A glimpse of social presence during an organic chemistry group activity

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Introduction: The US must strengthen the STEM workforce to provide solutions that support a resilient society and robust economy. Such solutions require a range of perspectives from individuals with diverse identities. However, women and individuals who identify as a racial or ethnic minority are woefully underrepresented in the STEM workforce. The reality doubly impacts those with intersecting identities, such as Black women. Efforts to increase the representation of Black women in STEM disciplines include interventions that improve their success in undergraduate courses. Paramount to this is expanding understanding of the experiences of Black women in the academic setting. The current work is situated within the social presence of the Community of Inquiry (CoI) framework, examining social talk among Black women in the learning environment. The CoI model holds that the interconnection between teaching, cognitive, and social presences influences how students engage to master course content. More specifically, each presence is critical for the student's ability to connect with their peers and instructor and engage in discourse related to the application of information.

Methods: The characterization of social presence was captured through audio and visual recordings. The videos were examined for academic and non-academic social talk. The group examined consisted of four Black women at a HBCU.

Results: Instances of social talk were captured that aligned with affective and emotional expression, open communication, and group cohesion. The dialog was both academic in nature, corresponding to the task, and non-academic, unrelated to the task.

Discussion: Few studies have been done to characterize CoI in academic spaces consisting only of Black women. Disaggregating the stories of Black women from the broader context provides the visibility needed to understand their experiences and imagine a STEM paradigm responsive to their existence. Such knowledge is critical to understanding better how women, particularly women of African descent, navigate the learning environment. The article provides a preliminary look at Black women in an active learning setting to shed light on the experiences of these individuals in the STEM context.

1 Introduction

There has been a growing demand for a well-trained STEM workforce due, in part, to the enmeshment of technology within the everyday human existence and the need for diverse perspectives in STEM-informed solutions (Ireland et al., 2018; Grieco and Deitz,

2021; Fry et al., 2021). The concern prompts a deeper exploration into the challenges faced by those with identities underrepresented in STEM, particularly challenges faced by Black women in STEM. Despite gains in the number of women in the physical sciences, from 22% in 1990 to 40% in 2019, Black women remain underrepresented in the STEM workforce (Kennedy et al., 2021). A wide pay gap accompanies the disparity in representation. In 2019, Black women earned only 55% of the salary earned by Asian men and 62% of that earned by White men (Fry et al., 2021). The salary trend among women shows that Black women earned $57,000 compared to $66,000 earned by White women and $88,600 earned by Asian Women (Fry et al., 2021). The gender and racial inequity, evident in the numbers, has a critical inverse relationship to the future economic stability of the country (Benavent et al., 2020). The year 2019 also saw a 3% drop in STEM bachelor's degree attainment for Black students compared to degrees earned by these individuals in s 2010 (Grieco and Deitz, 2021). Of the 7% of bachelor's degrees earned by Black students, 2.66% were earned by Black women. Further, women and underrepresented minorities have been found to leave STEM majors at rates significantly higher than non-underrepresented minorities (Hrabowski, 2018; Seymour et al., 2019; Hrabowski et al., 2020; Suran, 2021).

The work described here complements efforts to address the trend in underrepresentation by providing an avenue to explore the experiences of Black women in STEM courses. The exploratory qualitative study focuses explicitly on women of African descent with various socioeconomic backgrounds. The study is a component of a larger project aimed at (1) understanding how Black women demonstrate agency in a STEM classroom and (2) shifting the conversation regarding minority learners from one that characterizes deficits to one that empowers learners regardless of their skill sets. Curricula related to the project were implemented in organic chemistry courses, resulting in the active engagement of Black women in the course (Fullilove et al., 2017; Sanders et al., 2019; Winfield L. et al., 2019; Ballard et al., 2023). Pedagogies include asynchronous online learning for delivering content, reading materials, and face-to-face course activities to promote practice and mastery of concepts. As higher education continues to embrace such pedagogies, it is of interest to examine the impact of these strategies on learning behaviors in small liberal arts environments and among Black women. Acknowledging the imperative to understand the dynamic nature of learning within courses employing active learning pedagogies, conventional metrics like GPA and course grades fall short of comprehending the intricacies of students' success and perseverance in STEM classrooms, particularly for individuals with identities underrepresented in STEM (Talanquer, 2014; Conrad and Gasman, 2015; Seymour et al., 2019).

Examining how students engage with learning resources and respond to collaborative learning activities is of particular interest in unearthing these intricacies. Therefore, the current paper provides a glimpse into student social engagement in this context and is guided by the research question: *What is the nature of social talk during the group quiz?* The work was conducted at a single-gender HBCU, an environment in which the weight of holding membership in two distinct yet marginalized identity groups is believed to be minimized. The context removes the obscurity of seeing Black women, providing needed information to ensure they are correctly recognized and characterized inside a co-educational and non-HBCU environment. Such baseline information can be used to identify how these individuals engage in multi-gender, multi-racial spaces.

2 Literature review

2.1 Hearing the voices of Black women in STEM

The racial and gender disparities related to women and underrepresented minorities have been consistently reflected in statistics published by the National Science Foundation in current and prior releases of Women, Minorities, and Persons with Disabilities in Science and Engineering (Grieco and Deitz, 2021). Researchers have sought to illuminate causality for the disparity related to Black women through various means (Ireland et al., 2018; Lee and Ferrare, 2019; Mcgee, 2021; Campbell-Montalvo et al., 2022; Williams, 2024). Their work provides an in-depth treatment of the issues faced by Black women in STEM by forcing the academic and professional communities to grapple with the history of trauma endured by these individuals while navigating oppressive systems. Critical approaches lifted in this literature render Black women "unhidden" and emphasize their stories (Ireland et al., 2018).

Ireland et al. write, "Taken separately, the bodies of education research focused on the experiences of Black students and female students in STEM fields often render Black women and girls 'hidden figures' in that they have not sufficiently addressed their simultaneous racialized and gendered experiences in educational contexts" (Ireland et al., 2018, p. 226). The notion of hidden figures is both a nod to the movie but also steeped in the reality that Black women's issues can be lost in that of Black men when it comes to race and in that of women en masse when it comes to gender. Disaggregating their stories from the broader context provides the visibility needed to understand their experiences and imagine a STEM paradigm responsive to their existence (Ireland et al., 2018; Leath and Chavous, 2018; Ferguson and Martin-Dunlop, 2021; Williams, 2024). Work in the area also references the fact that women and underrepresented minorities enter spaces aware of the presence of discrimination and are confronted with stereotypes and biases that question their ability (Leath and Chavous, 2018; Morton and Parsons, 2018; Allen et al., 2022; Campbell-Montalvo et al., 2022; Williams, 2024). These individuals increase their participatory social capital, a trusted network of support, through groups outside the classroom comprising individuals of the same race or gender (Campbell-Montalvo et al., 2022). It is also important to provide students with routes to social connections within the academic environment (Ferguson and Martin-Dunlop, 2021; Wilkins-Yel et al., 2023; Williams, 2024). Doing so should extend beyond the typical interventions where students find community outside of the classroom, which helps but can be isolating.

It has been shown that the student experience at HBCUs provides a model of empowerment that allows graduates of these institutions to navigate better the aggression and oppression of non-HBCU STEM environments. Wicker et al. (2023) dissected the narratives of Black women who earned undergraduate degrees at Spelman College, chronicling the role of HBCUs in nurturing the success and retention

of Black women in STEM. The need to understand better the outcomes and related efforts at these institutions was also highlighted. The authors decrease the focus on deficits cited by many scholars and showcases the role of HBCUs in cultivating the social capital Black women need for resilience. Mainly, the work focuses on same-gender relationships, an area that has not been thoroughly examined to understand its role in realizing a robust STEM workforce reflective of the US population.

There are limited studies that feature Black women's, creating the need to study these individuals in isolation. In addition, Black women must be empowered to self-author their STEM identities and correct the intentional and unintentional misidentifications of Black women in STEM (Williams, 2024). Hughes et al. (2024, p. 2) write, "Research that gives Black women an opportunity to tell their stories to both counter and disrupt the current White supremacist storyline allows us to uncover the interlocking oppressions that prevent Black women and girls from thriving in STEM". Adding to this is a need for qualitative scholarship that addresses the impact of intersecting identities on the success of Black women in STEM courses that present disaggregated "data on Black women's unique STEM experiences" (Wicker et al., 2023, p. 95). Both signify the need for a sterile context for examining Black women in STEM that is free from the realities associated with primarily white institutions (PWI).

Nevertheless, questions remain such as: (1) How do they gain this resilience and sense of empowerment from these environments? (2) Can the sparks that occur along the way be tracked? (3) Is it evident in courses or purely stimulated by co-curricular activities? (4) What are the social aspects that lead to this spark? The ultimate answers to these questions are beyond the scope of this paper. It is envisioned that the work presented herein gives a baseline for seeing how these students show up as their authentic selves in courses by examining social engagement in the group setting.

2.2 Group work

Faculty agree that when employed thoughtfully and systematically, student-centered learning strategies enhance learning compared to traditional lecture techniques (Kober, 2015). Such strategies encompass various activities, including inquiry-, problem-, case-, and team-based learning. Each of these strategies focuses on deeper learning with students being actively involved and having control over their learning process while encouraging collaboration and building a community of learners. Sahin, Ayar, and Adiguzel found that collaboration contributes to students' ability to learn from each other, understand the different aspects of an assigned task, and complete the activity (Sahin et al., 2014). The social component is important to consider as it has been shown that social engagement connects students to their coursework and supports an enjoyable learning experience (Richardson et al., 2017).

One must also consider how the gender composition of the learning environment, particularly in group work, impacts the social aspects of learning. Hosaka (2014) found that Japanese women typically had a discouraging experience working in groups with their male peers. Women in engineering participated more actively in groups when the members were mainly female vs. mostly male or in equal gender proportions (Dasgupta et al., 2015). It was also found that, even when women excel in STEM, gender bias continues to play

a role in undergraduate classrooms (Bloodhart et al., 2020). Female peers protected women's confidence and engineering career aspirations despite masculine stereotypes about engineering. Similarly, in physics, female students in the single-gender condition solved problems more effectively than those in the mixed-gender condition (Ding and Harskamp, 2006). Despite this literature, inadequate studies have been done on the impact of group activities on Black women.

2.3 Social and cognitive engagement

Social interactions and markers of cognitive and emotional engagement have been examined (Naibert et al., 2022). Students reported demonstrating cognitive engagement by reviewing work, understanding mistakes, strategizing solutions, and connecting prior course material to the assignment. There was also a nod to working in teams and learning from others as a reflection of engagement. On the other hand, cognitive disengagement was based on students not contributing or trying to understand the assignment or simply transcribing answers without concern for the reasoning behind the outcome. Students perceived emotional engagement as seeing value in the activity or being confident about the accuracy of the solution. However, emotional disengagement was expressed as frustration, confusion, or discouragement. Negative feelings, self-doubt, or feeling rushed were characterized as emotional disengagement. It is striking that students in the study felt empowered to express these feelings. Potentially, doing so signals psychological safety or that the students felt little risk in engaging in the learning environment. The observation led Naibert et al. to find that social interactions were perceived to influence student engagement.

Bernstein codifies academic social talk as a component of regulative discourse (Bernstein, 2000). That is, regulative discourse establishes behaviors that signify confidence in one's belonging in an academic space. Regulative discourse establishes ways of negotiating instructional discourse, the skills, and actions needed to demonstrate and acquire knowledge to benefit learners from the curricular activity. In line with this, on-task conversations are often viewed as those that lead to productive learning and cognitive engagement. On the other hand, off-task conversations are considered personal, non-productive, and disruptive to learning. Such dialog is not believed to have a direct connection to the desired learning outcomes. In cases where social dialog, or social talk, is not problematized, it is sanitized to activities deemed acceptable during class time. In an asynchronous chemistry course, for instance, social engagement was defined as group roles, restricting the engagement to achieving consensus during group discussions, processing information, and reporting results (Flener-Lovitt et al., 2020). Others focus on social interactions as a means of exchanging information relevant to the content (Repice et al., 2016; Sjølie et al., 2022). The work also highlights the need to understand better off-topic conversations in the success of the learning environment, more specifically, how it nurtures the social presence during class activities.

In line with this, Chen and Wang (2009, p. 588) offer the "paradox of the relationship between effective discussion and social talk". Several studies have pointed to the need for non-academic discourse that provides social relationships that enable group dynamics. These studies found a positive correlation between social and productive dialog. In the online environment, discussion threads with the most

off-task conversations produced the most constructive responses to the prompts. The observation reiterates that social interactions may promote a level of comfort that makes cognitive engagement possible. The researchers also noted that off-task conversations and periods of disengagement alerted faculty to the fact that the group or an individual may be experiencing difficulties. The warnings align with me off-task messages explaining and apologizing for extended absences. In the face-to-face context, this absence may appear as students consistently not speaking during class activities or being otherwise disengaged. It was also found that off-topic dialog facilitated negotiating and establishing power. Notably, group members expressed soft power when expressing frustration at not receiving a response from peers regarding a social post, suggesting a need to be socially and emotionally responsive to promote group cohesion. Students also wrote "ha-has" to conclude a thought (Chen and Wang, 2009). The written emotion could be compared to instances of in-person dialog when individuals laugh at the end of a response to express excitement, nervousness, or uncertainty. The work reported by Chen and Wang challenges us to gain a deeper understanding of the relationship between learning and social talk in both online and in-person learning environments.

3 Theoretical framework

3.1 Community of inquiry overview

The community of inquiry (CoI) model, based on a constructivist approach to learning, posits that the student learning experience is influenced by three presences (Garrison and Vaughan, 2008): (1) Cognitive presence, the extent to which the participants in any particular configuration of a community of inquiry can construct meaning through sustained communication; (2) Social presence, the ability of learners to project their characteristics into the community of inquiry, thereby presenting themselves as holistic beings; and (3) Teaching presence, the design, facilitation, and direction of cognitive and social processes

FIGURE 1
The Community of Inquiry Model shows the interconnection between teaching, cognitive, and social presences influence the overall educational experience (Wowly_Infographics, 2021).
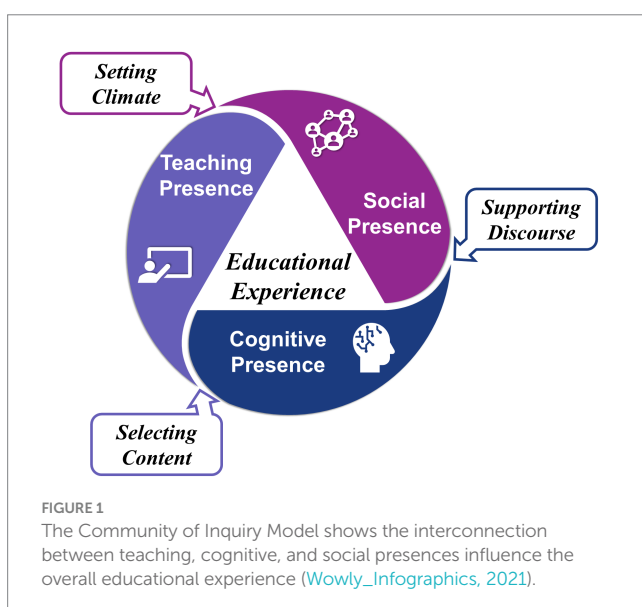
to realize personally significant and educationally worthwhile learning outcomes (Garrison et al., 1999; Garrison and Vaughan, 2008). The presences overlap and support the manner and extent to which students gather, discuss, and apply information through interactions with peers and the instructor. Therefore, the educational experience occurs at the center where each presence overlaps, Figure 1. The social and teaching presences intersect to establish the climate for learning, and the teaching and cognitive presences intersect to regulate learning through selecting content. The social and cognitive presences overlap to support meaningful communication or discourse. Although this framework was originally designed for online learning, the theory can be applied to understand self-regulated learning in the face-to-face context (Garrison and Vaughan, 2008; Smiley and Anderson, 2011; Hibbard et al., 2016; Fullilove et al., 2017; Winfield L. L. et al., 2019). In light of the multimodalities in self-regulated learning, the CoI offers opportunities to understand how individuals toggle between modalities (Guo et al., 2022). It has been proposed that the framework is a dynamic model where "constructivist approaches and community are necessary for creating and confirming meaning and are essential for achieving effective critical thinking" (Swan et al., 2009, p. 44).
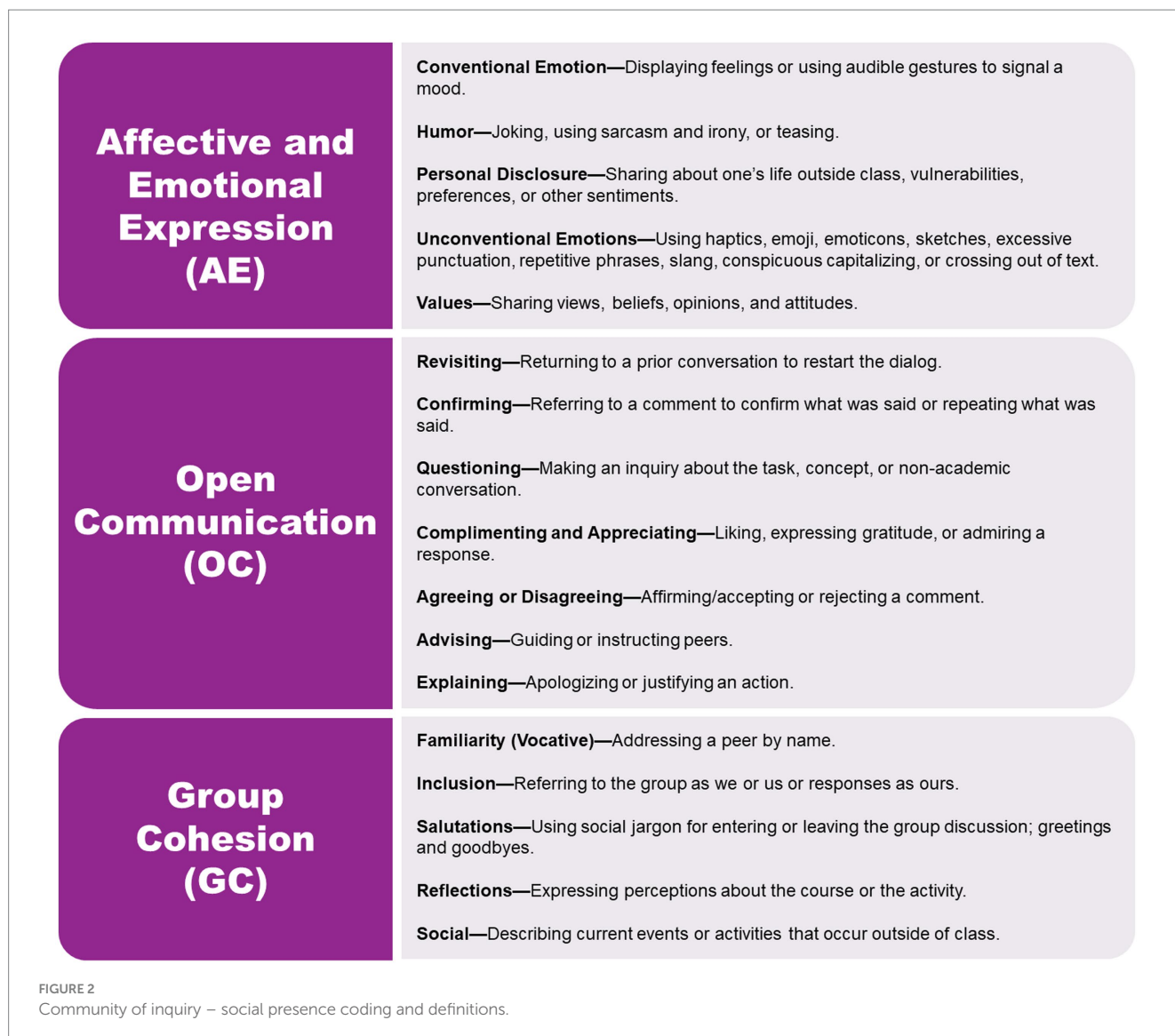
When analyzing the presences of CoI more closely, it is clear that engagement drives success in the environment (Pike et al., 2012). Researchers have found that a lack of engagement is responsible for high attrition rates in STEM disciplines (Gasiewski et al., 2012). Engagement is often thought of in behavioral terms, reflecting students' actions to participate in the learning process, such as attending class, reading the textbook, or discussing course grades (Smiley and Anderson, 2011; Davis et al., 2012). This and other types of engagement are essential to learning and promoting relational and cognitive dimensions of engagement. They can be mediated at the interface of the teaching and cognitive presences. With relational engagement, students demonstrate a value for interacting with various elements of the environment and exploit aspects in meaningful ways to advance their understanding of academic content.

Regarding the social presence component in CoI, relational engagement has implications for student-peer and student-teacher interactions. It also brings into question the students' reliance on resources provided by the instructor (Sanders et al., 2019, 2020). Cognitive engagement is multi-faceted, defined as "the student's psychological investment in an effort directed toward learning, understanding, or mastering the knowledge, skills, or crafts that academic work is intended to promote" (Lamborn et al., 1992, p. 12).

3.2 Social presence

Research has shown a relationship between social presence and retention in science (Richardson and Swan, 2003; Arbaugh and Benbunan-Finch, 2006; Akyol et al., 2009). The social presence of the CoI has been shown to impact student motivation, and participation, as well as satisfaction with the course and instructor. Garrison found that the participants must find the group interaction enjoyable to constructively contribute to activities taking place in groups (Garrison et al., 1999). Rourke

Affective and Emotional Expression (AE)

Conventional Emotion—Displaying feelings or using audible gestures to signal a mood.

Humor—Joking, using sarcasm and irony, or teasing.

Personal Disclosure—Sharing about one's life outside class, vulnerabilities, preferences, or other sentiments.

Unconventional Emotions—Using haptics, emoji, emoticons, sketches, excessive punctuation, repetitive phrases, slang, conspicuous capitalizing, or crossing out of text.

Values—Sharing views, beliefs, opinions, and attitudes.

Open Communication (OC)

Revisiting—Returning to a prior conversation to restart the dialog.

Confirming—Referring to a comment to confirm what was said or repeating what was said.

Questioning—Making an inquiry about the task, concept, or non-academic conversation.

Complimenting and Appreciating—Liking, expressing gratitude, or admiring a response.

Agreeing or Disagreeing—Affirming/accepting or rejecting a comment.

Advising—Guiding or instructing peers.

Explaining—Apologizing or justifying an action.

Group Cohesion (GC)

Familiarity (Vocative)—Addressing a peer by name.

Inclusion—Referring to the group as we or us or responses as ours.

Salutations—Using social jargon for entering or leaving the group discussion; greetings and goodbyes.

Reflections—Expressing perceptions about the course or the activity.

Social—Describing current events or activities that occur outside of class.

FIGURE 2
Community of inquiry – social presence coding and definitions.

and Anderson (2002) found that most students perceived environments with social communication as trusting, warm, friendly, disinhibited, and personal. Seven types of social expressions were delineated that corresponded to more positive ratings of the social climate. They comprised addressing others by name, complimenting, expressing appreciation, using the reply feature to post messages, expressing emotions, using humor, and salutations (Rourke and Anderson, 2002). Adding to this, Nippard and Murphy (2007) found that social presence occurred most often in the context of digressions that drew attention away from content delivery. Researchers argued the need for models that align the CoI with how individuals engage in the classroom, noting the relevance of emotional expression, open communication, and group cohesion categories in defining social presence (Lowenthal and Dunlap, 2014). Recently, researchers provided a more detailed description of social presence defining characteristics of affective and emotional expression, open communication, and group cohesion (Figure 2; Zou and Zhang, 2022). The current work uses the lens of social presence to examine course engagement for Black women in an organic

chemistry course. Further, as most work on self-regulated learning framed by the CoI has occurred online, work reported herein translates the framework to the in-person classroom to analyze the dialog among Black women.

4 Methodology

4.1 Participants

Convenience sampling was used to select the participants enrolled in a first-semester organic chemistry course. Groups were initially selected based on the sound quality of the recording and the visibility of groups on screen in the video. The study was completed at a women's historically black institution in the southeastern region of the United States. Reflecting the demographics of the institution, all participants identified as being of African descent, both single and mixed race. In prior work, the level of cognitive engagement was characterized based on the quality of student discourse (Ballard et al., 2023). Group

B was selected as all group members were actively engaged during both quizzes and had the highest quality cognitive dialog.

4.2 Course structure

The first semester organic chemistry course enrolled a maximum of 30 students. The course utilized blended learning, where students are exposed to the course content through reading and online lectures and engaged in small group activities and whole-class discussions during the face-to-face session. The first 10 min of the session were allotted for answering questions about topics previously covered. The instructor provided a mini-lecture (15 min) on concepts to be introduced and problems to be completed. The remaining 25 min were utilized to complete the problem sets. Problems not finished in class were assigned as homework and used as primers to begin the following class discussion.

4.3 Group quiz

Quizzes present a high-stakes opportunity, typically increasing students' commitment to performing at their best. There is a level of focus and engagement that comes with the stakes of the assessment that differs from that of typical group activities. In addition, the group quiz provides a shared sense of accountability while acknowledging everyone's rights and capacity to contribute. For this reason, dialog was examined for group quizzes instead of a lower-stakes group activity.

Groups consisted of 4–5 students. Four group quizzes were administered during the semester, a week before the exam. Students were given the topic before the quiz and expected to review relevant course materials. Students could not use the textbook or other resources during the group quiz. A mini lecture was not given on the day of the group quiz, allowing 50 min to set up and complete the assessment. Each quiz was structured to be completed in 30 min. Students were instructed to discuss each question aloud. They were also informed that the discussion, even mistakes, were as important as the solution. As described in the prior article, quiz prompts ranged in difficulty, aligning with Marzano's level of understanding (Marzano, 2001; Ballard et al., 2023).

4.4 Data collection and analysis

The classroom configuration consisted of six tables that seat up to 5 students. Each group was video and audio-recorded. The cameras were permanently mounted above each group and positioned at fixed angles throughout the recording. Student dialog was recorded for Quizzes 2 and 3. Audio from the recordings was transcribed and coded by two individuals using the definitions in Figure 2.

The dialog from the recordings was coded using the definitions in Figure 2. For affective and emotional expression (AE), conventional and unconventional expressions are written and

unwritten ways one displays feelings. The actions in the two subcategories could be vocal (e.g., a sigh when an answer is rejected), haptic (e.g., dramatizing the feeling or experience like a fist pump to display confidence in an answer), or emoticons (e.g., using sketches or symbols to describe the experience). Affective experiences are coded in subcategories that involve personal disclosures or talking about things that make a person human, not just a student, as well as sharing one's values or joking. When AE is a response to the task at hand, the social talk is academic. However, when AE is related to an off-topic conversation, the social talk is non-academic.

Likewise, open communication (OC) was coded as academic or non-academic social talk. In the academic sense, students can be seen returning to a previous comment (revisiting) or checking a response (confirming). For instance, a student might say, "Let us get back to question #3" for revisiting or "I think we are finished" for confirming. The examples would be considered academic social talk as the comments relate to the task but provide no relevant conceptual information. On the other hand, non-academic social talk related to revisiting and confirming may be "Girl, what happened at the party last night?" or "Wait, you did not go to the party," respectively.

Similarly, students may make academic or non-academic inquiries. Academic, social talk characterized as OC–questioning seeks additional information about tasks, comments, or conversations. Non-academic social talk in this subcategory may ask, "What did you do after the party," whereas academic social talk asks, "Are we missing any information in the answer." OC also contains actions that would align with influencing their peers' thoughts: complimenting, appreciating, agreeing, disagreeing, advising, and explaining. Again, these can be academic or non-academic expression depending on the context.

Finally, the social talk was coded as group cohesion (GC) when it related to the dialog that promoted or demonstrated group bonding. For instance, students expressed familiarity by calling a team member by name or other endearing term, e.g., girl. Bonded groups also used "we" to define the team as a unit. Such acknowledgments were coded in the inclusion subcategory under the GC category. Likewise, salutations that used social jargon when leaving and entering the group, e.g., "What's up" or "I'm out," were coded appropriately. Students' opinions about the course or the task were coded as reflections. Sharing news of current events was also coded as a form of GC under the subcategory of social. Note that GC–social differs from AE–personal disclosure in that the latter describes a situation in the student's life, and the former describes an event unrelated to the person. As with AE and OC, GC can be coded as academic or non-academic social talk, depending on the context connected to the dialog.

5 Positionality statement

The authors have experience working with undergraduate students majoring in STEM and participating in STEM-related co-curricular activities. Both authors identify as Black women. The first author (J.B.) was a graduate student at a Primarily White Institution (PWI) when the work was conducted. Her research is

focused on three areas: (1) designing and implementing K-12 outreach activities for the Biobus, (2) investigating the impact of group work in the Chemistry classroom, and (3) characterizing the agency of Black women in STEM. The corresponding author (L.W.) leads NSF-funded research to increase the participation and success of underrepresented groups in STEM and co-chairs the internal steering committee for the newly established Center of Excellence for Women of Color in STEM at Spelman College. Her research focuses on creating culturally relevant learning environments and characterizing the impact of such environments on student agency.

6 Results

Instances of dialog involving social talk are represented as a collection of connected speaking turns where speaking turns are marked each time a new student begins speaking. Each instance represents the beginning to end of the non-academic social talk, dialog irrelevant to the concepts and solutions to the quiz, or academic social talk, dialog related to the task. The instances of dialog are numbered and listed in the order in which they occur. Bracketed ellipses replaced inappropriate or derogatory language, […]. The code for each speaking turn is listed in parentheses following the speaking turn. Students in Group B were given pseudonyms of Brittany, Dawn, Farrah, and Jasmine. The instructor was given the pseudonym of Dr. Braxton.

6.1 Non-academic social talk from group quiz 2

6.1.1 Quiz 2 – instance 1

Group B appears collegial throughout the recording. After establishing a pace for answering questions, the group began social dialog approximately 10 min into the activity. However, Brittany interrupted Jasmine to alert the team that they were being recorded. The group members appeared unabashed about possible disclosures made in the recording. Overall, the conversation aligns with GC, focusing on a current event. Embedded in the conversation are elements of AE and OC.

> *Jasmine: Yesterday at work, a guy got arrested because he punched a cop. (GC-Social)*

> *Brittany points to the microphone to remind the group of the recording. (OC-Advising)*

> *Jasmine: Sorry. (AE-Humor)*

> *Farrah: I bet they be laughing when they review this stuff, hearing everything. (AE-Humor)*

6.1.2 Quiz 2 – instance 2

Group B continued to display affective and emotional expressions in the form of joking, showing emotion, and sarcasm during their on-task and off-task conversations. The group discussed recent news and its social justice implications for African Americans while waiting for the scribe to record the answer.

> *Dawn: No, what happened in California? (GC-Social)*

> *Brittany: In Vegas? (OC-Questioning)*

> *Dawn: Yeah, Vegas. (OC-Confirming)*

> *Brittany: It was a mass shooting. Fifty people died. (GC-Social)*

> *Dawn: Wow! (AE-Unconventional Emotion)*

> *Farrah: Wait, 50 people died? (OC-Questioning)*

> *Brittany: Yes. (OC-Confirming)*

> *Farrah: Oh my God! That's terrible. (AE-Unconventional Emotion)*

> *Brittany: Yeah, they tried to blame ISIS, but they were like, "Never mind. He didn't have any ties to the group. He's just a white guy." (GC-Social)*

> *Farrah: Wow! (AE-Unconventional Emotion)*

> *Brittany: And now they're trying to pull that whole "Oh, he had no criminal record. He was just troubled." (GC-Social)*

> *Farrah: Okay. (AE-Unconventional Emotion)*

> *Brittany: He's crazy and a hateful human being. (AE-Values)*

> *Farrah: Do they not notice that literally the majority of mass shootings that happen are committed by […]? Why? Why are they trying to ignore that? If you don't see people […] you know, going around shooting up schools like that. (AE-Unconventional Emotion)*

> *Brittany: […] don't do that. (AE-Values)*

> *Farrah: Who did Columbine? (OC-Questioning)*

6.1.3 Quiz 2 – instance 3

Brittany discussed a personal event with her group members. Affective and emotional expressions are observed as well. The aggression voiced in some statements is taken as lighthearted banter, given the body language and mood observed on the camera. Pseudonyms, i.e., Timothy, were used instead of the name for the friend who was mentioned.

> *Brittany: Oooo! I gotta tell y'all something. (AE-Unconventional Emotion)*

> *Brittany: On Friday, I went to my car to get some food with my friend. There was a piece of gum on my window. (GC-Social)*

> *Dawn: Wow. (AE-Unconventional Emotion)*

> *Brittany: I was like, "What trifling […] put some gum on my window!" (AE-Personal Disclosure)*

Dawn: That's messed up. (AE-Values)

Jasmine: I would sue all of […]. (AE-Values)

Brittany: It seemed like a move that a girl would do. (AE-Values)

Farrah: It does. (OC-Agreeing)

Jasmine: Maybe she wants Timothy. (AE-Values)

Jasmine: I'd have to beat, I'd fight everybody. (AE-Values)

Brittany: I told Timothy about it. He was like, "Whose man are you entertaining." (AE-Personal Disclosure)

Dawn: She wants your man. (AE-Values)

Brittany: That just made me upset all of Friday. (AE-Conventional Emotion)

Farrah: Were you able to get it off? (OC-Questioning)

Brittany: Yeah. It wasn't stuck on there. I took a receipt out of my purse to get it off, but it was still like soft. So, it must have happened like right before I came that day. (AE-Personal Disclosure)

Jasmine: Oh my God! (AE-Unconventional Emotion)

Britany: I was like […]. (AE-Unconventional Emotion)

Jasmine: If I ever caught somebody doing that, ooooohhh! (AE-Values)

Brittany: Ooooohhh! (AE-Unconventional Emotion)

Jasmine: A whole different side of Brittany. (GC-Familiarity)

Brittany: I'm throwing you off the 3rd floor. (AE-Humor)

6.2 Non-academic social talk from group quiz 3

6.2.1 Quiz 3 – instance 1

The first instance of social talk during Quiz 3 was primarily affective and emotional expression regarding a current event. The off-task conversations allowed group members to display vulnerabilities and fears. Within this instance of social talk, peer encouragement was evident when a group member reached a roadblock. The group discusses a recent event that happened near campus.

Brittany: Y'all, I woke up scared as […]! (AE-Personal Disclosure)

Farrah: Why? (OC-Questioning)

Brittany: Because I forgot about the demolition, and it had my dorm shaking, and I thought I was waking up to like an earthquake, and

I never experienced an earthquake. So, I was like about to cry. (GC-Social)

Farrah: I feel like I'm the only one that didn't hear it. (AE-Personal Disclosure)

Dawn: What demolition? I didn't hear […] (OC-Questioning)

Brittany: They blew up the old Georgia Dome, the football stadium. (GC-Social)

Dawn: I didn't know that. (GC-Social)

Britany: I will show you. It imploded, and it looks just like the Twin Towers. I'm a conspiracy theorist […] it. (GC-Social)

Dawn: I wish I was there to see it. (GC-Social)

Farrah: I don't know why I didn't hear it. Everyone else did. (OC-Explaining)

Brittany: It literally shook. (OC-Confirming)

6.2.2 Quiz 3 – instance 2

The second instance of social talk was also in the realm of affective and emotional expression. Jasmine discussed a personal event that happened outside of class.

Jasmine: I was so upset. We had a meeting on, um, Sunday, and it got in the way of my dad's birthday dinner, and everything that was in it could have been said in an email. So, I, first of all, had to drive 30 minutes to be like, "Oh yeah, this is kinda dumb, but it's mandatory […]." So, then put it in an email. (AE-Conventional Emotion)

6.2.3 Quiz 3 – instance 3

The affective and emotional expressions continue with group cohesion, encompassing the group members discussing singing.

Farrah: Dr. Braxton is Singing. (OC-Advising)

Brittany: Your little songs, like, keep me going. (OC-Complementing and Appreciating)

Farrah: I used to be in lab. She used to always ignore me, man. (AE-Personal Disclosure)

Brittany: I only sing in moments of distress, like when I can't find something or something. I just sing my feelings. (AE-Personal Disclosure)

Jasmine: I sing in my car. (AE-Personal Disclosure)

Brittany: Oh, I have full [unintelligible dialog] music videos in my car. (AE-Personal Disclosure)

Jasmine: Beyoncé in my car. (AE-Personal Disclosure)

Brittany: It's a movie. I got dance moves. (AE-Humor)

6.2.4 Quiz 3 – instance 4

The affective and emotional expressions continue, and Brittany shares personal medical information.

Brittany: (Clears throat) Sorry. This […]. I haven't been taking my allergy medication as fatefully as I should. (AE-Personal Disclosure)

Jasmine: You probably should (OC-Agreeing)

Brittany: So now I'm sick […], but not even sick because I'm not sick. It's just allergies. Every time I step outside, I feel like death. (AE-Personal Disclosure)

6.3 Academic social talk from group quiz 2

6.3.1 Quiz 2 – instance 1

The group members displayed open communication (OC) using an artistic references. Brittany and Farrah complimented Jasmine on her organic chemistry structures. Jasmine related Jasmine's artistry to the Mexican artist Frida Kahlo. Humor was also evident in the conversation.

Brittany: You're actually doing quite well, Jasmine! (OC-Complimenting and Appreciating/GC-Familiarity)

Farrah: You are. That's amazing! (OC-Complimenting and Appreciating)

Jasmine: The next Frida Kahlo. (OC-Complimenting and Appreciating)

Brittany: Sure, all you need is Diego Rivera, and you will be fine. (AE-Humor)

Jasmine: And a unibrow. (AE-Humor).

6.3.2 Quiz 2 – instance 2

Social talk could also be glimpsed in dialog directly related to the quiz prompts. For instance, a student would read the prompt and exclaim, "Oooh" or "I got it," expressing a conventional emotion. Also, in academic dialog, group members addressed one another by name when they needed help, reflecting GC-Familiarity. Academic dialog attempts to address the concept by affirming, correcting, or expanding information related to the problem being solved. In the prompt, students work on confirming heptane. Sarcasm and joking can be seen throughout the prompt.

Jasmine: It's three mountains, yes? (OC-Questioning)

Brittany: Whatever floats your boat! (AE-Humor)

Brittany: So, by C-3, C-4, do they mean carbons 3 and 4? Which way we counting from, though? (OC-Questioning)

Farrah: It doesn't matter. Either way. It should be the same, same amount of distance. (OC-Confirming)

Brittany: You're right. (OC-Agreeing)

Jasmine: See, it's three mountains! (OC-Advising)

Brittany: Yes, Shelby, three mountains. (OC-Agreeing)

Jasmine: I'm a whole child. (AE-Humor)

Brittany: At least you don't have a whole child. (AE-Humor)

6.4 Academic social talk from group quiz 3

6.4.1 Quiz 3 – instance 1

The artistic reference from Quiz 2 – Instance 1 returns. Given the attention to structure drawing in the first-semester organic chemistry course, it is notable that students admire their peers' work and understand the skill it takes to draw structures. Jasmine shared her feelings about her drawings in two separate conversations with Brittany. The former Frida Kahlo reference has become their inside joke. In a separate but related instance, Jasmine becomes critical of the work in Quiz 3 – Instance 1b. Her frustration leads her to erase the response, and she expresses that the drawing is less impressive than the previous one. She believes the drawing is ugly, although her peers disagree.

Quiz 3 – Instance 1a

Jasmine: I'm an artist. (OC-Complimenting and Appreciating)

Brittany: Picasso over there. (OC-Complimenting and Appreciating)

Jasmine: Truly Frida Kahlo. (OC-Complimenting and Appreciating)

Quiz 3 – Instance 1b

Jasmine: Okay, I'll just erase the whole thing. (OC-Disagreeing)

Brittany: No, we don't have the time. And what do you do? You erase it. (OC-Disagreeing)

Jasmine: Because it was ugly, and it was just making me very self-conscious. (OC-Explaining)

Brittany: How does a structure make you self-conscious? (OC-Questioning)

Jasmine: Because I just want it to look pretty, and it just didn't look pretty at all. (AE-Values)

6.4.2 Quiz 3 – instance 2

The social talk was also evident when the group engaged the faculty. The instances illustrate how teaching presence can inspire social presence and how the two intertwine to facilitate dialog. In this instance, students are attempting to form a stronger nucleophile in the nucleophilic addition reaction.

> *Instructor: What's gonna leave?*
>
> *Farrah: The OH? (OC-Questioning)*
>
> *Instructor: Not the whole OH, just the hydrogen.*
>
> *Farrah: Just the H leaves. Oooohhhhh! (AE-Unconventional Emotion)*
>
> *Instructor: That's the acidic hydrogen, right?*
>
> *Farrah: OH. Hold on, hold on! Got something working here. Cooking something up. (AE-Humor)*
>
> *Brittany: Okay, what's cooking? Good looking. (Laughs) (AE-Humor)*

6.4.3 Quiz 3 – instance 3

The instructor leaves the group. After about 20 lines of dialog, the group returns to the instructor with a question. In the response, analogies and gestures related to running are used. Specifically, the instructor is representing conventional emotions by using gestures.

> *Instructor: Take that information and run with it. (moving hands in a swooshing motion)*
>
> *Brittany: But this has to attack somewhere, so it just becomes OH again? (OC-Questioning)*
>
> *Instructor: Un un. Just come on, run with it, and make it negative. (pumping arms in a jogging motion)*
>
> *Brittany: I'm jogging. I can't run. (AE-Humor)*
>
> *Instructor: Pick up the pace.*
>
> *Brittany: I'm jogging. (AE-Humor).*

6.4.4 Quiz 3 – instance 4

After considering the prompt, the group finalizes the solution while expressing open communication, returning to the instructor's words to encourage one another.

> *Farrah: We gone do that. We just gone… (Brittany interrupts) (OC-Revisiting and OC-Advising)*
>
> *Brittany: We just gone run? (OC-Questioning)*
>
> *Farrah: We gone run with it. (OC-Agreeing)*

6.5 Social presence summary

During the quizzes, Group B employed various forms of social talk that aligned with the social presence of the CoI. The social talk reflected both academic and non-academic dialog. There were 97 total speaking terms, defined by the change of speakers, in the dialog for Quiz 2 and 3.

The non-academic social talk represented 66% of the total speaking turns, Figure 3. The relative breakdown of the components of non-academic social talk showed that AE was represented at 59.4%. Within AE, conventional emotions comprised 52.6% of the social talk, with personal disclosures, unconventional emotions, and values displayed at comparable rates. GC and OE represented 17.2 and 23.4%, respectively. Social talk within OC spanned the associated subcategories, with questioning being the largest subcategory, representing 37.5%. Social talk within GC only aligned with social at 91.7% and familiarity at 8.3%.
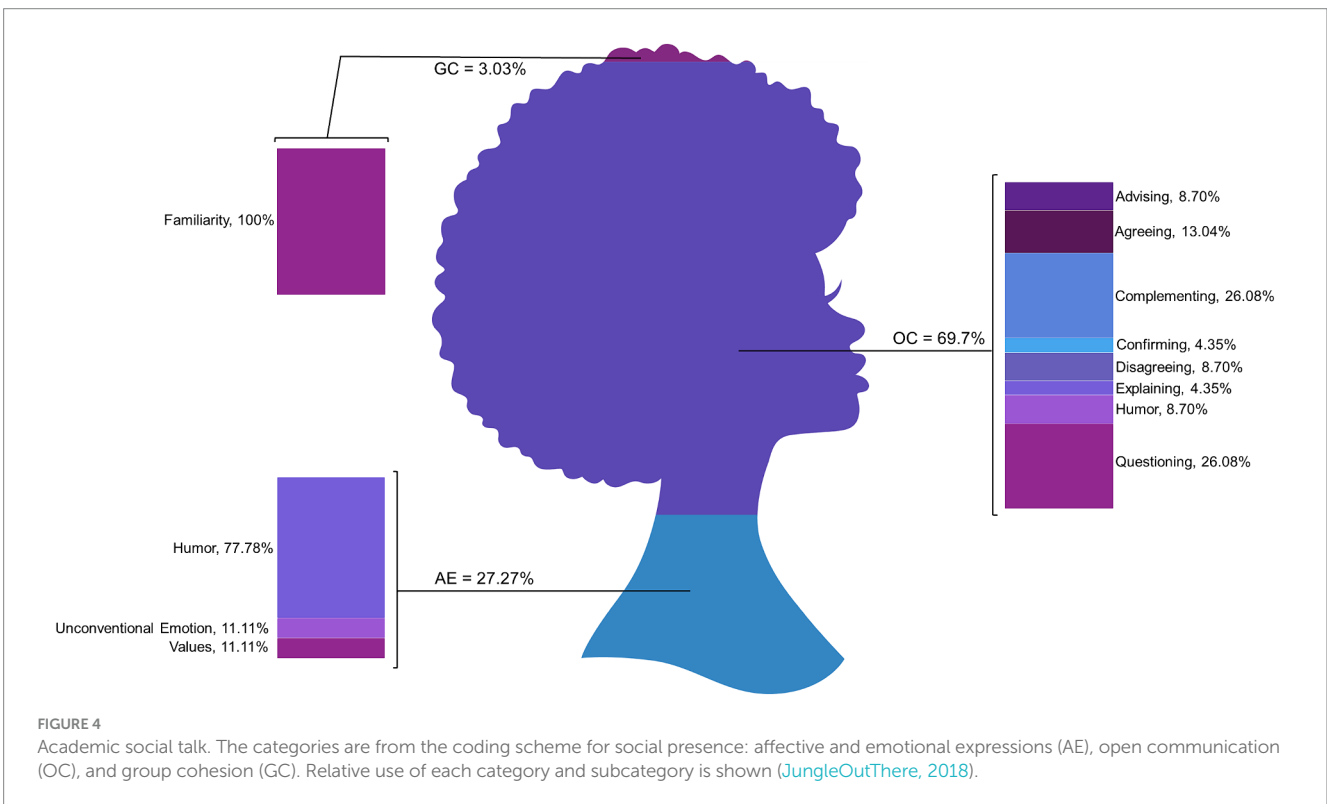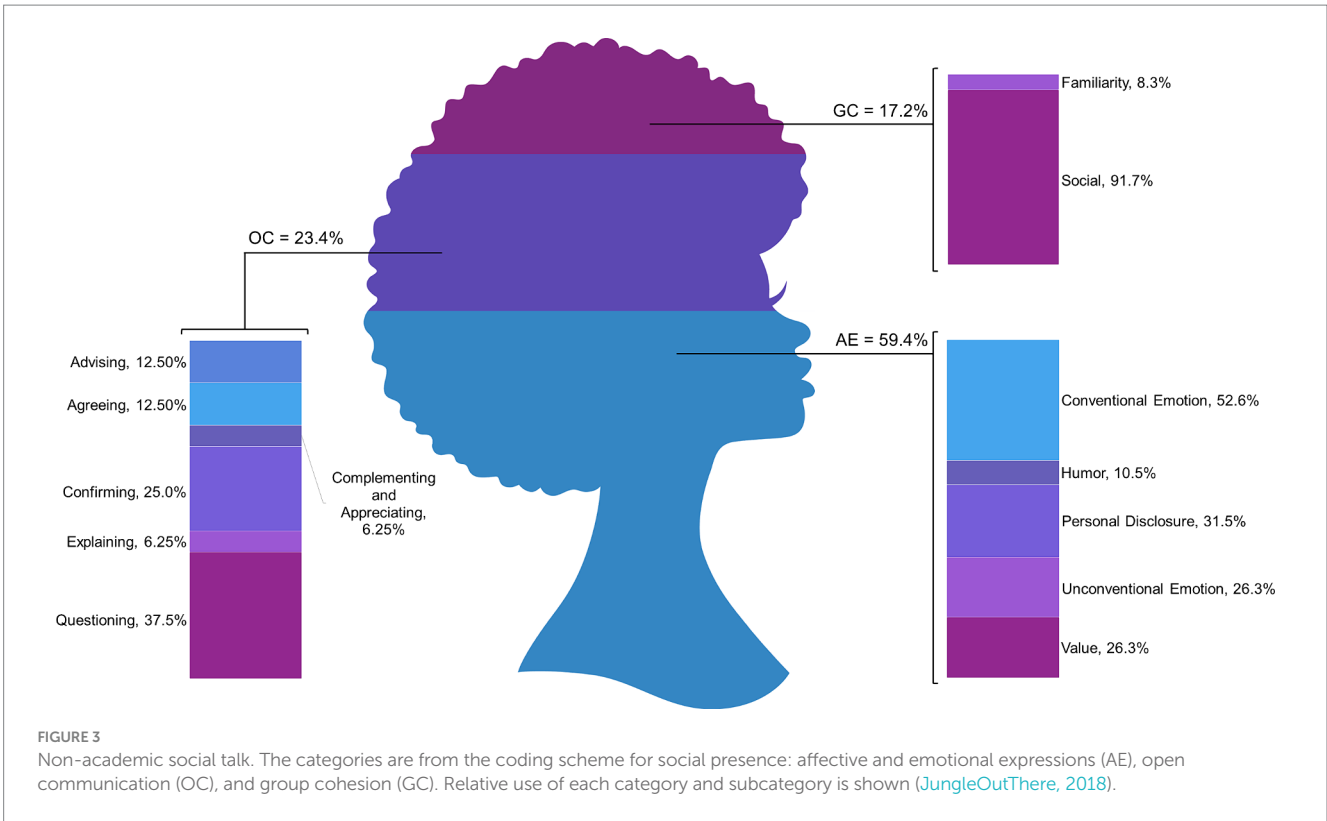
The academic social talk observed the most during the group quiz was OC at 69.7%, Figure 4. All subcategories of OC were represented, but complementing and questioning equally dominated dialog of this type. AE was modestly displayed at 27.27%, and GC only occurred in 3.03% of the dialog. Only three subcategories of AE were evident, with humor dominating at 77.78%. Of the five subcategories of GC, familiarity was the only subcategory present during academic social talk.

7 Discussion

The current work focuses on social presence, particularly social talk that promotes AE, OC, and GC. The group quizzes were recorded to visualize engagement in the CoI. The goal of this work was not only to learn how students engage but also to understand how peers influenced their teammates during collaborative activities. Group B was featured in previous work and was selected based on having the highest level of constructive and interactive dialog during the cognitive phase. In addition, all group members were consistently engaged across both group quizzes.

Group B demonstrated elements of social presence during the group quizzes. Early in the dialog, the group displayed little concern about what faculty might hear in the recording, demonstrating another level of comfort. In Quiz 2, the social talk began as group cohesion and evolved to open communication before moving to the risker conversation, where a personal disclosure was made. The order suggests that the group builds or re-establishes rapport before sharing non-academic commentary. Quiz 3, however, began with affective and emotional expression, indicating that sustaining the group configuration allowed trust to be present at the beginning of the succeeding quiz.

The non-academic social talk included joking, showing emotion, and sharing personal information during their conversations. The level of comfort and cohesion among group members was evident as a group member discussed being sick, another expressed fear over being awakened suddenly by a loud noise, and a third described her frustration over having her car defaced. Students shared emotions about headline news and personal affairs, addressing social justice

FIGURE 3
Non-academic social talk. The categories are from the coding scheme for social presence: affective and emotional expressions (AE), open communication (OC), and group cohesion (GC). Relative use of each category and subcategory is shown (JungleOutThere, 2018).

FIGURE 4
Academic social talk. The categories are from the coding scheme for social presence: affective and emotional expressions (AE), open communication (OC), and group cohesion (GC). Relative use of each category and subcategory is shown (JungleOutThere, 2018).

issues related to an incident in Las Vegas while waiting for the scribe to record the answer. During this instance, they also grappled with racial issues and stereotypes related to the incident.

The group used academic social talk to make meaning of both conceptual aspects of the work and to affirm group members' efforts. The instances provide a fascinating lens into students'

excitement and dread for the activity. When the instructor encouraged the group by asking them to "run with it," Brittany responded, "I'm jogging. I cannot run" (Quiz 3 – Instance 3). The groups later used humor to cope with anxiety and recover from mistakes in Quiz 3 – Instance 4. Farrah joked about the bond-line model of heptane and compared it to mountains in Quiz 2 – Instance 2, "See, it's three mountains!" also reflecting academic social talk. Such sentiments will be probed deeper in future studies to increase understanding of the link between the commentary and how peers use dialog to support risk-taking and ensure each member can speak freely during group work.

Although the full transcript is not published here, it is interesting to note where the social talk occurs. Group B engaged in a significant amount of social talk, with these instances happening at a point in the dialog representing a routine break-in cognitive engagement, i.e., at the end of the prompt. It appears to be an intentional "exhale" or the group's way of recovering from one prompt before proceeding to the next. Again, students moved in and out of social talk without fearing judgment. Findings suggest that even off-topic conversations contribute to comfort, vulnerability, and bonding among group members. This behavior was reflected in questioning, explaining, and agreeing/disagreeing dialog.

In summary, AE dominated the dialog during non-academic social talk. In this display of engagement, students showed their emotions, expressed sociopolitical views, and demonstrated a level of comfort with their peers. Within academic social talk, OC dominated. The dialog was related to students questioning solutions and affirming their approach to the task. Therefore, while non-academic social talk was operationalized to establish and sustain rapport, academic social talk demonstrated comfort with the task and validation for progress made. Overall, the work gives language to what is observed in CoI's social presence. The language can broaden the understanding of environments that foster students' social presence, particularly for Black women.

8 Recommendations

A lack of risk-taking and perceived safety in exchanging thoughts and ideas inhibits learning (Chen and Wang, 2009). Faculty must be mindful of things that may threaten, inhibit, or induce trepidation when encouraging student participation in group activities. Encouraging social talk to acknowledge its role in learning might be a way to increase engagement with these activities. Although this work is exploratory, it gives a glimpse into the easy flow of conversation needed to establish a social presence. Faculty should leave room for group members to establish rapport through social talk. Also, in redirecting groups that appear to be entirely off task, it is important to reinforce their belief in students' ability to do the work versus launching into a rebuke that may promote a fear of consequence. The latter could inadvertently lessen students' sense of comfort with sharing information in the classroom environment. When possible, let them do what they proverbially do. Today's students have a learning rhythm that is not fully understood. What was once believed to be the antithesis of learning could enable the community and social platform needed for cognitive engagement.

9 Limitations

The study reflects observations of one group in one section of an organic chemistry course at a given institution. Using only one group prevents comparing groups at different cognitive engagement levels and comparing the social talk of groups with similar levels of cognitive engagement. Nevertheless, we provide preliminary evidence of social presence based on social talk. Future work will examine the impact of teaching presence on social presence and characterize additional instances of social presence.

Data availability statement

The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving humans were approved by Spelman College and Georgia State University Institutional Review Boards. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent for participation in this study and for the publication of any potentially/indirectly identifying information published in the article.

Author contributions

JB: Conceptualization, Formal analysis, Methodology, Writing – original draft. LW: Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Project administration, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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