

Supplemental Material

CBE—Life Sciences Education

Gin *et al.*

Supplemental Information for
**Students with disabilities in life science undergraduate research experiences:
Challenges and opportunities**

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Copy of survey questions analyzed (Study I)

Research demographics

1. Have you, currently or in the past, participated in a scientific undergraduate research experience while enrolled in college? For example, conducting research with a faculty member or in a faculty member's lab.

- Yes
- No [*Students are directed to the end of the survey*]

2. Have you only participated in a summer research experience (e.g., REU) that you did not participate in during the school year?

- Yes [*Students are directed to the end of the survey*]
- No

3. Please choose the response that most closely reflects how long you participated in your first undergraduate research experience.

- 6 months or less
- 1-2 years
- 2-3 years
- 4 years or more

4. On average, how many hours per week do/did you spend working on undergraduate research (inside and outside the lab)?

- 1-5 hours
- 6-10 hours
- 11-15 hours
- 16 hours or more
- Decline to state

5. Please choose the response that most accurately describes how you are/were compensated for your time working on undergraduate research. (Check all that apply):

- I receive/received course credit for my time participating in undergraduate research
- I receive/received money for my time participating in undergraduate research (e.g., wage, stipend)
- I volunteer/volunteered my time in undergraduate research (do not/did not receive credit or money)

6. Please indicate who you work/worked with most closely during your first undergraduate research experience.

- PI (Principal Investigator)/faculty member
- A graduate student
- A post-doc

- A staff member (e.g., lab coordinator, lab manager)
- Other, please describe

7. Please type in the name of the institution you are attending
(e.g., Arizona State University, University of Colorado, Boulder)

Student demographics

8. I most closely identify as

- Woman
- Man
- Non-binary/Gender fluid
- Other (please describe)
- Decline to state

9. I most closely identify as

- American Indian or Alaska Native
- Asian
- Black or African American
- Hispanic, Latinx, or Spanish Origin
- Pacific Islander
- White/Caucasian
- Other (please describe)
- Decline to state

10. How long have you attended college while pursuing your undergraduate degree?

- 1 year or less (first-year student)
- 2 years (sophomore)
- 3 years (junior)
- 4 years (senior)
- 5 years or more
- Decline to state

11. I most closely identify as

- First-generation college student whose parents' highest level of education is a high school diploma or less
- First-generation college student (at least one parent has some college)
- Non-first generation college student (at least one parent has finished college)
- Decline to state

12. What is your grade point average (GPA)?

13. How old are you?

14. I most closely identify as a(n)

- Military veteran
- Active duty service member
- Military reserve
- None of the above
- Decline to state

Disability-specific demographics

15. Have you currently, or previously, been impacted by one or more of the following conditions? (Check all that apply):

- Learning disability (e.g., autism, dyslexia)
- Mental health and psychological disability (e.g., anxiety, depression, bipolar disorder)
- Physical disability (e.g., cerebral palsy, spina bifida)
- Chronic health conditions (e.g., cancer, diabetes)
- Vision loss (e.g., blind)
- Hearing loss (e.g., deaf)
- Other (please describe)
- None of these apply

Interview recruitment

16. We are interested in hearing more about your thoughts about undergraduate research. Are you interested in being contacted about participating in an online follow-up interview (via Skype, FaceTime, Zoom, etc.) in exchange for a \$15 gift card?

- Yes (please enter your email)
- No

Outreach email to students for interviews (Study II)

Hi XXXXXX,

We are a team of biology education researchers working to improve student experiences in undergraduate biology. We are specifically interested in the experiences of students with disabilities in undergraduate research.

To our knowledge, there have been no studies exploring the experiences of students with disabilities in undergraduate research. We believe that it is very important to learn more about the experiences of students with disabilities in order to create a more inclusive biology community.

If you identify as having a disability, we would be interested in hearing about your experience in undergraduate research in a 30 – 60 minute online interview. In exchange for your time, we will provide you with a \$15 gift card to Amazon.

If you would be willing to share your insights, please fill out this poll with the most convenient time for you: [insert link]

Please only sign up for a single time slot. Times listed may be different from your time zone.

We are planning to conduct all interviews over Zoom for your convenience. If another platform or medium is more appropriate or accessible for you, please let me know as I am more than happy to accommodate.

Thank you for considering!

Copy of interview questions analyzed (Study II)

Thank you for agreeing to talk with me. My name is XXXXX, and I am a biology education researcher, and I study ways to improve the experiences of undergraduate science students. To our knowledge, nobody has actually explored the experiences of undergraduate science students with disabilities in research, so our goal is really just to learn more about you and your experience. As someone who identifies as having a disability, I am particularly interested in your unique experiences. There are no right or wrong answers to any of these questions. If you do not feel comfortable answering a question, just let me know. Given that COVID-19 has likely impacted your research experience, please try to reflect on your experience prior.

Background

The goal of this study is to interview students with disabilities about their experience in undergraduate research, so could you please begin by describing your disability (or disabilities)? What are the symptoms of your disability (or disabilities) and how does it impact you on a daily basis?

Diagnosis and DRC

Have you been formally diagnosed for your disability (or disabilities) from a physician/psychiatrist/medical professional?

Are you currently registered for services through your university's Disability Resource Center?

- *If yes:* Could you briefly describe what your accommodations look like?
- *If not:* Why not?

Involvement in undergraduate research

Can you briefly describe your undergraduate research experience or experiences?

Why did you want to do undergraduate research?

To what extent did your disability inform the type of research that you sought to participate in?

- How, if at all, has your disability (or disabilities) affected what you choose to study in research?

Did you have any fear that your disability (or disabilities) would affect your experience in research?

Benefits and challenges of undergraduate research

To what extent has your disability (or disabilities) affected your research in a negative way?

To what extent has your disability (or disabilities) affected your research in a positive way?

- Do you feel as though your disability (or disabilities) gives you any advantages in research?
- What benefits or contributions, if any, do you believe you bring to undergraduate research given your disability (or disabilities)?

What, if anything, about undergraduate research has negatively affected your view of your disability (or disabilities)?

What, if anything, about undergraduate research has positively affected your view of your disability (or disabilities)?

Please describe any barriers you think undergraduate research presents for you as a researcher with a disability (or disabilities).

What, if anything, about undergraduate research can exacerbate your disability (or disabilities)?

Revealing/concealing disability

Who in your lab knows about your disability (or disabilities)?

- Grad mentor(s)
- PI/faculty mentor(s)
- Other people who aren't mentors

How did they find out?

- *If not:* Why not?

If they know: To what extent do you feel as though people's expectations for you changed when they found out about your disability (or disabilities)?

If they do not know: To what extent do you feel people's expectations would change for you if they found out about your disability (or disabilities)?

Accommodations and solutions in research

To what extent have you sought formal accommodations for your disability (or disabilities) in research (e.g., from the Disability Resource Center or department)?

To what extent have you sought informal accommodations for your disability (or disabilities) in research (e.g., conversations with mentors)?

To what extent is the process similar or different to the process you have gone through to receive accommodations in your lab courses?

To what extent are your accommodations in research similar or different to your accommodations in your courses?

Did you participate in undergraduate research for course credit?

- *If you enrolled for credit:* Are you aware that you may be eligible for accommodations for research through the DRC since it is a course?

What additional accommodations do you think could have been helpful given your disability (or disabilities)?

To what extent do you feel as though you have to personally advocate for what you need to be successful as an individual with a disability (or disabilities) in undergraduate research?

Career

What is your career goal?

How important is doing undergraduate research to your future career?

How, if at all, has your disability (or disabilities) impacted your career decisions?

Recommendations for improving the experiences of undergrads with disability

Tell me about a way that you think research mentors can positively affect students with disabilities in their research labs.

Is there anything else you would like to share?

Thank you so much for your time. Right after this, I am going to send you a quick follow-up email that asks you questions about your disability. There will be no right or wrong answers. At the end of the survey, we will ask for your email you would like your gift card sent to, and we will send that to you next week.

Copy of post-interview survey questions analyzed (Study II)

Research demographics

1. Please choose the response that most closely reflects how long you participated in your first undergraduate research experience.

- 6 months or less
- 1-2 years
- 2-3 years
- 4 years or more

2. On average, how many hours per week do/did you spend working on undergraduate research (inside and outside the lab)?

- 1-5 hours
- 6-10 hours
- 11-15 hours
- 16 hours or more
- Decline to state

3. Please choose the response that most accurately describes how you are/were compensated for your time working on undergraduate research. (Check all that apply):

- I receive/received course credit for my time participating in undergraduate research
- I receive/received money for my time participating in undergraduate research (e.g., wage, stipend)
- I volunteer/volunteered my time in undergraduate research (do not/did not receive credit or money)

4. Please indicate who you work/worked with most closely during your first undergraduate research experience.

- PI (Principal Investigator)/faculty member
- A graduate student
- A post-doc
- A staff member (e.g., lab coordinator, lab manager)
- Other, please describe

5. Please type in the name of the institution you are attending (e.g., Arizona State University, University of Colorado, Boulder)

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7. I most closely identify as

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- Black or African American
- Hispanic, Latinx, or Spanish Origin
- Pacific Islander
- White/Caucasian
- Other (please describe)
- Decline to state

8. How long have you attended college while pursuing your undergraduate degree?

- 1 year or less (first-year student)
- 2 years (sophomore)
- 3 years (junior)
- 4 years (senior)
- 5 years or more
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9. I most closely identify as

- First-generation college student whose parents' highest level of education is a high school diploma or less
- First-generation college student (at least one parent has some college)
- Non-first generation college student (at least one parent has finished college)
- Decline to state

10. What is your grade point average (GPA)?

11. How old are you?

12. I most closely identify as a(n)

- Military veteran
- Active duty service member
- Military reserve
- None of the above
- Decline to state

Disability-specific demographics

13. Have you currently, or previously, been impacted by one or more of the following conditions? (Check all that apply):

- Learning disability (e.g., autism, dyslexia)
- Mental health and psychological disability (e.g., anxiety, depression, bipolar disorder)
- Physical disability (e.g., cerebral palsy, spina bifida)
- Chronic health conditions (e.g., cancer, diabetes)
- Vision loss (e.g., blind)
- Hearing loss (e.g., deaf)
- Other (please describe)
- None of these apply

14. Have you been formally diagnosed for your disability or medical condition from a physician/psychiatrist/medical professional?

- Yes
- No

15. Are you currently (or have you previously been) registered with your university's Disability Resource Center (or equivalent office)?

- Yes
- No

Gift card information

16. Please type the email address where you would like to receive your \$15 Amazon gift card.

Table S1. Supplemental demographic data for the national sample of student researchers with disabilities and interview participants (Study I & II)

	Survey participants with disabilities n = 152 % (n)	Interview participants n = 20 % (n)
<u>Age</u>		
Mean (Standard Deviation)	21.5 (3.8)	21.2 (2.4)
Range	18-47	18-29
<u>Military veteran</u>		
Yes	3.9 (6)	5.0 (1)
No	92.8 (141)	90.0 (18)
Decline to state	3.3 (5)	5.0 (1)

Table S2: List of students' pseudonyms and self-reported disability types (Study II)

Interview	Pseudonym	Chronic health condition (e.g., cancer, diabetes, multiple sclerosis)	Hearing loss (e.g., deaf)	Learning disability (e.g., dyslexia)	Mental health/psychological disability (e.g., anxiety, depression)	Physical disability (e.g., cerebral palsy, spina bifida)	Visual loss (e.g., blind)	Total #
1	Amy	X			X			2
2	Skylar			X				1
3	Anita			X	X			2
4	Naomi					X		1
5	Michele	X			X			2
6	Wanda			X	X			2
7	Jesse	X		X				2
8	Odette			X	X			2
9	Hugh	X	X	X	X	X		5
10	Gabriella		X					1
11	Rebecca			X				1
12	Temple			X				1
13	Judith				X			1
14	Karin				X			1
15	Albert			X				1
16	Michael				X			1
17	Tia		X		X			2
18	Cornelius	X		X	X			3
19	Caroline			X				1
20	Katie		X					1
	Total	5	4	10	11	2	0	33

Table S3: Coding rubric with code descriptions (Study II)

Unique challenges experienced by students with disabilities in undergraduate research		
Theme	Description	% (n)
Difficulties carrying out research tasks	Students describe that they may have difficulties carrying out specific tasks in their research experience as a result of their disability (e.g., difficulties carrying, reaching, etc. or spending long periods of time working on specific tasks). This is specific to the type of research task that the student is doing and not the general type of research (which would be coded elsewhere). Students could describe a "flare up" or symptoms related to their disability that prevent them from fully carrying out research tasks. Students could describe that these difficulties ultimately lead to challenges with productivity in research.	55% (11)
Requires self-advocacy in URE	Students describe that they are required to self-advocate (more than what they typically would) in order to receive what they need to be successful in their URE. Students could also discuss having difficulties with advocating in the context of UREs.	45% (9)
Challenges getting help in research	Students describe that it can be difficult to reach out to their mentor regarding getting help, accommodations, or solutions in their research experience. This could be compounded by the fact that their mentor may or may not know whether they have a disability. This could also include if a student reached out to the DRC and was unable to be helped.	40% (8)
Not able to live authentically in research	Students describe challenges with revealing their disability as an identity to others in their research group. This can also include students who have invisible disabilities downplaying the effect of their disability or symptoms of their disability on their performance in research. Students may also describe that there are few role models of other students/researchers with disabilities for them to look up to.	25% (5)
Unique solutions experienced by students with disabilities in undergraduate research		
Theme	Description	% (n)
Able to get help in research from mentor	Students describe that they are able to reach out to their mentor regarding getting help, accommodations, or solutions in their research experience. This could be having conversations with their mentor about how their disability may impact them and their research. This could also be working 1:1 with the mentor to find individualized/informal accommodations to better their overall experience in research. This often requires that the student be open to discussing and/or revealing their disability (invisible) to their mentor.	45% (9)
Individualized solution	Student describes that they created a solution to a challenge that they were having in undergraduate research. Students can say that they created their own solution or that it was something that they came up with to lessen the effect of the challenges they were experiencing.	40% (8)

Able to live authentically in research	Students describe that they are able to reveal/discuss their disability as an identity to others in their research group. This can also include students who have authentically spoken about their disability and how it may impact them. Students can share this information with other people in the lab (positive). Students may also describe that they have role models and other students/researchers with disabilities for them to look up to (either in their research labs or in science more broadly).	25% (5)
Able to get help in research from DRC	Students describe that they have been able to reach out to the DRC in terms of which accommodations may work in their research experience. The student may describe that they have used their similar accommodations for their courses in their research experiences.	15% (3)
Unique benefits experienced by students with disabilities in undergraduate research		
Theme	Description	% (n)
Builds resilience	Student describes that undergraduate research teaches students with disabilities resiliency and may require them to overcome obstacles, which is helpful for students (in the face of adversity). This could be accomplishing and solving scientific problems which show them that they can overcome such an obstacle. Students may also go on to describe how this could parallel with some of the obstacles/adversity they face in their everyday lives as an individual with a disability.	45% (9)
Builds positively to science identity	Students describe that being able to conduct undergraduate research contributes to their overall feelings of being a "scientist." This could mean that they feel like they are a part of the scientific community as a result of participating in research. Students could describe themselves as a "scientist," someone "doing science," etc. which would go beyond just confidence in their ability to do science.	35% (7)
Influences career	Students describe that their disability may inform the type of research that they ultimately want to pursue (e.g., student with neurological disability working in neurology; autism research for students with autism).	30% (6)
Builds confidence or efficacy for doing science	Student describes that conducting undergraduate research can make students with disabilities "feel capable" in terms of being able to conduct scientific research. This could also be students feeling like they are able to contribute to science/can do science as an individual with a disability.	20% (4)
Unique contributions of students with disabilities to undergraduate research		
Theme	Description	% (n)
Sense of empathy	Students describe that they bring compassion, empathy, understanding, etc. which can inform the role that students with disabilities play in the research process. This can be students generally describing that their experience as someone with a disability can help them relate to others, relate to the research project, relate to how data is collected, etc.	30% (6)
Unique	Students describe that as an individual with a disability, they bring a unique	25% (5)

perspective of students with disabilities	perspective to the research process. This could be related to how they think about research problems based on their own disability. It could also include bringing in their lived experiences of someone who has a disability. This could also include students bringing in the perspective of someone with a particular type of disability doing research on a similar type of disability (e.g., autism research with a student with autism).	
Disability provides advantage/skill set for certain tasks	Students describe that some aspect/symptom/result of their disability allows for some advantage in the research process. For example, this could include students being able to hyper-focus on certain research tasks, attention-to-detail as a result of often making mistakes due to disability, etc. This could also be students developing skills/skill sets from living with a particular disability that provides an advantage for approaching situations in the context of research (e.g., physical disability considering accessibility of field work).	20% (4)