

Supplemental Material

CBE—Life Sciences Education

Reid *et al.*

Supplemental: Survey Items

Please select your appropriate age range.

- 18-20 (1)
 - 21-30 (2)
 - 31-40 (3)
 - 41-50 (4)
 - 51-60 (5)
 - 61-70 (6)
 - Prefer not to answer (7)
-

Please indicate which university you attend.

What degree are you working towards?

- Masters (1)
 - Doctorate (2)
-

As of today, approximately how long has it been since you began your current degree program?

- Less than one year (1)
 - 1 year (2)
 - 2 years (3)
 - 3 years (4)
 - 4 years (5)
 - 5 years (6)
 - More than 5 years (7)
-

Approximately, how many years of experience do you have with teaching a laboratory or lecture course (as either instructor of record or teaching assistant)?

- 1/2 year (1)
 - 1 year (2)
 - 2 year (3)
 - 3 year (4)
 - More than 3 years (5)
-

Does your research laboratory hold regular group meetings?

- Yes (1)
 - No (2)
 - I am not sure (3)
-

If so, do you attend regular laboratory group meetings?

Yes (1)

No (2)

Does your department hold regular teaching group meetings? (i.e., weekly lab prep meetings with other graduate students and/or faculty, teaching related workshops)

Yes (1)

No (2)

I am not sure (3)

If so, do you attend regular teaching group meetings?

Yes (1)

No (2)

Select which of the following that you have participated in while in your graduate program.
(Select all that apply)

- A course about teaching and learning (1)
 - A workshop on teaching and learning (2)
 - A teaching certification program (3)
 - A teaching observation of other teaching assistants and/or faculty (4)
 - A teaching orientation before the semester begins (5)
 - A weekly laboratory preparation meetings with other teaching assistants and/or faculty (6)
 - Other (7) _____
-

My research is best described as

- Biological Sciences Research (1)
 - Biology Education Research (2)
-

Where do you see yourself working in the future?

- Research-Intensive University (1)
 - Research and Teaching Balanced University (2)
 - Teaching-Intensive University (3)
 - Non-academic position (4)
-

Which of the following best describes how you identify as an academic?

- I identify primarily as a researcher (1)
- I identify primarily as a research but somewhat as a teacher (2)
- I identify primarily as a teacher but somewhat as a researcher (3)
- I identify primarily as a teacher (4)

End of Block: Demographics

Start of Block: Conceptions of Research and Teaching

In the space provided, please define "teaching".

What skills should a successful teacher have? (please try to list at least 3)

	Skills (1)
Teaching skill 1 (4)	
Teaching skill 2 (5)	
Teaching skill 3 (6)	

In the space provided, please define "research".

What skills should a successful researcher have? (please try to list at least 3)

	Skills (1)
Research skill 1 (4)	
Research skill 2 (5)	
Research skill 3 (6)	

End of Block: Conceptions of Research and Teaching

Start of Block: Perceptions of the Research-Teaching Nexus: Individual

Of the following statements, I most agree with...

- Teaching and research are synergistic activities. (1)
 - Research and teaching are independent activities that have no bearing on each other. (2)
 - Research and teaching are antagonistic activities and are often in conflict with one another. (3)
-

Of the following statements, I most agree with...

- My teaching helps me be a better researcher. (1)
- My teaching has no effect on my development as a researcher. (2)
- My teaching interferes with my research capabilities and productivity. (3)

Of the following statements, I most agree with...

- My research helps me be a better teacher. (1)
- My research has no effect on my development as a teacher. (2)
- My research interferes with my teaching capabilities and productivity. (3)

End of Block: Perceptions of the Research-Teaching Nexus: Individual

Start of Block: Perceptions of the Research-Teaching Nexus: Microsystem

For each individual (or group of individuals at the tops of the columns), please select whether each statement is something they have said to you or indicated to you. You may select multiple boxes for each statement OR if you have never heard these things, please do not select any boxes.

	Advisor (1)	Committee Members (8)	Peers (other graduate students in your department) (2)	Instructors (for courses you take) (3)	Students (that you teach) (4)	Teaching Supervisor (5)
1. "Research should be your priority and teaching will not support your research." (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. "Teaching should be your priority and research will not support your teaching." (2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. "Teaching will not influence your research and research will not influence your teaching." (3)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. "Teaching and research should both be your priority because teaching will support your research." (4)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. "Teaching and research should both	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

be your priority because research will support your teaching." (5)

I do not have conversations about teaching or research with this person (group of people). (6)

Have any of these statements been said by someone else other than those listed? If so, who and which message (you may indicate the message by the number next to the message above)?

End of Block: Perceptions of the Research-Teaching Nexus: Microsystem

Start of Block: Perceptions of the Research-Teaching Nexus: Exosystem

Please select whether you agree, disagree, or neither agree nor disagree with each statement.

	Strongly Disagree (1)	Somewhat Disagree (2)	Neither agree nor disagree (3)	Somewhat Agree (4)	Strongly Agree (5)
Graduate students in my department have adequate space to meet with students they teach outside of class. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Graduate students in my department have adequate space to meet with research colleagues and peers. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Graduate students in my department have adequate time to reflect upon and make changes to their instruction. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Graduate students in my department have adequate time to reflect	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

upon and make changes to research. (4)

All of the graduate students in my department are sufficiently competent to teach effectively. (5)

All of the graduate students in my department are sufficiently competent to conduct research effectively. (6)

All of the graduate students in my department are encouraged to seek out support and professional development opportunities related to research. (7)

All of the graduate students in my department are encouraged

to seek out support and professional development opportunities related to teaching. (8)

End of Block: Perceptions of the Research-Teaching Nexus: Exosystem

Start of Block: Block 8

	College/Academic Dean (1)	Dean of Research (2)	Department Chair (3)	Program Coordinator (4)	Faculty Development Director (5)	Departmental/Institutional Staff (i.e., laboratory managers) (6)
1. "Research should be your priority and teaching will not support your research." (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. "Teaching should be your priority and research will not support your teaching." (2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. "Teaching will not influence your research and research will not influence your teaching." (3)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. "Teaching and research should both be your priority because teaching will support your research." (4)

5. "Teaching and research should both be your priority because research will support your teaching." (5)

I do not have conversations about teaching or research with this person (group of people). (6)

For each individual (or group of individuals at the tops of the columns), please select whether each statement is something they have said to you or indicated to you. You may select multiple boxes for each statement OR if you have never heard these things, please do not select any boxes.

Have any of these statements been said by someone else other than those listed? If so, who and which message (you may indicate the message by the number next to the message above)?

End of Block: Block 8

Start of Block: Perceptions of the Research-Teaching Nexus: Macrosystem

Please select whether you agree, disagree, or neither agree nor disagree with each statement.

	Strongly Disagree (1)	Somewhat Disagree (2)	Neither agree nor disagree (3)	Somewhat Agree (4)	Strongly Agree (5)
Evidence of effective teaching and productive research is valued when making decisions about employment in biology. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Evidence of effective teaching is not valued when making decisions about continued employment in biology. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Teaching is respected as an important aspect of being a biologist. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To be recognized in my field of biology, it is more important to be a successful researcher than a successful teacher. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Graduate school is about learning to	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

become a successful researcher and an effective teacher. (5)

Graduate school is about learning to become a researcher, not a teacher. (6)

If I was to conduct a small research study about how my students learn best, the major conferences in my discipline would be receptive to my ideas and work. (7)

Conferences, organizations in my society would not be supportive nor receptive to my ideas and work about student learning. (8)

As a biologist, it will be more important for me to be trained both in research and in



teaching. (9)

As a biologist, it does not matter if I am formally trained in teaching or research, as long as I receive a degree in biology. (10)

As a biologist, it will be more important for me to be trained in research than in teaching. (11)

Please select "strongly disagree" only for a quality check. (12)

As a biologist, it will be more important for me to be trained in teaching than in research. (13)

Supplemental Table 1.

Think aloud interview responses to key constructs (note that quotes are not corrected for grammar or spelling).

Key Construct	Participant Examples
Teaching	<p>“when when I think about teaching I don't just mean giving information that needs to be memorized by well that is a part of it to build up their baseline knowledge what I really want students to know is how to how to make connections how to how to take the next step from how do they they take the information I give them and make new connections”</p> <p>“teaching to me is, yeah I'm gonna define teaching as something formal where you're standing up in front of a classroom, sort of what we traditionally think of is teaching. I think that that's a different thing for mentoring and I think it's a different thing from consulting.”</p> <p>“I view teaching as you know the passing of information from you know somebody who has the experience to somebody who doesn't have the experience.”</p> <p>“I think I called it the art of transferring information from one brain to a lot of brains at one time and make sure that information is understood by all those brains in different ways and that's why I think teaching is”</p> <p>“I think teaching for me happens in a variety of contexts. I feel like I'm teaching whenever I mentor undergrads; I feel like I'm teaching when I'm standing up in front of a classroom full of undergrads and trying to explain why they should care about plants or the sporic life cycle.”</p>
Research	<p>“Research is when you have a scientific question and you're collecting data and analyzing that data and then publishing that data that answers that particular scientific question.”</p> <p>“I think research comes into play when I have questions about things.”</p> <p>“research for me is asking the question you know in my field it's about the natural world asking a question and trying to figure out why it why that's happening”</p> <p>“To be a good researcher you're trying to come up with new information and find ways to demonstrate and support your hypotheses. Then you know there's an aspect there of then conveying your findings to others.”</p> <p>“I think research comes into play when I have questions about things”</p>

Supplemental Table 2

Sample descriptives and demographics.

Demographic	n	%
Identity		
<i>I identify primarily as a researcher but somewhat as a teacher</i>	144	56.5
<i>I identify primarily as a researcher</i>	56	22.0
<i>I identify primarily as a teacher</i>	6	2.4
<i>I identify primarily as a teacher but somewhat as a researcher</i>	49	19.2
University Type[†]		
<i>Research-Intensive</i>	208	81.6
<i>Teaching-Intensive</i>	45	17.6
<i>Not Reported</i>	2	0.8
Age		
<i>21-30</i>	199	78.0
<i>31-40</i>	45	17.6
<i>41-50</i>	9	3.5
<i>51-60</i>	2	0.8
Degree Program		
<i>Doctorate</i>	183	71.8
<i>Masters</i>	72	28.2
Time in Degree Program		
<i>1 year</i>	28	11.0
<i>2 years</i>	62	24.3
<i>3 years</i>	53	20.8
<i>4 years</i>	32	12.5
<i>5 years</i>	14	5.5
<i>Less than one year</i>	48	18.8
<i>More than 5 years</i>	18	7.1
Teaching Experience (time)		
<i>1 year</i>	46	18.0
<i>1/2 year</i>	49	19.2
<i>2 year</i>	54	21.2
<i>3 year</i>	37	14.5
<i>More than 3 years</i>	69	27.1
Research Description		
<i>No Response</i>	1	0.4
<i>Biological Sciences Research</i>	219	85.9
<i>Biology Education Research</i>	35	13.7
Anticipated Career		
<i>No Response</i>	1	0.4

<i>Non-academic position</i>	94	36.9
<i>Research and Teaching Balanced University</i>	74	29.0
<i>Research-Intensive University</i>	38	14.9
<i>Teaching-Intensive University</i>	48	18.8

[†]*Note.* For university type, participants provided their current university and we coded each university based on the Carnegie classification system (The Carnegie Classification of Institutions of Higher Education, n.d.).

Supplemental Table 3.

Microsystem messages perceived by biology graduate students.

	Advisor	Committee Members	Instructors	Peers	Students	Teaching Supervisor
"Research should be your priority and teaching will not support your research."	82 (32.2%)	43 (16.9%)	42 (16.5%)	126 (49.4%)	2 (0.8%)	7 (2.7%)
"Teaching should be your priority and research will not support your teaching."	4 (1.6%)	1 (0.4%)	13 (5.1%)	7 (2.7%)	21 (8.2%)	20 (7.8%)
"Teaching will not influence your research and research will not influence your teaching."	16 (6.3%)	15 (5.9%)	13 (5.1%)	32 (12.5%)	3 (1.2%)	11 (4.3%)
"Teaching and research should both be your priority because teaching will support your research."	79 (31.0%)	36 (14.1%)	57 (22.4%)	56 (22.0%)	3 (1.2%)	71 (27.8%)
"Teaching and research should both be your priority because research will support your teaching."	66 (25.9%)	27 (10.6%)	34 (13.3%)	37 (14.5%)	5 (2.0%)	44 (17.3%)
I do not have conversations about teaching or research with this person (group of people).	20 (7.8%)	69 (27.1%)	70 (27.5%)	23 (9.0%)	113 (44.3%)	55 (21.6%)

Supplemental Table 4.

Exosystem messages perceived by biology graduate students.

	College/ Academic Dean	Dean of Research	Department Chair	Departmental/ Institutional Staff	Faculty Development Director	Program Coordinator
"Research should be your priority and teaching will not support your research."	5 (2.0%)	2 (0.8%)	22 (8.6%)	16 (6.3%)	2 (0.8%)	24 (9.4%)
"Teaching should be your priority and research will not support your teaching."	0 (0.0%)	0 (0.0%)	2 (0.8%)	9 (3.5%)	2 (0.8%)	1 (0.4%)
"Teaching will not influence your research and research will not influence your teaching."	2 (0.8%)	1 (0.4%)	4 (1.6%)	5 (2.0%)	3 (1.2%)	8 (3.1%)
"Teaching and research should both be your priority because teaching will support your research."	10 (3.9%)	1 (0.4%)	25 (9.8%)	22 (8.6%)	7 (2.7%)	19 (7.5%)
"Teaching and research should both be your priority because research will support your teaching."	6 (2.4%)	3 (1.2%)	20 (7.8%)	14 (5.5%)	4 (1.6%)	12 (4.7%)
"I do not have conversations about teaching or research with this person (group of people)."	177 (69.4%)	184 (72.2%)	139 (54.5%)	110 (43.1%)	176 (69.0%)	144 (56.5%)