning context
	Equity	being (or striving towards) fair and impartial treatment
	Establishing Norms	Creating a set of norms that allow members of a learning context to be 'on the same page'
	Instructional Decision Making	Thinking about their instructional moves and being cognizant of various things about their students like context, status, etc.
	Motivations for Interventions	Beliefs behind why a status intervention or belief to mitigate unproductive status is justified
	Social Constructivism	Aligns with Vygotsky's ideas of knowledge construction i.e., each student constructs knowledge using their experience and from the help of peers. Student's do not explicitly have to mention these terms, but their ideas are along these lines.
	Status Intervention	This could be a possible intervention they or someone else in the classroom could have done to make a learning experience better. It also constitutes general beliefs they have about how to alleviate status-based inequalities in classroom spaces.

Limitations

The LAs at the private university were LAs for various STEM courses (chemistry, biology, chemical engineering, and mechanical engineering). However, the LAs at the public university were LAs for only chemical, biological, and environmental engineering courses. The LA responses were anonymous, and we did not collect demographic data. However, we sometimes infer identity characteristics from the context of the response. Additionally, we recognize that these LA reflections are not accompanied by direct evidence validating that they enacted their beliefs.

Results

In this section, we answer our four research questions based on analysis and elaboration of the Themes presented in Table 3.

Research Question 1: Range of Experiences

To answer our first research question, we find that LAs draw upon their previous student experiences with instructors and current experiences as instructors to generate the foundation of what they know about status characteristics and expectation states. The formation of these beliefs depends on the LAs' past and current experiences. Table 4 summarizes all references to unequal status interactions and is classified according to student or LA (instructor) experiences. These codes all fall under the Experiential coding theme. The LAs describe both student and instructor unequal status experiences, roughly to the same proportion in each setting.

Table 4. Code occurrence table for student and instructor experience. These codes are associated with the Experiential theme presented in Table 3.

	Private	**Public**	**Totals**
Student Experience	17	17	34
Instructor Experience	12	11	23
Totals	29	28	57

Below are examples of how LAs described student and instructional experiences related to unequal status interactions.

Student Experience

The student experiences described by LAs draw from both K – 12 and university experiences. For example, LA Evan describes the context of their elementary school experience.

> I went to an elementary school with few resources, and the structure of the environment had a significant impact on my view of academic success and the value I give myself in a classroom.

For LA Evan, the socioeconomic context of their elementary experience impacted how they processed learning experiences.

LA Baxter discusses their studio experiences in one of their core chemical engineering courses at the public institution. The LA describes the "high-status" or "low-status" social positions of individuals within the group:

> Personally, I can recall several experiences I had in the studio for [core chemical engineering course at the public institution], which illustrated the role of status well. Out of the five people in our group, there were ~2 (occasionally three) people who were evidently of higher status and would essentially monopolize the conversation. Of these, there was one individual who was the unspoken "leader" of the group, who often started and led the conversations and lines of thinking. He would decide whether the group would entertain a certain idea or line of reasoning or whether it would be discarded and would generally lead the problem-solving. On several occasions, myself or the other "low-status" individual would offer up an idea or solution only to have it ignored or shot down due to the high-status person disliking it or feeling it was not valuable. Status played a huge part in these interactions, though I did not understand the reasoning or the concept of status at the time.

Upon reflection, this LA recognized how a high-status student dominated the conversational floor, devaluing others' ideas. Apparently, the pedagogy seminar (or other student experiences) have allowed the student to understand how status impacts group interactions.

Instructional Experience

LA Rory discusses how status played a role in their instructional experiences. This interaction mirrors the type of unequal academic-related status differences that Baxter noted above.

> Last Tuesday was my 2nd day in class as an LA for [introductory biology course at the private institution] and coincidentally, the role of status came up while [the biology instructor] asked the class to think about a question regarding phosphodiester bonds in nucleotides. As I was walking up and down the aisle, I randomly decided to pop my head in a row of a couple of people who were working together to ask what they were thinking. Immediately the first thing I hear is, "ask Jack, he knows everything." Obviously, Jack wasn't his real name but this was a sign of a student not having confidence in his ability and deferring the question to someone with high status. In my opinion, status has a lot to do with confidence; while Jack confidently answered the question, he actually got it wrong. In my opinion, all people are born intelligent, but it all comes down to the opportunity to learn and work hard. Although I believe status does not say anything about someone's natural intelligence, it still plays a prevalent role in classrooms.

Although the high-status student, Jack, had the incorrect answer, status differences gave him the power to control the conversational floor, again taking away opportunities for other students to engage in their thinking.

Research Question 2: Types of Status Characteristics Identified

To answer our second research question, LAs mentioned four status characteristics: gender, race/ethnicity, meritocracy, and age/seniority. The first two were more prevalent and are the focus of our analysis. Table 5 shows the code occurrences for two each institution. LAs at the private university mentioned these status characteristics about 50% of the time, while those at the public university mentioned it less, around 15%.

Table 5. Code occurrence table based on institution. These are selected status characteristics from the Status Characteristics theme presented in Table 3.

	Private	**Public**	**Totals**
Gender	8	3	11
Race and Ethnicity	4	1	5
Totals	12	4	16

Below are examples of LAs identifying status characteristics.

Gender

LA Aubrey discusses their gender-related status experiences, acknowledging a "gender stereotype" that is "much too familiar" for women majoring in mechanical engineering:

> As the reading suggests, status judgments regarding ability often draw on stereotypes about race, class, ethnicity, or gender. For me, the gender stereotype is much too familiar as a woman majoring in Mechanical Engineering.

Race and Ethnicity

LA Salem discusses their experience as a historically marginalized student at a primarily white institution (PWI), describing how race impacts their belonging in STEM spaces:

> As a Black student at a PWI, especially in STEM classes, it can be especially difficult to feel like you belong. Because most of the time, these spaces are dominated by non-Black people who are perceived as more intelligent.

Research Question 3: Expectation States

To answer our third research question, LAs acknowledge expectation states regarding various structural inequalities. They do this in a similar mechanism presented in the conceptual framework. LAs learn about status characteristics associated with "low-status" individuals through their previous and current instructional experiences and associate them with the expectation state they see at the time. Through this, LAs then make conclusions about how expectation states may have impacted the LA **themselves** at the time of a previous learning experience or how these expectation states impact **students** they are currently teaching. Here we focus on those expectation states regarding how intelligence is perceived through the status characteristics of gender and race. The LAs who discussed concepts involving these gender- and race-based expectation states all appeared to be historically marginalized students.

LA Lux reflects upon an experience within their high school class where unequal status interactions attributed to gender as the condition for obtaining "respect" from their peers.

> I was one of four female-identifying members of a class of 20 students, and there were many occasions when some of the ideas coming from female students were overlooked or dismissed in the midst of ideas coming from male students. In this situation, I interpreted the role of status as defined by gender, where the male students seemed to receive much more respect in the eyes of their fellow male peers as compared to the female students, and this translated to a greater admiration of their ideas.

In Lux's case, only 20% of the classroom consisted of female-identifying students, an imbalance common to many STEM spaces, making expectation states about women even more apparent. These status beliefs are further perpetuated by the exchange between these two groups, as male-identifying students privilege listening to one another. The greater importance attached to ideas by male-identifying students then actively excludes female students from discourse in the class and prevents them from accessing learning opportunities.

LA Salem describes heterogeneous race and ethnicity status interactions within their current teaching experience as an LA, noting that, in general, at PWIs, being a Black student "can be especially difficult to feel like you belong."

> During the second week of classes, I was sitting in on a group of three: one white boy, a white girl, and a Black boy. I immediately noticed how the white boy in the group lead and dominated the conversation. The white girl in the group was able to follow the white boy's reasoning, agreed with him, and they seemed to decide together that that was the answer. I noticed that the Black boy in the group did not contribute to the conversation at all, and part of me put myself in his shoes. Is he not contributing because a) he doesn't feel comfortable in the space to share his ideas, or b) does he not understand the question and needs further clarification? As a Black student at a PWI, especially in STEM classes, it can be especially difficult to feel like you belong. Because most of the time, these spaces are dominated by non-Black people who are perceived as more intelligent. But, it's important to remember that Black students deserve a seat at the table just as much as anyone else.

Salem describes how Black students' social interactions at school can promote a loss of confidence because of an expectation state. They state that non-Black students "are perceived as more intelligent." LA Salem's reflection also includes an instructional assessment that involves negotiating whether this dynamic is based on status-driven inequalities or genuine confusion.

LA Amber discusses how their experiences as a Black woman in STEM impact how they perceive themselves in STEM spaces.

> One of the reasons why I chose to be an LA is because as a Black girl in all my STEM classes, I never felt comfortable speaking up and sharing my ideas. I was always surrounded in spaces where I felt like the lesser man, and it had a negative impact on my ability to learn and grow as a student in STEM.

LA Amber notes how aspects of these expectation states applied to Black women make them "not believe [they] were as 'smart' or as intelligible." In this case, we see an intersection between Amber's gender and racial identities. The resulting expectation state negatively impacted their ability to feel like they could succeed in the past, thus prompting their purposeful mission to dismantle these expectation states and boost students' confidence as a LA.

Research Question 4: Instructional Responses

To answer our fourth research question, LAs reflected on ways they had agency to create and decide amongst varying instructional responses to alleviate status differences in the classroom. These moves arise, in part, due to the expectation states the LAs have experienced, as LA Kit described:

> … the reading suggests ways to identify perceived status in the classroom and strategies to work against it; I look forward to implementing some of these strategies, specifically those surrounding participation and listening in my practice as an LA, and I believe my experiences as a student influenced my desire to work towards creating a space where all students are given the same opportunities and appreciating to learn and grow.

Below are examples of three common approaches: building confidence and self-esteem, engaging students, and establishing norms.

Building Confidence and Self-Esteem

LA Arden advises students to find supportive peers as a remedy for building confidence and self-esteem in response to unequal status interactions.

> Furthermore, my advice for students who don't feel confident in their ability or feel overshadowed by other students, I would say to surround yourself with peers who are supportive and who elevate your self-esteem.

LA Halston also discusses building confidence and self-esteem in their mechanical engineering course, specifically using individual check-ins and praise to try and help students feel seen and improve feelings of confidence and self-esteem.

> I will be watchful of how the one student in particular influences the rest of the 'group status' in future labs. In particular, I will be teaching them a SolidWorks activity next week and I hope they will all work well helping each other get the model they are trying to achieve. If the student seems to be the main initiator of conversation next week, I might walk around to everyone and do a short check in to make sure they are all following along and are not afraid to ask me questions. Also, if there are students who don't participate much but are following along, I will try to praise them in front of the students with higher 'status' to make sure there is equal respect among all of the classmates.

LA Halston believes that making the low-status student feel seen in the space allows for "equal respect" among all learners.

LA Amber discussed the expectation states that Black students might encounter. Later in their response, they discuss the learning environments they seek to create. They use their experiences as a marginalized student to ensure they create learning environments that boost self-esteem.

> If it wasn't more encouraging and thoughtful educators (like [professor of class at private institution]) who took the time to accommodate me and check up on me as I took her class asynchronously, I would not believe I was as 'smart' or as intelligible as the rest of my classmates. So, for me, I purposely go out of my way to look for students who need that extra boost in self-esteem and encouragement in class.

Engaging Students

LA Revel discusses how they could create a more positive experience in the classroom by impacting the engagement of gender minorities through counteracting the males who often dominate engineering learning spaces.

> A more positive experience would include the other members listening to my ideas and taking them into account, and though this may seem obvious, it is probably hard for many male students due to perhaps an ego or peer pressure. Because of this, I try to make sure that in my [core mechanical engineering lab], all the women in the group are actively engaged and have their voices heard when they want. This is just my experience being cast aside as a woman in a historically male-dominated field at school, but these behaviors persist into the workplace as well, and if I can do even a little bit as an LA to try and ameliorate some of these issues early on, I will do all that I can.

LA Revel desires to help women in the class engage by making sure to center their voices. LA Revel suggests that addressing these behaviors in an instructional context might also extend to the workplace.

LA Jude discusses how to navigate a situation where one of the students has already completed a problem before other students by promoting an "environment of respect and equality.".

> Even if one student did complete the problem beforehand, a more positive interaction may have taken place if the student allowed the other group members to think through the problem themselves and participate equally. This may have led to new ideas that the first student hadn't initially thought of. As an LA, I hope to level the playing field by promoting an environment of respect and equality.

<u>Establishing Norms</u>

Like LA Revel, LA Jupiter notes how the male voice dominates STEM spaces and how it can impact others' confidence. LA Jupiter then identifies using class norms as a tool to create a more inclusive space that can help women and non-binary people in STEM, similar to the class norms in the LA pedagogy seminar.

> I think for many women and non-binary people in STEM, the conversation often seems dominated by the male voice. I think a more positive interaction would have been one that was more open to questions than solving the problems. Looking back, I should have had more confidence in asking questions and questioning his answers. I think that if this class had established class norms for group work that this would have been a more positive and productive conversation. I think that it is important to establish class norms similar to the ones we have in the class as an LA for any small group work we lead.

Discussion

The findings from the four research questions presented above allow us to address our overarching question, *"How do LAs navigate status differences in the classroom space with equitable classroom environments in mind?"*

Their reflections indicate that LAs draw on their experiences as students and their experiences as instructors to form their status beliefs and notions of how those beliefs propagate within the

classroom. Their ability to draw upon their experiences in both roles and think about how status beliefs may propagate through the classroom forms the basis for understanding what they view as "positive" classroom interactions and further gauging what could be done better to facilitate LA professional development regarding anti-racist and anti-oppressive teaching.

Expectation states theory provides insight into the mechanisms of these interactions. As stated earlier, expectation states theory posits that in small-group collaborative interactions, status characteristics like sex, race, ethnicity, etc., produce expectation states. These states then play a role in group power structures and how group members perceive one another. We see the influence of expectation states specifically play out when LAs from historically marginalized communities think about their past and present experiences. Referring to LA Lux, we can summarize their thoughts in Figure 2. This mapping of the mechanism for LA Lux uncovers that there are expectation states associated with gender which play a role in small-group and large-group interactions in the classroom.

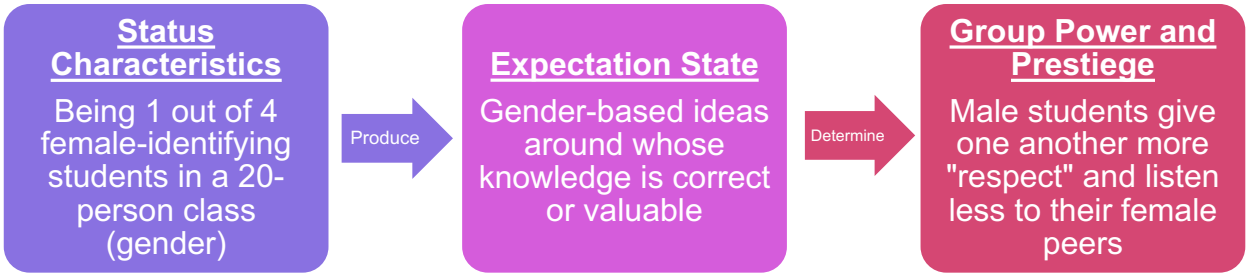

Figure 2. Mechanism of LA Lux's thoughts regarding their student experience and status.

Expectation states theory can be used to map LA Salem's racialized experiences in the classroom, as shown in Figure 3. In both cases, belonging becomes of central interest to the LAs because it will help promote more equitable learning spaces.

Figure 3. Mechanism of LA Salem's thoughts regarding their instructional experience and status.

To make more inclusive environments in the classroom, LAs have a variety of ways of doing it. In developing ways to alleviate status differences in the classroom, LAs use their lived experiences and current contexts to connect to possible expectation states they know might exist within a STEM classroom setting. Most commonly, those expectation states appeared to derive from gender and race/ethnicity status characteristics. LAs then described various approaches to mitigate unequal status in groups, including:

- Building confidence and self-esteem

- Engaging all students
- Establishing norms in the classroom

These strategies generally support building more equitable and approachable learning communities. Many LAs wrote how status differences and negative expectation states have made noticeable differences in their learning experiences and use these to make communities of learning that can support low-status students. LA Arden advises students to surround themselves with individuals who help improve how they perceive themselves in the classroom. Similarly, LA Revel's approach to center the voices of gender minorities in STEM spaces is another move they generate from their previous experiences. This instructional decision intends to formulate communities of learning that typically leave out the voices of gender minorities. LA Halston's use of "praise" equalizes the voice and input of a lower-status student relative to a higher-status student. Deliberate use of praise to boost self-esteem requires much thought on an LA's part because they need to be attentive to the motivations they bring into their instructional moves and make sure that they recognize specific competencies in assigning praise (as opposed to generic, effusive praise).

Understanding how LAs construct and understand what status-based inequalities look like within the classroom and how they plan to navigate them has important implications for interpreting their role as potential status interventionists. LAs are mediators in various aspects of a student's learning, and their roles as agents within the classroom activity system produce learning and knowledge construction as an outcome. They can serve as mediators to support content knowledge development and as those who can understand and mediate other sociocultural aspects of a classroom, such as the role of status and the distribution of power within small groups.

Implications

Lessening unequal status interactions and inequity is integral to helping students succeed within educational spaces. It has already been documented that LAs and their participation in instructional teams provide benefits for students in the social, emotional, and cognitive aspects of their learning (see [34], [35], [36], [25], [27], [4], [5], [37], [38]). This study focuses on ways that LAs can help address unequal status interactions towards education practices that are more equitable and diverse. Their reflections show their ability to think critically about status and how they can use their experiences to intervene and help facilitate more equitable group dynamics.

To further support LAs in this endeavor, the following ideas can be emphasized during conversations around status in the pedagogy seminar:

- **Expectation States:** Status characteristics impact how expectation states are produced. Instructors in the pedagogy seminar should ensure that LAs acknowledge their ideas around status characteristics and inequality. Pedagogy seminar instructors and LAs should also discuss that the students in their classes will come in with preconceived notions of others, which may promote unequal status interactions. LAs can discuss hypothetical situations that portray unequal learning environments and practice varying instructional responses.

- **Methods of Engagement**: Different students will choose to participate in different ways. LAs should be taught how to converse with students about how they best engage during complex group interactions.

More generally, STEM instructors can:

- **Norms**: Establish a baseline set of rules for class discussion and engagement that promote environments where students feel their voices will be centered. These norms should be revisited during the term, especially if the instructor notices a violation.

Teaching is not a neutral activity, and educators must work to engage in anti-racist and culturally sustaining forms of teaching. More inclusive and equitable teaching can result from fostering healthy and productive instructional teams, including LAs, graduate TAs, and instructors, who work together to create a space where students become co-constructors of knowledge. This study has provided an understanding of how LAs navigate conceptions of status based on their experiences. However, more research is needed. This LA detailed the following when discussing how they observed an unequal status interaction.

> But, since the studio was meant to be led by GTA [graduate teaching assistant], not LA. I didn't know what I should do.

Broadly, this confusion leads to investigating the interactions and conceptions of status between the power dynamics of the instructional team in future studies.

Conclusion

In this analysis, we examined fifty written responses from LAs at two institutions to see how they navigate and conceptualize status. We use expectation states theory to conceptualize the beliefs that LAs have regarding status. LAs utilize their prior and current experiences to think about how status can impact learning in the classroom. Through this lens, we observe some LAs, particularly those from historically marginalized communities, notice status characteristics and their impact within small- and large-group collaborative interactions. This understanding of how inequitable learning spaces have impacted them or others, allows them to create instructional moves towards creating more positive learning spaces. We hope this study can be used specifically to improve the pedagogy seminar and, more generally, help all STEM instructors create equitable spaces.

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