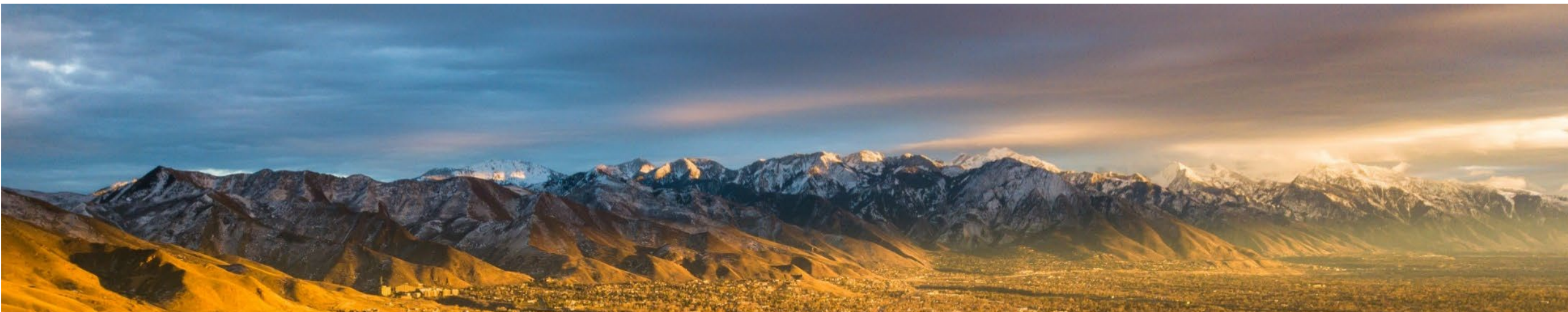


What characteristics do students use in describing their course-level social belonging?

Gina Frey
University of Utah



Social Identity

- **Social Identity**: self-concept derived from membership in social groups (Tajfel & Turner et al., 1979)
 - Age, ability, ethnicity, first language, gender, national origin, race, religion, sexual orientation, socio-economic status...
- Individuals' multiple identities are salient in different contexts, can intersect/interact in complex ways
- **Identity threat**: when individuals fear their treatment will be contingent on one of their social identities (Steele, Spencer, Aronson, 2002; Walton, Murphy, Ryan, 2015)

3-minute Discussion with your Neighbor

- What are some identities that you have?
- What identities of yours are salient in your teaching or professional life?
- How might these identities affect your course and your teaching (or your interactions in your professional life)?

Theoretical Framework – Constructs and Models

Social Belonging:

Sense of Belonging (SB): One's perception of social connections within a social setting (e.g. a course/classroom); *"Do I belong in this course?"*

Belonging Uncertainty (BU): A student's level of confidence in their social connections in an academic setting and their perception of their own academic ability. *"Do people like me belong in this course?"*


Identity Engagement Model: Identity engaged → Heightened awareness of situational cues → Cues interpreted as confirmation of identity-based threat → Lowered performance → Identity engaged → ...

Mechanism for social belonging on performance: Supportive classroom environment → Sense of belonging → Motivation → Engagement in academic activities → achievement


1. Cohen, G. L.; Garcia, J. Identity, Belonging, and Achievement: A Model, Interventions, Implications. *Curr. Dir. Psychol. Sci.* **2008**, 17 (6), 365–369. <https://doi.org/10.1111/j.1467-8721.2008.00607.x>.
2. Cohen, G.; Garcia, J.; Purdie-Vaughns, V.; Apfel, N.; Brzustoski, P., Recursive Processes in Self-Affirmation: Intervening to Close the Minority Achievement Gap. *Science*. **2009** 324, 400. 10.1126/science.1170769.
3. Fink, A.; Frey, R. F.; Solomon, E. D., Belonging in general chemistry predicts first-year undergraduates' performance and attrition. *Chem. Educ. Res. Pract* **2020**,10.1039/d0rp00053a.
4. Walton, G. M.; Cohen, G. L., A question of belonging: race, social fit, and achievement. *Journal of Personality and Social Psychology* **2007**, 92 (1), 82-96,10.1037/0022-3514.92.1.82.
5. Walton, G. M.; Cohen, G. L., A brief social-belonging intervention improves academic and health outcomes of minority students. *Science* **2011**, 331 (6023), 1447-51,10.1126/science.1198364.
6. Zumbrunn, S., McKim, C., Buhs, E., & Hawley, L. R. (2014). Support, belonging, motivation, and engagement in the college classroom: A mixed method study. *Instructional Science*, 42, 661-684.

Adapted course-level belonging measures

Sense of belonging (SB)

- 
- I feel like I fit in General Chemistry.
 - I feel comfortable with my peers and classmates in General Chemistry.
 - I feel comfortable with my professors in General Chemistry.
 - Setting aside my performance in class, I feel like I belong in General Chemistry.

Belonging Uncertainty (BU)

- 
- I feel uncertain about my belonging in General Chemistry (i.e., sometimes I feel that I belong, sometimes I don't)
 - When I don't perform well, I feel like maybe I don't belong in General Chemistry.

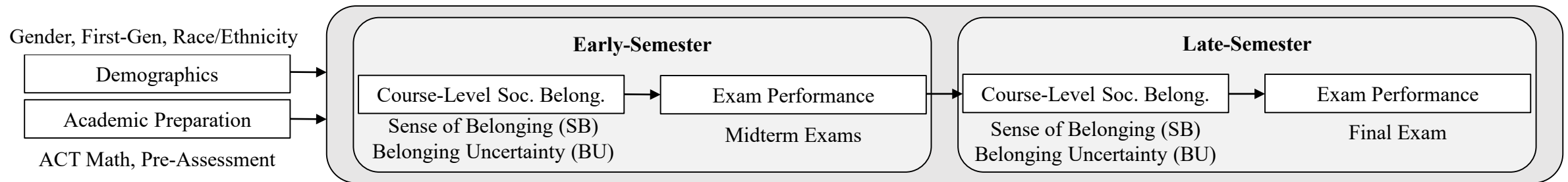
Strongly Disagree	Disagree	Mildly Disagree	Mildly Agree	Agree	Strongly Agree
1	2	3	4	5	6

Adapted: Both scales, Fink et al (2020); People in General Chemistry are a lot like me.

SB original: (London et al., 2013; Walton & Cohen, 2007, 2011); BU original (Walton & Cohen, 2011)

Prior/Current Studies

- General Chemistry 1
 - Private highly selective research-intensive institution
 - Public land-grant research-intensive institution
- Persistence to General Chemistry 2
 - Private highly selective research-intensive institution
 - Public land-grant research-intensive institution
- Organic Chemistry 1 and 2:
 - Public land-grant research-intensive institution
- Introductory Physics 1:
 - Public land-grant research-intensive institution
- Introductory Biology:
 - Community College

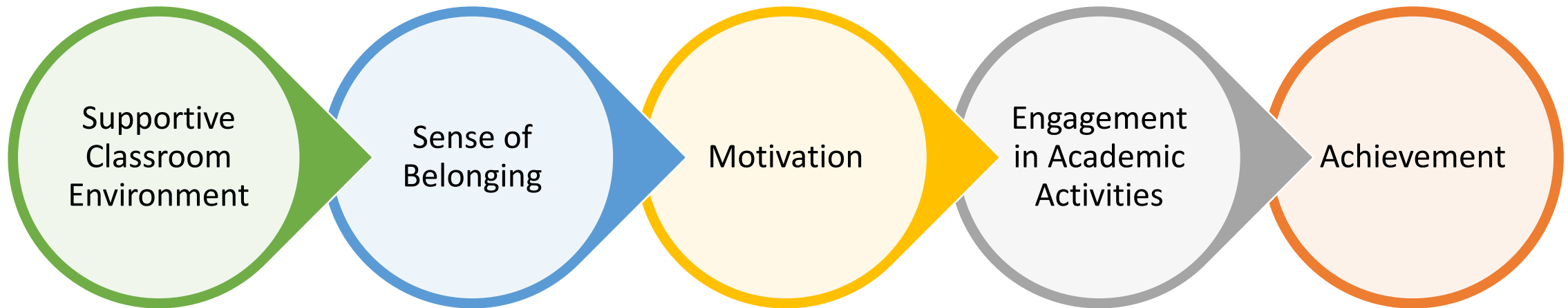


Prior Studies: Belonging

- Effect of Demographics (gender, race and ethnicity, first-generation status)
 - Gender difference in SB and/or BU in early and late semester in all courses
- Effect on Performance
 - SB/BU affects exam performance in all courses for all students
 - Above content pre-knowledge or ACT/SAT scores and, in one case, peer-led collaborative approach (PLTL)
 - Recursive process seen in GC1 and Introductory Biology
 - Above content pre-knowledge, BU affects early exam performance which affects late SB/BU which affects final exam score (SB only)
- Effect on Persistence in General Chemistry series
 - Late semester GC1 Sense of Belonging affects continuing to GC2 (in one case)
 - Above content pre-knowledge and PLTL and GC1 exam performance
 - For women in the B+/B/B- GC1 range, late semester BU may deter them from continuing onto GC2 (in another case)

Ref: Fink et al., 2020; Edwards et al., 2022; Edwards et al., 2022 (physics); Edwards et al. (2023)

Why might belonging affect performance (one current model; not yet studied in science, math, and engineering)?



So, what are students thinking when they answer these questions?

Sense of belonging (SB)

- I feel like I fit in General Chemistry.
- I feel comfortable with my peers and classmates in General Chemistry.
- I feel comfortable with my professors in General Chemistry.
- Setting aside my performance in class, I feel like I belong in General Chemistry.

Belonging Uncertainty (BU)

- I feel uncertain about my belonging in General Chemistry (i.e., sometimes I feel that I belong, sometimes I don't)
- When I don't perform well, I feel like maybe I don't belong in General Chemistry.

Adapted: Both scales, Fink et al (2020); People in General Chemistry are a lot like me.

SB original: (London et al., 2013; Walton & Cohen, 2007, 2011); BU original (Walton & Cohen, 2011)

Setting

- Public land-grant research-intensive institution
- Large General Chemistry 1 course with multiple sections taught as a single section (N = 800-900)
 - Multiple instructors
 - Sections have same homework, quizzes, exams, syllabi, and all students are graded commonly with same absolute grading scale
 - Conducted during the Pandemic (fall 2020)
 - Asynchronous lecture videos with synchronous problem-solving sessions using breakout rooms
- Organic Chemistry 2 course (N=200)
 - One section; In-person (not during pandemic)

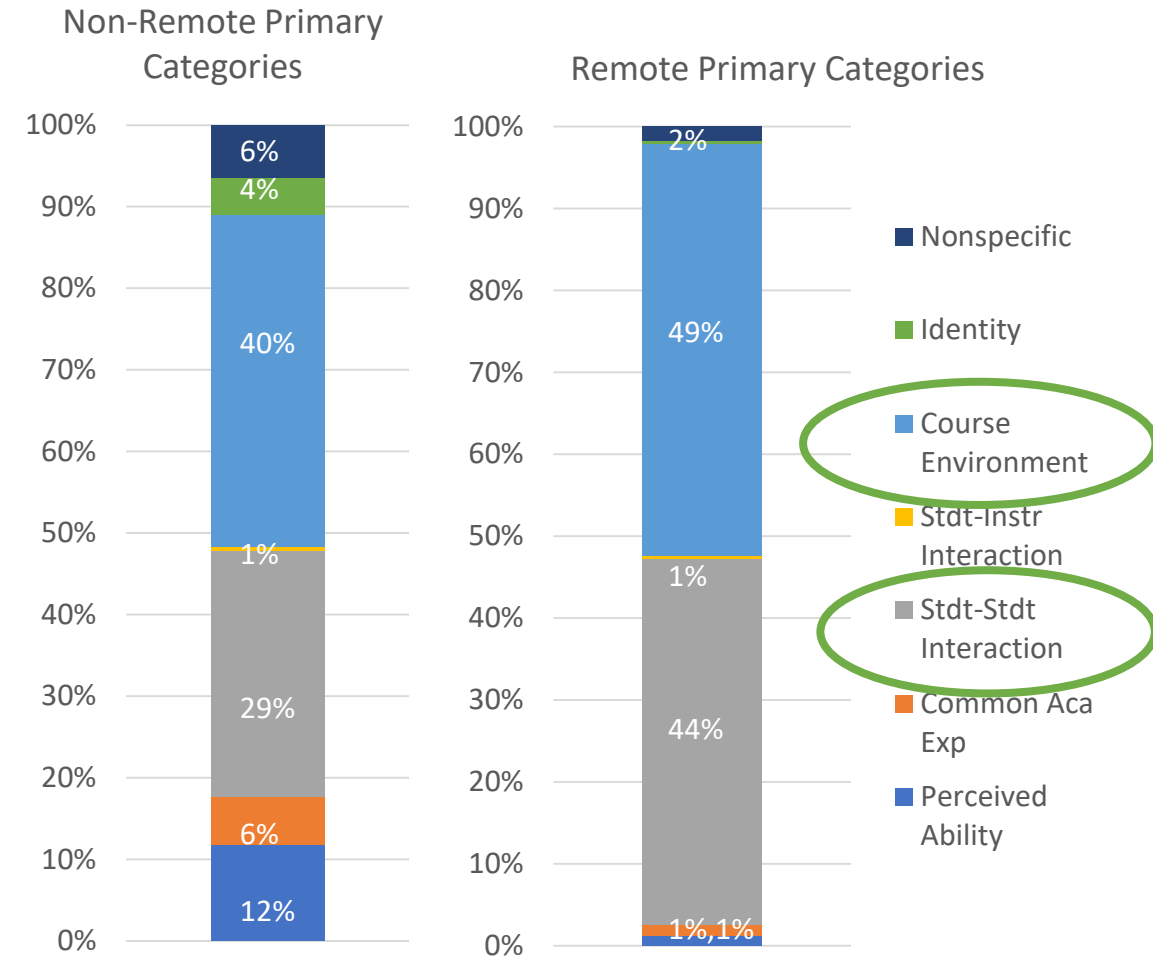
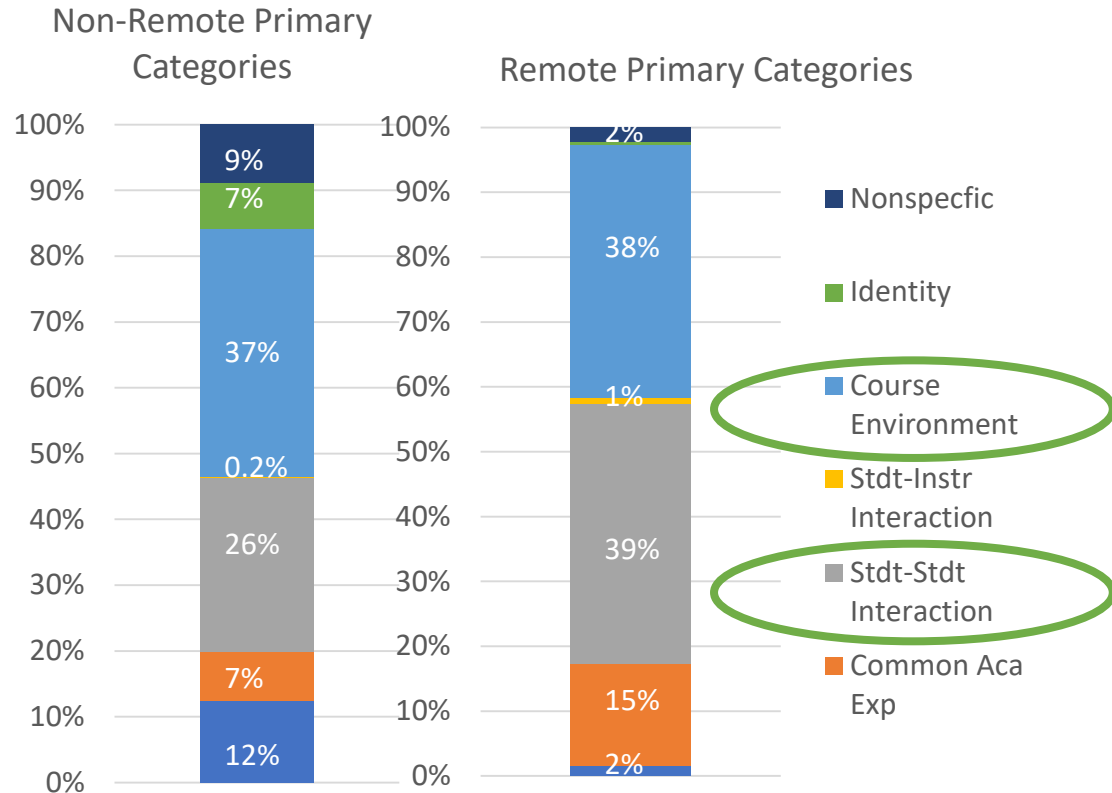
Sense of Belonging -Comfortable with Peers and Classmates

Primary Category	Definition	Example Quotes
Common Academic Experience	Describes having a similar education experience in the course	"I don't feel like I stand out in it, as there are many others who are new to the course and the ideas that are being expressed there."
Perceived Ability	individual perception of their ability to succeed in the course in comparison to their peers or to a perceived academic standard.	"I feel like the students are all at different levels of knowledge, some know a great deal about chemistry, others don't know much at all."
Student-Student Interactions	level of forming a connection or interacting with other students	"... I know they would always be willing to help if needed."
Student-Instructor Interactions	Ways in which the instructor encouraged participation and instructor's ability to facilitate effective learning	"..Professors have been highly communicative; no worries so far!"
Course Environment	presence or absence of a learning environment that is respectful, accepting, engaging, welcoming, safe, supportive, and nondiscriminatory.	"I feel comfortable with my peers because my professors make it feel like a safe environment."
Identity	Reference their individual demographic identity (e.g., gender, race, age, ethnicity), academic identity (e.g., major, interests, career), or personality traits, sometimes compared to other students.	"I have a shy personality so it takes me a little be to feel comfortable around/with my peers."
Non-Specific	Students describe comfort level using no specific details	"I have had no reason to feel uncomfortable"

Frequencies for Comfortable with Peers (Gen Chem 1)

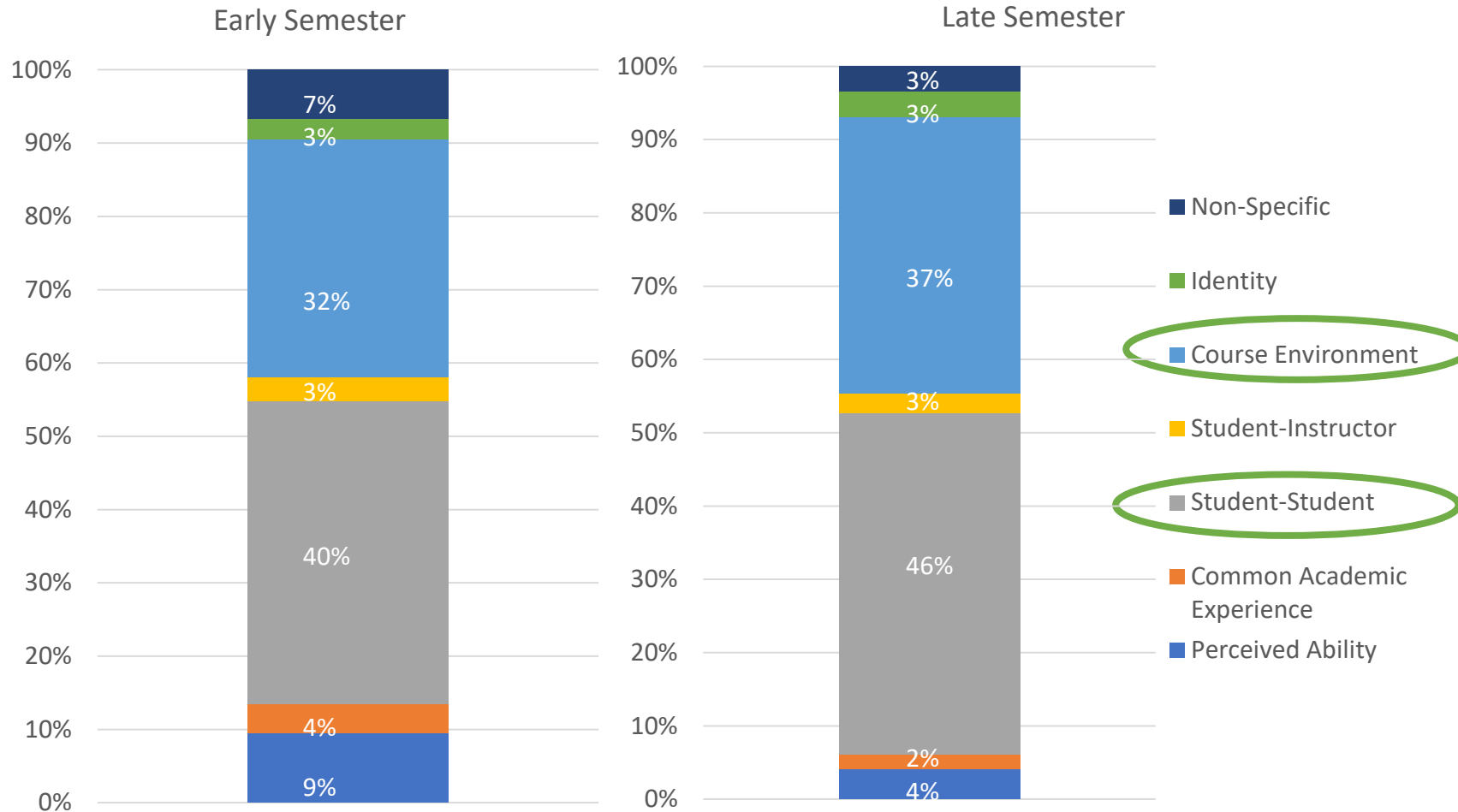
Late semester

Early semester



Frequencies for Comfortable with Peers

Organic 2 (fully in-person; spring 2022)



Sense of Belonging -Comfortable with Peers and Classmates

Primary Category	Definition	Example Quotes
Common Academic Experience	Describes having a similar education experience in the course	"I don't feel like I stand out in it, as there are many others who are new to the course and the ideas that are being expressed there."
Perceived Ability	individual perception of their ability to succeed in the course in comparison to their peers or to a perceived academic standard.	"I feel like the students are all at different levels of knowledge, some know a great deal about chemistry, others don't know much at all."
Student-Student Interactions	level of forming a connection or interacting with other students	"... I know they would always be willing to help if needed."
Student-Instructor Interactions	Ways in which the instructor encouraged participation and instructor's ability to facilitate effective learning	"..Professors have been highly communicative; no worries so far!"
Course Environment	presence or absence of a learning environment that is respectful, accepting, engaging, welcoming, safe, supportive, and nondiscriminatory.	"I feel comfortable with my peers because my professors make it feel like a safe environment."
Identity	Reference their individual demographic identity (e.g., gender, race, age, ethnicity), academic identity (e.g., major, interests, career), or personality traits, sometimes compared to other students.	"I have a shy personality so it takes me a little be to feel comfortable around/with my peers."
Non-Specific	Students describe comfort level using no specific details	"I have had no reason to feel uncomfortable"

Sense of Belonging - Comfortable with My Professor

Primary Category	Definition	Example Quotes
Course Structure	Instructor's communication ability/frequency, organization of materials, course/grading policies	"... He also provides several resources and is organized in the structure of the course."
Human Aspect of Teaching	Instructor's personality, approachability, professionalism, welcoming, positive/negative/no connection	"They seem very welcoming and approachable."
Perception of Instructor Knowledge	Instructor's course content knowledge	"Professor XX seems very knowledgeable about chemistry "
Perception of Instructor's Teaching Practices	Instructor's capability as a teacher, their passion and enthusiasm for teaching and student learning, ability to explain material	"My instructor invites questions and is good at simplifying material"
Course Environment	Instructor's ability/willingness to create a learning environment that is respectful, accepting, engaging, welcoming, safe, supportive, and nondiscriminatory.	"My instructor made me feel comfortable and safe enough to ask questions without feeling discouraged."
Identity	Student response references an identity of their own (could also include personality traits such as anxiety)	"I feel somewhat nervous to ask questions in a male-dominated field."
Non-Specific	Students describe comfort level using no specific details	"I have not had a bad nor good experience."

Belonging Uncertainty – Sometimes Yes, Sometimes No

Primary Category	Definition	Example Quotes
Course Environment	Presence or absence of a learning environment that is respectful, accepting, engaging, welcoming, safe, and supportive.	"I can feel the enthusiasm in the class, and instructor tried to make everybody participate in."
Course Structure	Discusses the organization of the course and the ease (or lack of) understanding deadlines, finding material, etc.	"Still trying to get set up in the class, and understand the scheduling and everything"
Std-Inst Relationship	Instructor's ability to facilitate effective learning, their attitude, skills, or competency. Instructors enthusiasm and efforts to increase participation.	"I can feel the enthusiasm in the class, and instructor tried to make everybody participate"
Std-Std Relationship	Addresses the attitudes, actions, or interactions between students, including approachability of other students.	"I struggle to make friends with people in person in class because it's a place where I am predisposed to being more quiet...lecture halls are usually jam-packed and I don't like sitting that close to others"
Identity	Student response references an identity of their own (could also include personality traits such as anxiety)	"I am a non-traditional student"
Perceived ability	Addresses the individual's perception of their own ability to succeed in the course.	"when I struggle to understand a topic, all those insecurities of maybe not belonging in this class come back."

Belonging Uncertainty – Sometimes Yes, Sometimes No

Primary Category	Definition	Example Quotes
Chemistry Value	Discusses inherent value of taking the course for reasons such as it being a pre-requisite, fun or interesting to learn for the individual, or useful to know in general. May also address the future career, field, or aspirations.	“This course has helped me see the practicality of chemistry in my life and major, which disconnect is hard to bridge.”
Non-Specific	Students describe comfort level with no specifics	“I feel as if I belong”

Summary

- Common categories in all three questions
 - Course Structure
 - Course Environment
 - Identity
- Common Categories in the Student questions (i.e., Comfortableness and Belonging Uncertainty)
 - Std-Std Interactions
 - Perceived Ability
 - Std-Instructor Interactions
- Comfortable with Professor question
 - Human Aspect of Teaching
 - Teaching Practices
- Belonging Uncertainty question
 - Chemistry value
- Organic Chemistry 2 students describe their comfortableness with their peers and comfortableness with their professor using the same characteristics (i.e., categories) as General Chemistry 1 students

Frequency Summary

- Top two categories for Comfortableness with Peers
 - Course Environment
 - Presence or absence of a learning environment that is respectful, accepting, engaging, welcoming, safe, and supportive.
 - Student-Student Interactions
 - level of forming a connection or interacting with other students
- Top two categories for Comfortableness with Professor
 - Course Environment
 - Instructor's ability/willingness to create a learning environment that is respectful, accepting, engaging, welcoming, safe, supportive, and nondiscriminatory.
 - Human Aspect of Teaching
 - Instructor's personality, approachability, professionalism, welcoming, positive/negative/no connection
- Top two categories for Belonging Uncertainty
 - Course Environment
 - Presence or absence of a learning environment that is respectful, accepting, engaging, welcoming, safe, and supportive.
 - Perceived Ability
 - Addresses the individual's perception of their own ability to succeed in the course.

Group members and Collaborators

Group Members on Project

- Graduate Students
 - Vanessa Bustamante
 - Hector Torres
- Undergraduate Researchers
 - Bricia Hendry
 - Kass Johnson
 - Becca MacGillvray
 - Maria Munoz
 - Jessica Pike
 - Ray Quintus-Bosz
 - Olivia Schmitz
 - Jocelyn Tucker
 - Josie Valerius



Collaborators on this Project

- Center for Integrative Research on Cognition, Learning, and Education (CIRCLE; Washington University in St. Louis)
 - Peer Led Team Learning (PLTL) project
 - Classroom Inclusivity and social belonging project (HHMI)
 - Concept-building Approach project
 - Social Network Analysis (HHMI)
- Josh Edwards, Dept of Chemistry, Texas A&M (alumnus of group)
- Lori Laguerre Van Sickle, Dept of Chemistry, Catawba College, North Carolina (alumna of group)



REU Program

Discussion Questions

- Discuss at your neighbor, 2-3 key ideas or insights you see from the data about the characteristics students' perceive in determining their course-level social belonging (from any of the three questions)
- What identities do your students bring to your class? How might these identities affect your students' course-level belonging?
- Thinking about the data, what changes might you make to your teaching practices to improve your students' belonging?

Thank you for listening.

Questions/Comments?

