Community College Students' Perspectives on Classroom Environments in College Algebra

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We present a preliminary report on community college students' perspectives of classroom environments in college algebra. Drawing on nine student interviews from four states, we developed and calibrated a coding framework of 34 codes organized into nine categories. Our analysis highlights three broad dimensions of classroom experience: individual factors, relational dynamics, and structural or contextual elements. Students emphasized the role of supportive and responsive instruction, including instructors who re-explained concepts, offered second chances, and adapted to diverse learning needs. They also described participation structures that shaped collaboration with peers, as well as classroom climates that encouraged or at times discouraged active engagement. Beyond their current experiences, students voiced aspirations for more inclusive and collaborative practices. These early findings provide insight into how community college students experience college algebra and point toward future directions for exploring diversity, equity, and inclusion in mathematics classrooms.

Keywords: Community college, classroom environment, equity, diversity, inclusion

Although equity research in mathematics education has emphasized instructional practices and teacher perspectives (Gutiérrez, 2002), far less attention has been paid to how students perceive the classroom environments that support or hinder their learning. Prior work highlights the importance of classroom environments in shaping opportunities to learn, but student voices are rarely centered in the literature. As noted by recent research, we have limited perspectives from students underscoring the need for more studies that foreground their voices (Wickersham & Nachman, 2023). We focus on college algebra, a gateway course that can influence whether students persist in STEM-related fields (Walkington, 2025). Our study takes place in community colleges, where many students are first-generation, low-income, or racially minoritized (American Association of Community Colleges, 2025), and where equitable access to mathematics is especially consequential. By centering students' voices, our goal is to examine how they describe classroom environments and to consider how their accounts affirm, complicate, or extend existing research on equitable practices in mathematics education. Guided by this perspective, we ask: How do community college students describe classroom environments in college algebra?

Conceptual Framework

In mathematics education, equity-focused research emphasizes the importance of classroom environments that provide fair opportunities to learn and supportive conditions for participation

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(Esmonde, 2009a, 2009b). The classroom environment in mathematics education refers not only to instructional practices but also to the social and affective climate shaped by peer and instructor interactions. For example, Cobb and Hodge (2002) highlight a relational perspective on equity, in which classroom norms and interpersonal dynamics determine whether participation feels fair, inclusive, and respectful. Gutiérrez (2002) argues that equity in mathematics education requires not only access to content and achievement but also meaningful opportunities for participation and recognition of diverse student identities. Understanding interactions in diverse classrooms**,** where students vary in race, culture, language, socioeconomic background, ability, gender identity, and more, is essential but complex. Mathematics educators have sought to understand instruction as interactions that occur between teachers, students, and the content, and that take place within a classroom environment that can determine the nature of those interactions (Cohen et al., 2003). By understanding instruction in this way, and the classroom environment as either supporting or constraining the interactions, we seek to uncover individual, relational, and structural or contextual elements that may affect students' participation in mathematics.

Methods

The study follows a grounded theory design that calls for theoretical sampling and multiple iterations of data collection. Participants from eight community colleges were invited to participate in an interview study (four interviews over an eight-month period). The students had to be familiar with college algebra at their college (i.e., were taking or had taken the course). For this preliminary report, we analyzed interviews from nine participants (out of 38) across seven institutions. The sample included five women and four men (ages 18–50) with varied commitments outside school (e.g., full-time jobs, caregiving). Participants identified as African American/Black, White, West Asian, Hispanic, Kenyan, and multiracial (e.g., half Peruvian and half Guatemalan). This purposive sampling aimed to capture a wide range of perspectives while keeping the dataset manageable for early analysis. The first interview asked about general feelings toward mathematics and memorable experiences, peer and instructor interactions (including moments of support and lack of support), and definitions of diversity, equity, and inclusion. These questions provided a baseline for subsequent interviews and explored how students understood classroom interactions in relation to their participation and motivation. Interviews were semi-structured, with open-ended and probing prompts (Roulston, 2013).

Codebook development proceeded in four phases. First, one transcript was coded in Dedoose by three researchers, followed by discussion to clarify meanings and expand initial codes. Second, four additional transcripts were independently coded to seek new codes and refine definitions, producing 41 codes with examples. The transcripts were selected based on the impressions of the interviewers that they could bring different perspectives to the ones already captured. Third, the 41 codes were organized into 11 categories framed by the instructional triangle (teacher, student, and their interactions). For example, the codes *Supportive and Responsive Instruction* and *Commitment to Teach* were subsumed under the category *Instructor*, because they both describe how students perceived their instructors' teaching practices, attitudes, and dedication, rather than focusing on students' own actions or broader classroom conditions. As no new codes emerged, we moved to the fourth phase, using four transcripts from students at colleges not yet represented, to broaden the codebook. These were assigned to two new coders paired with original team members. They coded three transcripts each. The goal of this step was to confirm the definitions of the codes, make sure that they were applied consistently, and determine whether the codes were correctly placed under the existing categories. During this phase, one additional code emerged "Small class size limits opportunities for group

collaboration" which we placed under Factors. During this calibration, some codes were merged and definitions refined. The process concluded with nine categories and 34 codes, stabilized for use in this preliminary analysis (see Figure 1), and pseudonyms are used throughout.

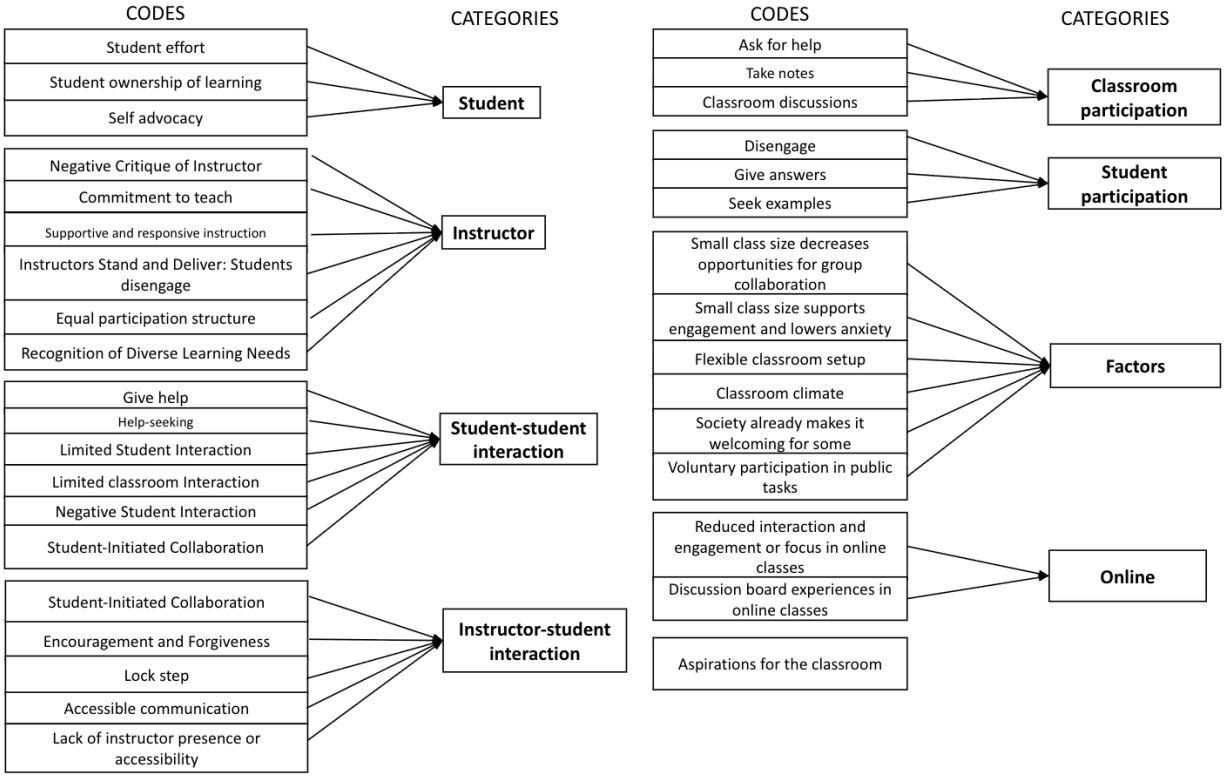

Figure 1. Preliminary codes and categories based on nine transcripts

Preliminary Findings

Our analysis draws attention to the ways students talk about instructors, peers, participation, and classroom environment. In organizing the codebook, we grouped codes into three broad dimensions: individual factors that capture how students described their own role in learning (e.g., student-focused codes such as effort and self-advocacy); relational dynamics that encompass interactions with instructors and peers, highlighting how teaching practices, responsiveness, and student–student collaboration shaped opportunities and constraints for participation (e.g., instructor, student–student, and instructor–student interactions); and structural or contextual elements that encompass broader features of the learning environment (e.g., class size, classroom climate, online formats) (see Figure 2).

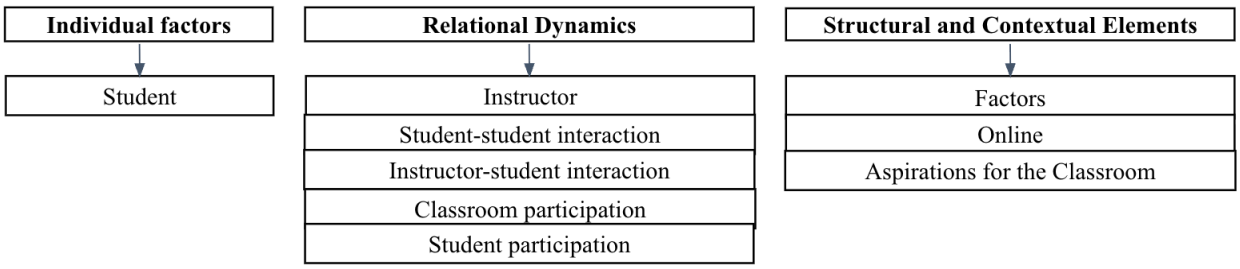

Figure 2. Preliminary categories and dimensions

These dimensions show that students' learning was shaped not only by their own effort and strategies, but also by how supportive instructors were, how much students interacted with peers, and how the classroom itself was structured. Viewed through an equity lens, these individual, relational, and structural or contextual elements show how classroom environments supported or constrained students' opportunities to learn and participate. In the following preliminary findings, we place particular emphasis on individual factors, relational dynamics, and structural or contextual elements, as these codes emerged most prominently in students' accounts.

Individual Factors. Within this dimension, we focus on two features of the classroom environment: Student Ownership of Learning and Self-Advocacy. Through **Student Ownership of Learning**, students described becoming more aware of how their own choices and persistence affected their outcomes. George reflected: "I also helped with a lot of the questions that [the instructor] asked… and at that time I actually got decently good with math." Jacob similarly noted, "I have to put in a lot of time outside of class… when I don't get that done, it really piles up after a while." These reflections show students making connections between their actions and their academic growth, underscoring their sense of responsibility for learning. With **Self-Advocacy**, students highlighted how voicing their needs and seeking support enabled them to navigate challenges. Elena explained: "I think just being more vocal about needing help instead of sitting in that frustration has just helped me." Pilar described this as a personal strength: "I think personally, I'm really good at advocating for myself and asking questions, and I've never had a teacher refuse to answer." Such accounts reflect how students exercised agency in creating equitable opportunities for themselves.

Relational Dynamics. Within this dimension, we highlight four features of the classroom environment: Supportive and Responsive Instruction, Equal Participation Structures, Recognition of Diverse Learning Needs, and Limited Classroom Interaction. **Supportive and Responsive Instruction** refers to instances in which students highlighted instructors who re-explained concepts, offered second chances, or encouraged persistence. Elena said that her instructor "made it very clear that his goal is for us to understand… he will not move on until he's like, 'Are you sure you get it?' and he tries to explain it from a different standpoint." Jacob similarly emphasized that his professor consistently checked for understanding, "going around the classroom… answering our questions, making sure that we're getting it." These accounts align with Gutiérrez's (2002) view that equity requires meaningful access to resources and opportunities. **Equal Participation Structures** collects students' descriptions of opportunities to engage simultaneously in problem-solving or to collaborate informally with peers. Jaime explained how her instructor ensured that "…so, like, people that need the extra extra explanation, it assists everyone. She's including the people that don't understand the same assignments as the people that do." Similarly, George noted the value of simply allowing time for collective work: "…So just let everyone get a chance to study together in class that would help a lot of people trying to get assignments done." Such practices reflect Esmonde's (2009a, 2009b) definition of equity as the fair distribution of opportunities to learn and participate, not only access to content, but also mathematical discourse and identities as knowers and doers. **Recognition of Diverse Learning Needs** captures students' comments about the importance of instructors adapting to varied learning styles and providing multiple entry points into mathematics. As Ayami explained, "We kind of need to branch out and explore different learning styles. Right now, I'm getting tested for neurodivergency, and it's a little bit difficult to just go through the way my current professor is teaching." Similarly, Althea said, "He does a survey… seeing how people, like, learn… 'email me if you need more explanation… and I'll

make a video about it,' because he just did a general video for the whole class." These reflections highlight students' desire for instruction that acknowledges diverse learning needs and aligns with equity-oriented calls for culturally and linguistically responsive pedagogy (Cho et al., 2022; Felton-Koestler, 2019). Finally, **Limited Classroom Interaction** refers to statements about how peer-to-peer communication was minimal or absent. Elena explained, "we all keep to ourselves… it's not too much talking, but there is some limited [interaction]." Althea, reflecting on her online algebra course, noted that "the only time I talked to another peer about math [was] in the tutoring center." Pilar similarly described the atmosphere as "kind of isolating… it almost felt like no one else was in the classroom." These accounts show that when opportunities for peer collaboration were limited students experienced learning as individuals and were disconnected. These experiences resonate with Cobb and Hodge's (2002) relational perspective, which emphasizes that equity also depends on the classroom norms and interpersonal dynamics that shape how participation is defined and enacted. When interaction is minimal, students have fewer opportunities to build mathematical identities and to experience learning as a shared endeavor.

Structural and Contextual Elements. Within this category, we highlight two features related to this dimension: Classroom Climate and Aspirations for the Classroom. **Classroom Climate** captures comments students made about their willingness to contribute to the emotional tone of the classroom and their perceptions of whether student mistakes were treated as learning opportunities or as sources of embarrassment. As Elena explained, "creating that space and that tone that mistakes are okay… we can solve the problem even though it's wrong." Jacob similarly emphasized that his instructor was "not judging… not going to us with a judging tone… not going to be super hard on us for getting it wrong." As Asa explained, her instructor interacted with all students "in the same and respectful" way and kept "trying to explain again and again so the sign translator could translate for those students". These accounts echo Cobb and Hodge's (2002) relational perspective, which argues that equity depends on whether norms and interpersonal dynamics create inclusive and respectful participation. With **Aspirations for the Classroom** we captured students' hopes for more inclusive and collaborative classroom practices. Elena suggested for instructors to check in with all students, not just the ones who frequently participate: "I would just make sure that I'm asking everyone if they understand. I am not just going to the person who always raises their hand… especially to the ones who don't answer or who don't raise their hand." Similarly, Pilar envisioned more group-oriented work: "Maybe like more problems or projects that make people work together and make more groups." These aspirations resonate with Esmonde's (2009a, 2009b) definition of equity as the fair distribution of opportunities to participate.

Next Steps and Questions

Ongoing analysis with all the interviews will identify common themes and better understand perspectives students bring to what an equitable math classroom environment looks like for algebra at community colleges. Questions for the audience, currently we have the following:

1. How might the categories we developed (e.g., student effort, classroom climate, instructor–student interaction) be grouped into broader themes that address equity?
2. What strategies could strengthen triangulation and support stronger claims about students' experiences?

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