

Supplemental Material

CBE—Life Sciences Education

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Supplement material 1.

Version 1 of the DeSBI questionnaire. Including information from cognitive interviews

Item	Conclusions from cognitive interviews
Sense of belonging	
<p>Question prompt: Please rate your agreement with the following statements based on how you feel about the [THE NAME OF THE UNIVERSITY] biology department.</p>	<p>Prompt changed to: Please rate your agreement with the following statements based on how you feel about the Department of Biological Sciences at [THE NAME OF THE UNIVERSITY] (here called the biology department).</p>
	<p>To make each item cleaner (<i>here called the biology department</i>) was added to the prompt and [THE NAME OF THE UNIVERSITY] was removed from each item.</p>
<p>I feel like a real part of the [THE NAME OF THE UNIVERSITY] biology department.</p>	
<p>People here notice when I'm good at something.</p>	
<p>It is hard for people like me to be accepted here.</p>	
<p>Other students at the [THE NAME OF THE UNIVERSITY] biology department take my opinions seriously.</p>	
<p>Most instructors at the [THE NAME OF THE UNIVERSITY] biology department are interested in me.</p>	<p><i>Instructors change to faculty and staff.</i> Students told stories of other staff than instructors being interested in them.</p>
<p>Sometimes I don't feel as if I belong here.</p>	
<p>There's at least one instructor or other [THE NAME OF THE UNIVERSITY] biology faculty member at the department I can talk to if I have a problem.</p>	<p>Changed to: There's at least one instructor or other biology faculty or staff at the department I can talk to if I have a problem.</p>
<p>People at the [THE NAME OF THE UNIVERSITY] biology department are friendly to me.</p>	
<p>Instructors here are not interested in people like me.</p>	<p>Removed. Students didn't know how to interpret <i>people like me</i>.</p>
<p>I am included in lots of activities at the [THE NAME OF THE UNIVERSITY] biology department.</p>	
<p>I am treated with as much respect as other students.</p>	
<p>I feel very different from most other students here.</p>	<p>Removed. Ambiguous interpretation. Some students thought being different was something good and others something bad.</p>
<p>I can really be myself at the [THE NAME OF THE UNIVERSITY] biology department.</p>	
<p>The instructors here respect me.</p>	<p><i>Instructors change to faculty and staff.</i></p>

People here know I can do good work.

I wish I were in a different department

I feel proud of belonging to the [THE NAME OF THE UNIVERSITY] biology department.

Other students here like me the way I am.

Items added after the cognitive interviews.

Faculty and staff at the biology department value my opinions.

Students in the biology department help each other to succeed.

I have a good relationship with other students at the biology department.

The instructors here give me compliments when I do something good.

Faculty and staff in the biology department really want me to succeed.

Involvement

Please rate your agreement with the following statements.

During this academic year, it is likely that I will:

participate in undergraduate research in the [THE NAME OF THE UNIVERSITY] biology department.

interact closely with a [THE NAME OF THE UNIVERSITY] biology faculty member outside of class.

talk about my career plans with a [THE NAME OF THE UNIVERSITY] biology faculty member.

discuss course topics, ideas, or concepts with a [THE NAME OF THE UNIVERSITY] biology faculty member outside of class.

discuss your academic performance with a [THE NAME OF THE UNIVERSITY] biology faculty member.

discuss undergraduate research opportunities with a [THE NAME OF THE UNIVERSITY] biology faculty member.

ask for advice from a [THE NAME OF THE UNIVERSITY] biology faculty member on something other than on a research project.

attend the office hours of a [THE NAME OF THE UNIVERSITY] biology faculty member.

read a research paper from a [THE NAME OF THE UNIVERSITY] biology faculty member.

attend a research seminar by a [THE NAME OF THE UNIVERSITY] biology faculty member.

visit the lab of a [THE NAME OF THE UNIVERSITY] biology faculty member.

Unpaid and paid were added. Students were not sure about what to consider as *participate in undergraduate research*.

Outside of class was added to clarify that discussion inside class not should be considered.

Who is not my instructor was added to clarify that advices given in class not should be considered.

Item changed to *attend a seminar hosted by the biology department*. Students were unsure if the seminar were hold by a biology faculty member. It seemed easier to know who hosted the seminar.

join a biology-related student group at [THE NAME OF THE UNIVERSITY].

attend a poster on research from a [THE NAME OF THE UNIVERSITY] biology faculty member.

join a [THE NAME OF THE UNIVERSITY] biology-related volunteer work or community service.

participate in a [THE NAME OF THE UNIVERSITY] biology-related internship.

Student group changed to *student club*. The meaning of *student group* was unclear. Many students had a stronger relation to *student club*.

Removed. Many students had problems with interpreting the meaning of *a poster on research*. None had attended one.

Changed to *participate in biology-related volunteer work not connected to research* (e.g. *clean up beaches or volunteer in a state park*). Volunteer work or community service was unclear terms for the students and sometimes difficult to separate from undergraduate research.

Removed. Students had no clear perception of the word *internship*

Item added after the cognitive interviews.

get involved as a PLTL leader at the biology department.

Supplement material 2.

Correlation matrix and descriptive statistics for the sense of belonging items, biology majors, second data collection (n=201)

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21
S1	1																				
S2	.68	1																			
S3	.58	.69	1																		
S4	.01	.15	.08	1																	
S5	.49	.50	.64	.09	1																
S6	.62	.66	.63	.08	.59	1															
S7	.16	.24	.08	.53	.12	.19	1														
S8	.41	.55	.60	.17	.51	.59	.1	1													
S9	.40	.48	.59	.22	.57	.57	.25	.63	1												
S10	.37	.37	.50	.21	.55	.41	.15	.47	.66	1											
S11	.49	.40	.28	-.17	.20	.40	.03	.25	.27	.26	1										
S12	.40	.40	.56	.21	.54	.47	.21	.46	.79	.72	.23	1									
S13	.39	.38	.47	.17	.53	.43	.18	.42	.63	.61	.27	.67	1								
S14	.48	.48	.52	.23	.55	.54	.28	.52	.70	.61	.34	.69	.71	1							
S15	.35	.38	.53	.18	.55	.50	.11	.50	.70	.63	.14	.72	.56	.67	1						
S16	.48	.55	.48	.20	.38	.52	.27	.50	.63	.46	.39	.59	.30	.61	.53	1					
S17	-.05	.06	.00	.39	.09	.06	.43	.11	.15	.13	-.17	.18	.20	.24	.13	.11	1				
S18	.48	.53	.59	.11	.58	.58	.21	.65	.65	.48	.33	.50	.45	.60	.53	.49	.04	1			
S19	.41	.44	.42	.06	.46	.41	.18	.42	.59	.50	.36	.54	.64	.67	.51	.53	.28	.58	1		
S20	.36	.42	.39	.19	.52	.44	.23	.49	.58	.65	.29	.57	.68	.66	.54	.50	.21	.59	.66	1	
S21	.35	.38	.50	.17	.58	.46	.18	.49	.64	.62	.10	.68	.64	.65	.72	.58	.18	.55	.56	.63	1
Mean	3.6	3.9	4.2	4.4	4.4	3.8	4.1	4.2	4.8	4.9	3.3	4.9	4.8	4.6	5.0	4.6	4.5	4.3	5.0	4.9	5.0
SD	1.6	1.5	1.4	1.4	1.2	1.4	1.6	1.7	1.2	1.0	1.6	1.2	1.2	1.3	1.1	1.3	1.5	1.4	1.0	1.0	1.1
Skew	-0.1	-0.4	-0.8	-0.9	-0.9	-0.3	-0.6	-0.6	-1.2	-1.1	0.2	-1.5	-1.3	-1.2	-1.6	-1.1	-1.0	-.7	-1.2	-1.0	-1.6
Kurt	-1.1	-0.9	0.1	-0.2	0.7	-0.8	-0.9	-1.0	1.3	1.4	-1.1	2.4	1.5	1.0	3.1	0.9	-0.1	-0.4	1.8	1.5	3.0

Correlation matrix and descriptive statistics for the involvement scale, biology majors, second data collection (n=201)

	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13	I14	I15	I16	I17	I18
I1	1																	
I2	.69	1																
I3	.63	.84	1															
I4	.62	.86	.87	1														
I5	.55	.78	.79	.80	1													
I6	.78	.83	.83	.83	.74	1												
I7	.60	.70	.70	.71	.68	.79	1											
I8	.56	.65	.65	.68	.61	.69	.63	1										
I9	.60	.75	.68	.70	.64	.79	.73	.64	1									
I10	.60	.68	.68	.68	.71	.72	.72	.64	0.77	1								
I11	.62	.68	.62	.66	.66	.72	.68	.63	0.79	.81	1							
I12	.60	.53	.55	.54	.53	.60	.50	.58	0.59	.64	.64	1						
I13	.65	.58	.61	.61	.55	.62	.55	.57	0.57	.61	.58	.71	1					
I14	.59	.57	.53	.52	.47	.51	.52	.47	0.51	.56	.47	.50	.55	1				
I15	.58	.65	.60	.65	.56	.65	.54	.52	0.66	.61	.62	.51	.59	.47	1			
I16	.49	.54	.58	.56	.57	.56	.45	.48	0.50	.50	.57	.54	.59	.41	.75	1		
I17	.54	.49	.49	.52	.49	.56	.51	.50	0.44	.55	.59	.55	.60	.39	.64	.74	1	
I18	.45	.48	.52	.49	.51	.49	.40	.42	0.41	.45	.52	.43	.52	.34	.64	.75	.77	1
Mean	4.3	4.3	4.5	4.4	4.5	4.4	4.2	4.5	4.0	4.2	4.3	4.2	4.5	3.8	4.6	4.8	4.8	5.0
SD	1.6	1.5	1.5	1.5	1.5	1.6	1.5	1.4	1.6	1.6	1.5	1.5	1.5	1.7	1.4	1.3	1.3	1.2
Skew	-0.6	-0.6	-1.0	-0.8	-0.9	-0.8	-0.5	-0.8	-0.4	-0.5	-0.6	-0.5	-0.8	-0.1	-0.9	-1.2	-1.1	-1.2
Kurtosis	-1.0	-0.9	0.1	-0.5	0.4	-0.6	-0.9	-0.3	1.0	0.9	-0.6	-0.9	-0.4	-1.4	0.0	1.0	0.6	0.9

Supplement material 3.

Correlation matrix and descriptive statistics for the sense of belonging items, biology majors, third data collection (n=596)

	S2	S3	S5	S6	S8	S9	S10	S12	S13	S14	S15	S16	S18	S19	S20	S21
S2	1															
S3	.75	1														
S5	.60	.63	1													
S6	.44	.52	.46	1												
S8	.45	.49	.32	.45	1											
S9	.65	.48	.49	.65	.56	1										
S10	.64	.58	.38	.61	.56	.67	1									
S12	.43	.56	.45	.44	.45	.55	.49	1								
S13	.29	.33	.40	.27	.24	.46	.28	.33	1							
S14	.25	.40	.39	.26	.33	.59	.55	.31	.31	1						
S16	.28	.31	.44	.27	.27	.47	.56	.55	.31	.38	1					
S18	.44	.41	.47	.41	.36	.52	.50	.50	.62	.40	.50	1				
S15	.45	.55	.41	.43	.41	.64	.44	.60	.53	.57	.51	.46	1			
S19	.39	.39	.42	.33	.37	.53	.48	.47	.54	.62	.58	.41	.39	1		
S20	.27	.37	.51	.28	.34	.45	.51	.52	.62	.63	.51	.37	.27	.62	1	
S21	.44	.55	.39	.43	.42	.64	.45	.52	.44	.45	.69	.48	.50	.54	.49	1
Mean	3.69	4.12	4.47	3.41	4.38	4.86	4.88	5.14	5	4.72	4.92	4.05	3.93	4.12	4.95	4.95
SD	1.43	1.23	1.09	1.38	1.48	1.08	1.14	0.93	0.99	1.13	0.98	1.38	1.5	1.23	0.94	1.03
Skew	-0.2	-0.74	-0.9	0.04	-0.82	-1.4	-1.35	-1.56	-1.33	-1.15	-1.54	-0.55	-0.46	-0.74	-1.21	-1.34
Kurt	-0.92	0.14	0.71	-0.91	-0.38	2.55	2.01	3.74	2.62	1.36	3.78	-0.51	-0.9	0.14	2.32	2.34

Correlation matrix and descriptive statistics for the involvement scale, biology majors, third data collection (n=596)

	I1	I2	I3	I4	I5	I7	I8	I9	I10	I11	I12	I13	I14
I1	1												
I2	.61	1											
I3	.50	.70	1										
I4	.51	.71	.72	1									
I5	.43	.64	.68	.73	1								
I7	.40	.50	.59	.58	.59	1							
I8	.41	.48	.52	.53	.57	.47	1						
I9	.51	.49	.49	.48	.41	.48	.51	1					
I10	.47	.50	.49	.52	.49	.46	.50	.69	1				
I11	.54	.56	.52	.58	.50	.54	.47	.61	.66	1			
I12	.44	.43	.44	.45	.41	.39	.39	.37	.47	.52	1		
I13	.47	.42	.40	.39	.39	.41	.35	.41	.49	.47	.54	1	
I14	.41	.34	.22	.30	.25	.26	.28	.27	.32	.36	.36	.37	1
Mean	3.67	4.07	4.4	4.2	4.35	3.98	4.54	3.83	3.92	3.91	4.19	4.38	3.55
SD	1.57	1.43	1.4	1.4	1.36	1.56	1.29	1.46	1.43	1.54	1.52	1.42	1.57
Skew	-0.12	-0.54	-0.88	-0.68	-0.84	-0.38	-0.94	-0.31	-0.39	-0.3	-0.54	-0.72	0.02
Kurtosis	-1.18	-0.69	-0.05	-0.39	-0.02	-1.01	0.29	-0.87	-0.77	-1.04	-0.75	-0.42	-1.16