

Supplementary Information

SI-1. Interview Protocol

(Used in the study; referenced in Methods)

SI-2. Coding Framework / Codebook

(Definitions/Examples; mirrors what's in Methods)

SI-3. Coding Directions

SI-1.Interview Protocol

Note: These interview questions are intended to guide the conversation, but interviewers should feel free to ask follow-up questions or probe deeper into specific topics as appropriate during the interviews. (do not constrain timeframe, but guide throughout time)

Intro:

Thank you so much for taking the time to join me today. I am really excited to learn more about your experience and perspective within the chemistry community as well as outside the chemistry community. Our conversation today will cover different aspects of your academic and professional journey, ranging from the past to the present and looking ahead to the future. Please know that there are no right or wrong answers and this is a space for you to express yourself openly.

UNDERGRADUATES/GRADUATES/FACULTY:

To kick things off, I'd like to encourage you to share your story in a way that feels natural to you. Feel free to take me through your academic journey from your early days to your current position. With that said let's begin could you please start by telling me about your early experiences (and influences) that led you to pursue a career in chemistry?

Past: Reflection on Academic Journey

1. Introduction and Background
 - a. Can you tell me a little about your journey in the field of chemistry?
 - b. Was there any specific experience or moment that led you to choose the path that you choose?
 - c. Was there anyone that played a role in your motivation and passion?
 - d. Why not other subjects? Why specifically chemistry?

2. Experiences and Influences
 - a. Looking back on your academic career, are there specific moments or individuals that stand out as having had a profound impact on your approach and perception of chemistry,
 - i. If so why did the moments stand out?
 - ii. If so who influenced you?
 - iii. Did they change your way of thinking/or why were they influential?
 - b. Classes
 - i. Difficult classes
 - ii. Easy classes
 - iii. Types of teachers
 - c. Extracurriculars
 - i. What consisted of free time?
 - ii. Any events?
 - d. Community
 - i. What was your friend group like?
 - ii. Who did you identify with? Certain groups/people?

- e. Have you ever attended chemistry related events?
 - i. Was this a positive or negative experience?
 - ii. If more than one did one have more of an impact on you?
 - iii. Why?
 - iv. What was your role within the event?
- f. Can you recall a specific event or situation from your past where you felt your background or personal characteristics significantly influenced your experience or perspective?
 - i. How do you think this experience has shaped your current outlook on similar situations?
- g. (Imagine you're part of a group project where you're the only student from a minority background).
 - i. How would you ensure that your voice is heard and your contributions are valued by your peers?
 - ii. How would you handle any situations where you feel excluded or overlooked due to your background?
- h. Among your experiences in the past would you say that you have witnessed a support for diversity within your academics? Or how about within the field of chemistry?
 - i. What was the event?
 - ii. How has the experience shaped your views of the role of diversity in chemistry (or science)?
- i. Among your experiences have you witnessed equal opportunities within the chemistry community?
 - i. If yes, then where was this at?
 - ii. How was it equal?
 - iii. If no, then is there a lack of equal opportunities?
 - iv. Why do you think this is?
- j. Among your experiences, have you been offered the same opportunities as your peers?
 - i. If yes, what were these opportunities?
 - ii. If no, What was the differentiating factor? Age? Gender? Race?
- k. Among your experiences have you ever felt excluded by age? How about by gender? Now how about race? in the chemistry community? How about overall in your academic journey)
 - i. If so, how?
 - ii. How did this experience shape your current perceptions of the role of inclusion?

3. Challenges and Triumphs

- a. Reflecting on your experiences in chemistry, what are some of the challenges you have encountered in chemistry,
 - i. Why was it challenging?
 - ii. How have you managed or overcome them? What strategies were used?

- iii. Did overcoming this led to any shifts in your perspective of chemistry or of the field of chemistry?
 - iv. Would you do anything different?
 - b. Were there any personal struggles or challenges that have had profound impact on you?
 - i. Did these struggles ever interfere with your academics?
 - ii. How?
 - iii. How were these resolved or overcome?
- 4. Extra:
 - a. If you had to give personal/or academic advice to your prior self what advice would you give?

Now that we've discussed your academic journey and past experiences, lets shift our focus to some of your present experiences. I'm interested in hearing why you chose your current path...

Present: Current Perspectives

1. Background
 - a. So, what led you to choose University of Arizona?
 - i. Which field of chemistry are you in? Why that field?
 - ii. OR which field of chemistry are you interested in? Why?
 - b. Has your Current motivation/passion/drive changed compared to your initial interest?
2. Experiences
 - a. Classes
 - i. What type of difficult classes have they had?
 - ii. What has been their favorite classes?
 - iii. What types of professors have they had? Have these been good/bad experiences?
 - b. Extracurriculars
 - i. What do they do in their free time?
 - c. Have you attended any chemistry events while being at University of Arizona? If not are there any events that you would like to attend?
 - i. Which ones?
 - ii. And why?
 - d. As of recent has there been any influential moments or individuals that has made an impact on your view of chemistry?
 - i. Who?
 - ii. How? Why?
 - iii. What?
 - iv. How does it compare to before? How big of an impact compared to some of the influential moments that occurred in the past?
 - v. What did this have an impact on? Views? Academic Success? Personal Well-being? Professional Development?

- e. In your current role or environment, do you feel that your background or or personal attributes have a noticeable impact on how you navigate certain situations or interact with others?
 - i. Can you provide an example of this?

3. Current Struggles

- a. Are there any current academic struggles that you are dealing with?
 - i. If so how are you dealing?
 - ii. Why is it a struggle?
 - iii. Which resources are you utilizing?
 - iv. Or any individuals that are helping?
- b. Are there any current personal struggles that you are dealing with?
 - i. Do you believe this is influencing your success in your academics?
 - ii. How are you overcoming this? Any strategies?

Having gained insight into your current experiences, lets now explore some of your future aspiration and goals.

Future: Aspirations and Vision

1. Aspirations

- a. What are your future aspirations? (or career goals)
 - i. Where does this come from? (Why?)
 - ii. How will you achieve this? (do you have a plan)
 - iii. Do you have any resources you are using to help achieve this?
 - iv. How about individuals helping you to achieve this?
- b. Do you have any long-term academic or personal goals for yourself?
 - i. Where does this come from? (Why?)
 - ii. How will you achieve this?
 - iii. Do you have any resources or individuals you are using to aid you?

As we discuss your future aspiration, lets connect it back to your experiences. How do you see your past experiences helping you to achieve the goals you've set for yourself?

2. Experiences

- a. How do you see your future in chemistry?
 - i. Do you think chemistry will be important to you in the future?
 - ii. Why?
 - iii. What do you hope will change in terms of the field of chemistry?
 - iv. What do you believe will change in terms of the field of chemistry?
- b. How do you think the chemistry community could do a better job of representing diverse populations or diverse perspectives?

- c. AS we consider the future, how would you recommend creating an environment that is fairer in providing equal opportunities?
 - i. What specific actions might be beneficial?
 - ii. Potential challenges getting In the way?
- d. How do you think the chemistry community could improve on creating an environment where everyone feels equally supported?
 - i. Do you think there are certain obstacles?
 - ii. What role do you see yourself playing?

Outro:

Thank you so much for sharing your valuable insights and experiences with me today. Your journey is truly fascinating, and I appreciate your openness. Before we conclude, I want to make sure you've had the chance to share everything you wanted to. Is there anything else you'd like to add regarding your experiences or any of the broader topics we discussed?

I genuinely appreciate your time and willingness to participate in this conversation. Your perspectives are incredibly valuable and will contribute significantly to our understanding of the diverse experiences within the chemistry community.

If there's anything else you'd like to share in the future or if you have any questions feel free to reach out. Once again, thank you, and I wish you continued success in your endeavor.

SI-2.Coding Framework/Codebook

1. Affective Framing Codes

These codes capture the emotional tone participants used when describing each experience.

Code	Label	Operational Definition	Inclusion Criteria	Exclusion Criteria	Example Quote
+	Positive	Experience described with positive emotion, growth, accomplishment, enjoyment, excitement, or fulfillment.	Clear emotional tone indicating pride, joy, confidence, motivation, accomplishment.	Statements describing events without emotional evaluation.	“I felt really accomplished after my presentation at the seminar.”
-	Negative	Experience described with frustration, anxiety, discouragement, confusion, or negative emotion.	Language referencing difficulty, fear, stress, feeling lost, or self-doubt.	Neutral statements about difficulty without affect.	“I struggled to keep up during the lecture, and it made me feel lost.”
/	Neutral	Experience described factually or routinely without clear positive or negative emotion.	Routine activities, descriptions without emotion, matter-of-fact statements.	Any phrasing indicating positive or negative affect.	“I attended the workshop...”

2. Role Positioning Codes

These codes capture how participants position themselves relative to the discipline in each experience.

Code	Label	Operational Definition	Inclusion Criteria	Exclusion Criteria	Example Quote
BS	Being a Student	Participant frames themselves as a learner subject to instruction, evaluation, or structured expectations.	Receiving instruction, attending class, doing required coursework, following lab protocols.	Teaching, mentoring, or taking on expert roles.	“I attended a lecture on quantum mechanics.”
BP	Being a Professional	Participant frames themselves as an expert, contributor, or agent within the discipline.	Mentoring, teaching, presenting, independent research, writing proposals.	Passive learning situations.	“I prepared grant proposals to secure research funding.”

3. Experience Type Codes (Context Categories)

These codes categorize the type of experience based on its relationship to formal academic structures.

Code	Label	Operational Definition	Inclusion Criteria	Exclusion Criteria	Example Quote
C	Curricular	Academic courses or labs tied directly to degree requirements.	Lecture courses, required labs, for-credit activities.	Research, internships, workshops, clubs.	"In my organic chemistry lab, I learned titrations."
Co	Co-Curricular	Activities adjacent to coursework that support disciplinary development but are not required for academic credit.	Research, seminars, workshops, conferences, internships.	Athletics, clubs, unrelated volunteerism.	"I attended a workshop on scientific writing."
EC	Extracurricular	Activities outside academics, often socially or personally meaningful.	Outreach, student organizations, sports, leadership roles.	Academic or co-curricular experiences.	"I participated in a sorority outreach event."

4. Subcontext Codes

These codes specify the setting of each experience within its broader category.

4.1 Curricular Subcontexts

Code	Label	Operational Definition	Example Quote
T	Traditional	Traditional lecture-style instruction.	"My general chemistry lecture was very fast-paced."
La	Laboratory	Laboratory courses tied to formal coursework.	"I was nervous every week in lab, but when an experiment worked, I felt proud."

4.2 Co-Curricular Subcontexts

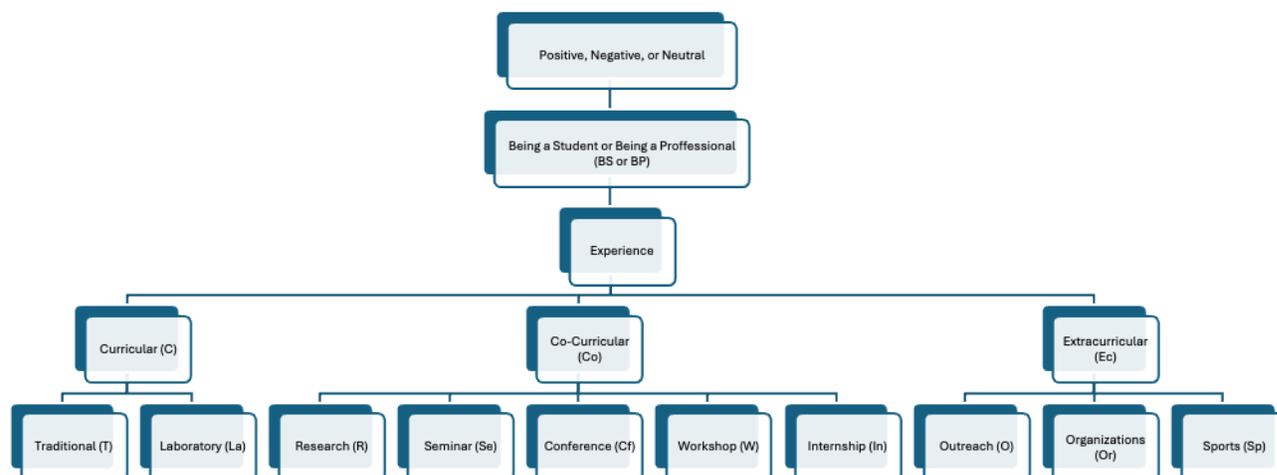
Code	Label	Operational Definition	Example Quote
R	Research	Research experiences applying academic knowledge to scientific inquiry.	"Working in the lab helped me see myself as a chemist."
Se	Seminar	Seminars attended or participated in.	"I went to a seminar about medicinal chemistry."
W	Workshop	Workshops designed for skill-building.	"I attended a workshop on scientific writing."

Cf	Conference	Conferences for presenting or learning.	“Presenting at ACS made me realize I belonged in the field.”
In	Internship	Internships in applied or professional environments.	“My internship showed me what industrial chemistry looks like.”

4.3 Extracurricular Subcontexts

Code	Label	Operational Definition	Example Quote
O	Outreach	Research experiences applying academic knowledge to scientific inquiry.	“Working in the lab helped me see myself as a chemist.”
Or	Organization	Seminars attended or participated in.	“I went to a seminar about medicinal chemistry.”
Sp	Sports/Athletics	Sports or athletic participation.	“Being on the soccer team taught me discipline and balance.”

Overview of Code Breakdown:



SI-3.Coding Directions

Step 1: Deciding if the experience is positive/negative/neutral

- Is the experience described as positive, negative, or neutral?
- Look for keywords or sentiments in the data to categorize this.

Examples:

- Positive: "I felt really accomplished after my presentation at the seminar."
- Negative: "I struggled to keep up during the lecture, and it made me feel lost."
- Neutral: "I attended the workshop..."

Codes:

Positive: +
Negative: -
Neutral: /

Step 2: Deciding if they are being a student (subject to) or being a professional (subject of)

- Determine the role: Is the individual describing this experience as a student or as a professional?
- Look for clues about their stage in education or career, e.g., undergraduate coursework vs. faculty research.
- Keep in mind that some experiences have both

Examples:

- Student: "I attended a lecture on quantum mechanics."
 - o BS = Learning within a lecture a setting
 - o Vs. BP= Teaching within a lecture setting
- Professional: "I prepared grant proposals to secure research funding."
 - o Think about whether a student would experience

Codes:

Being a student (BS)
Being a professional (BP)

Step 3: Categorize the experience type

- Curricular:
 - o Academic courses or labs tied to a degree.
- Co-Curricular:
 - o Activities adjacent to coursework, such as research, seminars, workshops, and conferences.
- Extracurricular:
 - o Activities outside academics, such as sports, outreach, or clubs.

Examples:

- Curricular: "In my organic chemistry lab, I learned titrations."
 - o Apart of curriculum for degree
 - o Usually for letter grade
- Co-Curricular: "I attended a workshop on scientific writing."
 - o Experiences that occur alongside formal coursework but are not required for a class
 - o Usually related to degree subject (or to aid in experience/skills)
 - o Usually not for letter grade (research work study is a special case)
- Extracurricular: "I participated in a sorority outreach event."
 - o Not necessarily related to degree subject

Codes:

Curricular (C)

Co-Curricular (Co)

Extracurricular (EC)

(Personal/Unique experiences = not categorizable within C, Co, and EC)

Step 4: Identify the Context of the Experience

- Ask:
What is the specific context or situation surrounding the experience?
- Consider details like location, purpose, and duration.
- Each categorical experience has unique contexts.

Examples:

- Curricular:
 - Traditional:
 - Standard classroom instruction and structured coursework environment.
 - Lab Class:
 - Includes hands-on experimental learning, data collection, and practical application of concepts.
- Co-Curricular:
 - Research:
 - Involve applying academic knowledge to new investigations, developing research skills, working closely with faculty or research teams, and engaging in scientific inquiry beyond the traditional classroom.
 - Seminar:
 - Structured learning experiences outside of regular coursework where individuals attend talks, discussions, or panels. Focused on specific research topics or career development.
 - Conference:
 - Formal gatherings, often regional, national, or international, where individuals present their work, attend presentations, network, and engage with the broader professional or academic community.
 - Workshop:
 - Interactive designed to build specific skills, expand knowledge, or foster professional growth through activities, discussions, or training.
 - Internship:
 - Structured, short-term work experiences that allow students or early-career individuals to apply academic knowledge in real-world professional settings, often offering hands-on exposure to industry, research, or other career-related environments.
- Extracurricular:
 - Outreach:
 - Engaging with the broader community (often outside the university or formal education setting) to promote science awareness, inspire others, and share knowledge. These activities are voluntary and contribute to community building and science communication skills.

- Organization:
 - Participation in student-led, academic, professional, or social organizations that are outside the formal curriculum but often support personal, academic, or professional development. These experiences build leadership skills, and networks through involvement, service, or leadership roles.
- Sports:
 - Organized athletic activities (intramural, club, or varsity sports) that occur outside the formal academic curriculum. Sports involvement can shape personal development by fostering teamwork, leadership, resilience, discipline, and time management skills.

Codes:

Curricular:

Traditional, or lecture style (T)

Lab class (La)

Co-Curricular:

Research (R)

Seminar (Se)

Workshop (W)

Conference (Cf)

Extracurricular:

Outreach (O)

Sports (Sp)

Organizations (Or)