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Engineering Students' Perceptions of the Dynamics between Students and Instructors: A Humanizing Perspective

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Introduction

Dynamics or interactions between students and instructors shape the learning experience in engineering classrooms [1], [2]. Research has shown that such dynamics can lead to either positive or unpleasant experiences, depending on how the interactions transpire in class. In higher education, such dynamics have shown to be shaped by many factors, which include the banking and transactional nature of education [3], the chilly climates felt and perceived by historically oppressed communities [4], [5], and the different cultures [3]. There has been scholarship on examining such dynamics from the undergraduate student perspective [4], however further expansion of such literature is needed as overall research on this topic is scarce. In addition, as far we are concerned, exploring how the student-instructor interaction and dynamics in the classroom from the humanizing and dehumanizing perspectives is not substantially documented in engineering education research. Thus, our study began to address this by answering the **research question**: ***What are some of the humanizing and dehumanizing power dynamics between students and instructors that undergraduate engineering students perceive?***

Literature Review

Humanization in learning environments has been a key component in philosophizing and engaging efforts to address the increasingly consumer-based, banking model of education [6], [7], [8], [9], [10]. Several key components define humanizing pedagogy from various scholars, with the key publication by Freire [6] describing the need for a pedagogy for the humankind that must be created, developed, and formed by those experiencing differential treatments by the systems and structures. Freire also called for cultivating consciousness on such systems and structures through reflections. However, various scholars have argued that it is difficult to incorporate humanizing pedagogy ideals into practice in the classrooms. del Carmen Salazar [7] and many other scholars like Bartolome [9], Huerta [8], and Camangian [11] began to address these by providing more concrete visuals, examples, and guidelines for teachers and instructors in the classrooms to practice humanizing pedagogy, with the key reminder that "one-size-fits-all" must not be the goal, but to focus on asset-based by valuing the students in such practice.

In these works, power dynamics between students and teachers are raised as one key element that must be acknowledge, addressed, and transformed for humanizing pedagogy to work [7], [9], [10]. Bartolome [9] specifically explained that such pedagogy can help reduce power dynamics by encouraging students to become more active and engaged participants in the learning process, unlike the passive learner role common in lecture-based modalities in engineering classrooms. del Carmen Salazar [7] implied the need to address power dynamics in the process of practicing humanizing pedagogy, explaining that co-constructing mutual trust between students and teachers through dialogue must be a component in such practice. All in all,

to humanize engineering education, our community must further research in understanding student-teacher power dynamics in engineering classrooms. As far as we have reviewed the existing engineering education literature [4], [12], knowledge on this topic should continue to be expanded and built to develop foundations for pushing efforts to practice humanizing pedagogy in engineering education.

Student-instructor power dynamic or relation research is abundant in the education domain spanning various contexts [2], [13], [14], [15], [16], [17], [18], [19]. Traditional teaching practices, like lectures, can often reinforce hierarchical structures that position instructors as sole authorities, leaving students in subordinate roles [2], [20]. For example, the instructor chooses how to present the material, which students get what grades, and what happens if a student doesn't follow their set rules; students are expected to submit to all these whims. This power dynamic often creates a space for instructor to abuse their power knowingly or not. For example, an instructor can declare a student cannot take an exam later even though they were unable to make it to the exam due to car trouble. This can also lead to fear of making mistakes or challenging authority, which can prevent students from engaging fully in the learning process. In addition, such dynamics can partly shape the emotional relationship between students and teachers [21]. All in all, such dynamics can shape the learning experience for the students in the classrooms, which is worth extending such exploration into engineering education.

It is then crucial for students to understand the power instructors use to influence students because they could use it to break out of their traditional learner role. If students can identify and perceive how instructors hold powers [1], they may have the ability to take control of their learning experience and respond appropriately. Such power used have a majority negative effect on student behavior [2]. Some expressions of authority in a classroom are a good thing; however, the excessive use of these power techniques, especially coercive and legitimate power, can cause the student population to have high amounts of dissatisfaction [1]. Findings suggest that students are more likely to voice or privately complain when they perceive excessive use of legitimate or coercive power [2]. From the student perspective, understanding the power dynamics can empower them to navigate the imbalances.

Equitably sharing power in the classroom can shift this dynamic by encouraging students to take an active role in their learning. This approach fosters independence, critical thinking, and a deeper understanding of course material [20]. For example, students may feel more in control of their learning experience, resulting in greater intrinsic motivation and improved cognitive outcomes [1]. These can be done with humanizing teaching practices, such as recognizing students as individuals with unique experiences, empowering students, fostering trust, and encouraging collaborative relationships between instructors and students [14], [18], [22], [23], like what del Carmen Salazar described as "mutual trust" between students and instructors [7]. However, there are dehumanizing experiences for students that create environments that are not conducive for learning as hierarchical or coercive power structures alienate students and reduce them to passive participants in their education [4], [5]. Such dynamics occur when instructors

prioritize control and discipline over collaboration and mutual respect, like instructors positioning themselves as unapproachable authority figure and refusing to provide feedback on a project until the final submission. In short, humanizing teaching can help with equitably sharing power between students and instructors, reducing the power dynamics. Dehumanizing teaching, however, can exacerbate such power dynamics.

Majority of the works cited here looked at student teacher power dynamics in education, but this is scarcely studied in engineering education. Considering that research on student-teacher power dynamics in engineering education has not fully embraced the perspectives of humanizing pedagogy, the lack of theorizing of such construct, and the scarcity of research of such power dynamics in engineering education, our work begins to build foundational knowledge for engineering to address such scarcity by exploring the engineering students' perceptions of what and how humanizing teaching looks like to them, with the power dynamics consistently emerged among our participants.

Theoretical Lens

We explored the use bell hooks' engaged pedagogy to ground our lens in understanding how humanization and dehumanization can happen in engineering classroom, where the data led to power dynamics emerged as a crucial construct that we present in this paper [22]. hooks' engaged pedagogy argued for the need to see students as human being in addition to being students, with the instructors also have to see themselves as healers in addition to being teachers. This pedagogical philosophy also calls for creating a community to learn together, arguing that the need to get students to feel authentic about themselves to facilitate learning today [24]. In our study, three components of engaged pedagogy (treating students as human beings, engaging students as a community in the classroom, and instructor being human) shape the questionnaire questions as show in Table 1 below.

Methods

This paper presents findings from an informational questionnaire administered to all undergraduate engineering students in a private, teaching-focused institution. Though humanizing pedagogy is conceived to advocate for and empower students who face differential treatment by the systems and structures, we collected data from all students regardless of their demographic information. This approach was not due to a lack of acknowledgment of the various unbalanced power relations among the students based on their backgrounds and the unjust systems, but because engineering, and to certain extent STEM, classrooms can be rigid and unwelcoming in general [25], [26], [27]. Exploring the student-teacher power dynamics from a general student perspective can be useful in understanding what these dynamics look like in engineering classrooms before we begin to consider the intersections of student backgrounds and demographics with power dynamics.

The informational questionnaire contained six open-ended questions asking about the engineering students learning experience that they perceived as humanizing and dehumanizing based on the theoretical lens (Table 1). Open-ended questions provide the student participants spaces to describe their experiences instead of choice-based questions. In addition to these questions, we included demographic questions to understand briefly who the participant pool was (Table 2) [28], [29]. 61 participants completed the survey, with 59 being undergraduate students pursuing their bachelor's degree of which we report the data in this paper.

Table 1: The questions in the questionnaire based on bell hooks' engaged pedagogy components.

bell hooks' Engaged Pedagogy Components	**Open-ended Questions**
Treating students as human beings instead of just students	Q7: Think back to your time in the engineering courses you have taken so far, share a learning moment that *you feel your course instructor sees you as a whole human being, not just a student, in your course.*
	Q8: Think back to your time in the engineering courses you have taken so far, share a learning moment that *you feel your course instructor just sees you as a student of the course and nothing more.*
Engaging students as a community in the classroom	Q9: Think back to your time in the engineering courses you have taken so far, share a learning moment that *makes you feel like you are an active part of a community in the classroom*.
	Q10: Think back to your time in the engineering courses you have taken so far, share a learning moment *makes you feel like you are not an active part of a community in the classroom*.
Instructor being human	Q11: Think back to your time in the engineering courses you have taken so far, share a learning moment that *makes you feel like your course instructor is being a whole human being, not just being an instructor/teacher of the course*.
	Q12: Think back to your time in the engineering courses you have taken so far, share a learning moment *makes you feel like your course instructor is just an instructor of the course, and nothing more*.

Table 2: Summary of Participant Major Information

Major	**Number of Participants**
Aerospace Engineering	45
Mechanical Engineering	7
Human Factors	2
Computer Science/Software Engineering	2
Have not Declared	3

Table 3: Summary of Participant Race Information

Major	Number of Participants
Black of African American	2
Hispanic, Latino/Latina/Latine/Latinx, or Spanish origin	1
Asian	6
White	23
Did not answer	31

In addition, seven respondents answered that they were part of the LGBTQIA+ community, while the rest mentioned "No" or did not answer this question. These are the overview of the participants we had. Analyzing the open-ended questions involve multiple iterations of coding that led to groupings that describe our data [30].

We conducted emergent coding with the open-ended responses. Two of the three authors analyzed the data by having iteration of coding, as illustrated below. Both authors coded separately before meeting at each iteration to discuss their codes and definitions, how they interpreted these codes, and how they interpreted the responses [30].

Table 4: Summary of the coding process and the codes that emerged

Coding Process	Code that Emerged
Iteration 1	• Emotions • Respect • Two-way street
Iteration 2 (consolidated some of the codes that emerged in Iteration 1)	• Compassion (part of Emotions) • Respect • Closed-off/No emotion (part of Emotions) • Kindness **Two-way street was defined with power dynamics after this iteration as an overall theme.*
Iteration 3 (last consolidation and re-coding on all the responses)	• Compassion (include kindness) • Connections (include emotion and closed-off) • Respect

Findings

Three groupings emerged from the analysis, that characterize how our data show student-instructor power dynamics that students perceived: 1) Connections, 2) Compassion, and 3) Respect.

Connection

After analyzing the survey, we found that students tend to describe that they understand the content better when their instructors made a connection with them. Two connections were found personal and work related. Personal connections could help the students develop a bond with the instructor, making it easier for the student to ask for help. Work-related connections helped the student could become more interested in the outcome of their project and in turn learn more about the topic, since they were allowed to apply their class studies to a topic they were passionate about.

"A project-based sustainable design lesson in engineering made me feel whole... The instructor included personal reflection and interdisciplinary conversations into our tasks throughout the course... Additionally, the instructor addressed student needs outside of academics. They encouraged frank conversation regarding business, personal, and emotional issues. This support built trust and helped us operate better... These encounters made me feel valued for my academic skills and unique experiences and viewpoints. This technique improved my understanding of sustainable design and stressed empathy and holistic thinking in engineering. It showed how engaged teaching can make the classroom a place of personal growth and meaningful learning."

Personal connections can help students connect with their instructors on a new level, allowing bonds to grow and develop. As described in the quote above, instructors addressed student needs outside of academics. The connections help build trust and adds a deeper understanding of learning. The next quote shoes the work-related connection.

"Recently, I had a professor ask me about my internship experiences and interests. This was to help him understand my background in understanding the course material."

This quote shows that work-related and personal connections can work together to create a great learning environment. With the background information it could facilitate the student to applying their background information to their learning.

However, there is another side to connections, which is when the instructor appears to be "closed off" to the students. "Closed off" may manifest when the instructor is there just to teach and does not make any connections with their students. Once the class was over the instructor would leave and that would be the end of discussion. When the instructor decided to do this, students could feel like they could not ask questions, go to office hours, or tell the instructor

about anything that is happening in their life that might affect their learning, as shown in the quote below.

"[Professor 1] is by far the best example of this, and he makes it known in class that he is there to be a teacher and nothing else. He doesn't care to know his students or really help them beyond the teaching he already does most of the time. He closes himself off so, even though they're available, students don't want to attend his office hours."

Compassion

We also found the students described their experiences that we interpreted as compassion. Many students tend to have something happening outside of their lives in the classroom. Some of those things might even interrupt what they were doing in class. Like this student states:

"W*hen I was taking EGR 101 with [professor 2], I felt he saw me as a whole human being because I was really sick for a couple of days, and he made sure to check up on me as well as help catching me up on what I missed.*"

In this quote, the student described that the instructor treated them as a human being by checking up on them while they were sick, which we interpreted as a form of compassion as the instructor helped the students not just on catching up with coursework, but also to catch up with the student had missed.

We also found manifestations of compassion in terms of course policies. Some students described that some instructors had strict deadlines, but the instructors still cared about the students and their well-being. Students describe that such instructors tend to be the ones that allow the students to work with the instructors on finding a way to still get the assignment done while still keeping the students themselves healthy and maintaining a life outside of school. Some respondents also described that there were instructors who seem to not care what happens to students in general and instructors who only focused on the academic side in the classroom.

"My EGR 120 Professor was very kind and offered support to student who needed it, last semester my grandfather had a stroke and passed away and while a few of my gen ed teachers were rude and dismissive of me taking a couple days off to be with my family she was very understanding and even offered to extend my deadlines so that I would have proper time to process and morn my loved one."

This student described their instructors showing compassion towards them by allowing them to maintain a balanced life. Another side of this was when the instructor only showing focus on the courses.

"In one of my engineering classes, I felt like my lecturer saw me mostly as a student. The instructor conducted mostly transactional [and] intellectual interactions with pupils in this class. There was little effort to get to know us or acknowledge our histories, hobbies, or issues outside of class. Lectures, homework, and tests were prioritized over our lifestyles. This perspective was

shown during a difficult assignment conversation. The lecturer gave a brief, technical explanation when I asked. There was no attempt to discuss my material struggles or engage in a deeper conversation."

In this quote, the student described that the instructor did not seem to show compassion when it came to students' struggle with a difficult assignment, considering the instructor did not make efforts to know the students. This led to the student perceiving that the instructor could not connect with them to help with the difficult assignment. Our data have shown that students perceive instructors who could be less compassionate tend to be more distant, leading to them struggling with parts of the coursework.

Respect

We also found respect emerged from the data analysis, where we defined as affording the students certain level of respect that goes both ways (between instructor and students). One student stated that:

"My 120 professor barely speaks to us and only lectures for about 5 minutes. There is no personal connection with them at all. They also get upset when we ask questions and make me feel stupid. Sometimes I need a question reworded in order to understand better, but they just are not kind at all."

As quote above described, some students perceived the lack of respect by their instructors, as manifested in the interactions in asking questions.

Another dimension to this was how the lecture was structured:

"... Lectures were focused on following along with the professor in class. It was very easy to fall behind during the lecture and then face difficulty fixing it at home, leading to further difficulty completing the homework. Questions were difficult to communicate and receive an answer satisfactorily, and my worth in that class felt heavily dependent upon my ability to complete the nightly homework (~8hrs per week, sometimes more) rather than my actual understanding of the material (as demonstrated in the final project) ..."

This quote shows that because of the way the course was structured, the students felt the lack of respect of their actual understanding of their knowledge, instead it appeared to fall on the nightly homework. The students were struggling to complete the homework due to how the course was structured.

Another quote had shown that respect between instructors and students could go both ways. Our respondents described that when their instructors appear to show respect for their student, it could help making the student feel like a real human being instead of just part of the instructors' job, as shown in the quote below.

"When I went into the office hours for my engineering 101 class I related to my professor that I felt the group was slacking and quite frankly I was doing most of the work. She encouraged me to keep reaching out to them and that made it feel like I was more of a person rather than just a student."

By having the instructor showing them the students a certain level of respect, this student explained that it allowed them to feel like they could go talk to their instructor when they had issues in a group setting.

Discussions

Our data analysis identified three groupings – connection, compassion, and respect, that describe how engineering students perceive their dynamics with their instrutors. These are important to begin building knowledge on student perceptions of such power dynamics in the classroom in the engineering education context as such study is scarce. In addition, we framed such power dynamics from the humanizing pedagogy perspective. Considering that our study started off as focusing on what students perceive as humanizing and dehumanizing learning experiences, the eventual emergence of student-instructor power dynamics as a key component in the humanization of engineering learning environments affirm existing literature on humanizing pedagogy (Bartolome, 1994; del Carmen Salazar, 2013; Freire, 1970; hooks, 1993; Huerta, 2011). Situating our findings in power dynamics literature, we interpreted these three groupings as possible forms of humanizing teach that could counter the differential power dynamics between the students and their professors [2]. For instance, research has shown that Mejia et al. (2023) have shown that having professors build relationship with their students helped with building an inclusive environment. Our data affirm this, showing that when instructors attempt to connect with the students, students have described an improved learning experience. Mejia and colleagues also explained that instructors connecting students about the real-world application with the course content can help with students learning, as shown in our data. With compassion, our data also affirm work by Kannen (2012) where instructors demonstrating empathy and understanding of students' struggles can reduce the power dynamics. Lastly, having mutual respect between instructors and students can improve the learning environment due to shared power between them, which we also have found in our data [4], [20].

Our data also contribute to knowledge about dehumanizing practices and how that could shape the power dynamics, leading to a less than pleasant learning environment. Instructors who lack efforts to build connections with their students could lead to students not being able to form connections with their professors to improve their learning experiences [2]. The lack of respect we found also contributes to the understanding of instructors making themselves unapproachable, which can lead to students disengage from the professors and the learning process [5]. In short, our findings have contributed to beginning understanding student-instructor power dynamics in engineering learning environment, and how the humanizing and dehumanizing teaching practices manifesting in such dynamics.

Our findings largely affirm existing literature on power dynamics and humanizing pedagogy domain. However, we argue that our findings also contributed to addressing the scarcity of research of this topic in the engineering education context. For instance, this paper presented has shown several examples of how engineering students perceive the humanizing and dehumanizing instances of power dynamics in their learning process. These instances range from direct interactions with the instructors to the course structure and policies enacted in the courses they took. Such examples can have implications to our research and practice community. For our researchers, further explorations and research on student and instructor perceptions [21] of power dynamics are warranted to further efforts in humanizing engineering education. For practitioners, the examples shown in our data can provide a more visualized instances of how students may perceive certain practices as dehumanizing from the power dynamics perspective, and practitioners may have these as a starting point to begin reflect on their own courses of how power dynamics may look like in their classrooms, such as the use of negotiations in their classrooms [31], [32], [33].

References

[1] J. C. McCroskey and V. P. Richmond, "Power in the classroom I: Teacher and student perceptions," *Commun Educ*, vol. 32, 1983.

[2] E. Symonds, "An 'unavoidable' dynamic? Understanding the 'traditional' learner–teacher power relationship within a higher education context," *Br J Sociol Educ*, vol. 42, no. 7, pp. 1070–1085, 2021, doi: 10.1080/01425692.2021.1962246.

[3] M. Y. Wong, "Teacher–student power relations as a reflection of multileveled intertwined interactions," *Br J Sociol Educ*, vol. 37, no. 2, pp. 248–267, Feb. 2016, doi: 10.1080/01425692.2014.916600.

[4] K. Z. Mejia, H. Kenney, T. Dewitt, and J. A. Turns, "Exploring undergraduate engineering students' understanding of power dynamics," in *Proceedings for American Society for Engineering Education (ASEE) Annual Conference*, 2023.

[5] K. Hogan, "Pitfalls of community-based learning: How power dynamics limit adolescents' trajectories of growth and participation," vol. 104, no. 3, pp. 586–624, Apr. 2002.

[6] P. Freire, *Pedagogy of the oppressed*. 1970.

[7] M. del Carmen Salazar, "A Humanizing Pedagogy: Reinventing the Principles and Practice of Education as a Journey Toward Liberation," in *Review of Research in Education*, vol. 37, no. 1, SAGE Publications Inc., 2013, pp. 121–148. doi: 10.3102/0091732X12464032.

[8] T. M. Huerta, "Humanizing pedagogy: Beliefs and practices on the teaching of Latino children," *Biling Res J*, vol. 34, no. 1, pp. 38–57, Jan. 2011, doi: 10.1080/15235882.2011.568826.

[9] L. I. Bartolome, “Beyond the methods fetish: Toward a humanizing pedagogy,” *Harv Educ Rev*, vol. 64, no. 2, pp. 173–195, 1994, [Online]. Available: http://proquest.umi.com.proxy.lib.umich.edu/pqdweb?did=1660116&sid=2&Fmt=3&clientId=17822&RQT=309&VName=PQD

[10] A. Ita Olszewska, E. Bondy, N. Hagler, and H. Jinna Kim, “A humanizing pedagogy of engagement: Beliefs and practices of award-winning instructors at a U.S. university,” *Teaching in Higher Education*, vol. 28, no. 7, pp. 1671–1687, 2023, doi: 10.1080/13562517.2021.1920575.

[11] P. R. Camangian, “Teach Like Lives Depend on It: Agitate, Arouse, and Inspire,” *Urban Educ (Beverly Hills Calif)*, vol. 50, no. 4, pp. 424–453, Jun. 2015, doi: 10.1177/0042085913514591.

[12] K. Z. Mejia, C. Donaldson, M. Zavary, and J. Turns, “Insights into Power Relations from the Co-designing of Classroom Norms between Students and Faculty,” in *Proceedings - Frontiers in Education Conference, FIE*, Institute of Electrical and Electronics Engineers Inc., 2021. doi: 10.1109/FIE49875.2021.9637134.

[13] R. Crosnoe, M. Kirkpatrick Johnson, and G. H. Elder, “Intergenerational Bonding in School: The Behavioral and Contextual Correlates of Student-Teacher Relationships,” 2004.

[14] J. Cummins, “Pedagogies of choice: Challenging coercive relations of power in classrooms and communities,” *Int J Biling Educ Biling*, vol. 12, no. 3, pp. 261–271, 2009, doi: 10.1080/13670050903003751.

[15] L. B. Yoke, “Interrelationship between Perceived Instructor Power, Student Dissatisfaction, and Complaint Behaviors in the Context of Higher Education,” *International Education Studies*, vol. 11, no. 7, p. 12, Jun. 2018, doi: 10.5539/ies.v11n7p12.

[16] M. Lovorn, C. S. Sunal, L. M. F. Christensen, D. W. Sunal, and C. Shwery, “Who’s in control? Teachers from five countries share perspectives on power dynamics in the learning environment,” *Journal of Research in International Education*, vol. 11, no. 1, pp. 70–86, Apr. 2012, doi: 10.1177/1475240911435869.

[17] S. S. Myers and R. C. Pianta, “Developmental commentary: Individual and contextual influences on student-teacher relationships and children’s early problem behaviors,” *Journal of Clinical Child and Adolescent Psychology*, vol. 37, no. 3, pp. 600–608, Jul. 2008, doi: 10.1080/15374410802148160.

[18] V. Kannen, “‘My body speaks to them’: Instructor reflections on the complexities of power and social embodiments,” *Teaching in Higher Education*, vol. 17, no. 6, pp. 637–648, Dec. 2012, doi: 10.1080/13562517.2012.658566.

[19] Z. C. Chan, W. T. Chien, and S. Henderson, “Power dynamics in the student-teacher relationship in clinical settings,” *Nurse Educ Today*, vol. 49, pp. 174–179, Feb. 2017, doi: 10.1016/j.nedt.2016.11.026.

[20] H. A. Davis, “Conceptualizing the role and influence of student-teacher relationships on children’s social and cognitive development,” *Educ Psychol*, vol. 38, no. 4, pp. 207–234, Sep. 2003, doi: 10.1207/S15326985EP3804_2.

[21] R. Tormey, “Rethinking student-teacher relationships in higher education: a multidimensional approach,” *High Educ (Dordr)*, vol. 82, no. 5, pp. 993–1011, Nov. 2021, doi: 10.1007/s10734-021-00711-w.

[22] B. Hooks, *Teaching to transgress: Education as the practice of freedom*. New York, NY: Routledge, 1993.

[23] G. Sidky, “The power game: Power dynamics between the teacher and the students in a graduate seminar,” *English Language Teaching*, vol. 10, no. 5, p. 179, Apr. 2017, doi: 10.5539/elt.v10n5p179.

[24] K. J. Chew, “Work-in-progress: Exploring students’ perception of engineering classrooms with bell hook’s engaged pedagogy,” in *Proceedings of the American Society for Engineering Education (ASEE) Annual Conference*, Portland,OR, 2024.

[25] E. A. Cech and T. J. Waidzunas, “Navigating the heteronormativity of engineering: The experiences of lesbian, gay, and bisexual students,” *Engineering Studies*, vol. 3, no. March1, 2011, doi: 10.1080/19378629.2010.545065.

[26] K. L. Tonso, “Engineering identity,” in *Cambridge Handbook of Engineering Education Research*, 2014, pp. 267–282. [Online]. Available: https://login.libweb.lib.utsa.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=34435806&site=ehost-live&scope=site

[27] E. Seymour and N. M. Hewitt, *Talking about leaving: Why undergraduates leave the sciences*. Westview Press, 1997.

[28] N. Bates, M. Chin, and T. Becker, *Measuring sex, gender identity, and sexual orientation*. National Academies Press, 2022. doi: 10.17226/26424.

[29] L. Westbrook and A. Saperstein, “New Categories Are Not Enough: Rethinking the Measurement of Sex and Gender in Social Surveys,” *Gender and Society*, vol. 29, no. 4, pp. 534–560, 2015, doi: 10.1177/0891243215584758.

[30] M. B. Miles, A. M. Huberman, and J. Saldaña, *Qualitative data analysis: A methods sourcebook*, 3rd ed. Thousand Oaks, California: Sage Publications, 2014.

[31] Y. Oral, "'The right things are what I expect them to do': Negotiation of power relations in an English classroom," *Journal of Language, Identity and Education*, vol. 12, no. 2, pp. 96–115, Apr. 2013, doi: 10.1080/15348458.2013.775877.

[32] S. Hyde, "Sharing power in the classroom," in *Negotiating the curriculum: Educating for the 21st century*, G. Boomer, Ed., 1992, p. 67. [Online]. Available: http://ebookcentral.proquest.com/lib/flinders/detail.action?docID=254499.

[33] K. Winograd, "The negotiative dimension of teaching: teachers sharing power with the less powerful," 2002.