

Supplemental Material

CBE—Life Sciences Education

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Appendix A
Response rates by institution and major

	University 1 (n=295)			University 2 (n=342)			University 3 (n=484)			University 4 (n=41)		
	Sample	Populatio n	% response	Sample	Populati on	% response	Sample	Populatio n	% response	Sample	Populatio n	% response
Biology	98	412	24%	278	342	81%	170	245	69%	23	130	18%
Biochemistry	17	48	35%	0	--	--	47	65	72%	0	--	--
Chemistry	6	24	25%	64	75	85%	22	27	81%	5	25	20%
Computer Sci	102	482	21%	0	--	--	9	NR	NR	0	--	--
Math	23	178	13%	0	--	--	120	207	58%	7	39	18%
Physics	16	58	28%	0	--	--	19	41	46%	4	9	44%
Other	33	NR	NR	0	--	--	97	NR	NR	2	24	8%
Total	295	1202	25%	342	417	82%	484	696 ^a	70%	41	227	18%

Notes. NR = not reported. -- = participants not recruited from these departments. ^a Total number of students majoring across all departments except NR.

APPENDIX B

STEP-U Survey

Rate the following skills in terms of importance to you in your undergraduate education. The word *discipline*, used below, refers to your primary major field of study (e.g., chemistry, biology, mathematics).

1 (Not important), 2, 3, 4, 5 (Extremely important)

1. Working in groups
2. Writing for a scholarly or professional audience
3. Memorizing some basic facts
4. Acquiring major concepts in your discipline
5. Learning basic sets of laboratory skills
6. Understanding the evolving nature of your discipline
7. Understanding how your discipline applies to the real world
8. Remembering formulas
9. Remembering procedures or steps
10. Applying quantitative reasoning
11. Solving problems
12. Evaluating credibility of sources in your discipline
13. Locating credible primary sources
14. Understanding information presented in primary sources
15. Developing creativity and innovation
16. Developing an understanding that your discipline connects with other disciplines
17. Memorizing large quantities of information
18. Decision-making based on evidence
19. Developing oral communication skills
20. Developing entrepreneurial thinking
21. Analyzing data
22. Using software appropriate to your discipline
23. Developing Computer programming skills
24. Interpreting data
25. Designing research studies
26. Collaborating with peers
27. Drawing conclusions based on reason and evidence

In how many courses for your primary major did your instructors use these methods?

1 (Never), 2, 3 (About half of my courses), 4, 5 (In all of my courses)

1. Writing assignments (reflective writing, journals, essays, reports)
2. Extensive lecturing (more than 15 minutes per session without breaks for questions or active engagement of students)
3. Requiring you to memorize large quantities of information
4. Emphasizing major concepts or theories
5. Emphasizing the evolving nature of your discipline
6. Relating course material to the real world
7. Engaging with content during class through non-lecture activities.
8. Teaching with an approach that emphasizes that your discipline connects with other disciplines(e.g., making connections between physics and biology, between math and computer science)
9. Communicating course goals and objectives to students
10. Answering questions from individual students in class
11. Administering a pre-test at the beginning of the semester to assess your prior knowledge
12. Assigning homework that counts toward final grade

In how many courses for your primary major were you asked to engage in the following:

1 (Never), 2, 3 (About half of my courses), 4, 5 (In all of my courses)

1. Working in groups during class time
2. Working in groups outside of class time
3. Discussing and exchanging ideas with classmates during class time
4. Taking exams that allow you to bring notes or a formula sheet
5. Applying quantitative reasoning
6. Solving problems
7. Reading primary sources
8. Completing assignments/activities that require creativity and innovation
9. Oral presentations
10. Analyzing data
11. Using software appropriate for my discipline
12. Computer programming
13. Interpreting data
14. Designing research studies
15. Using evidence to support ideas

APPENDIX C

Additional analysis

Table A1 shows the regression coefficients for four additional models. Each model has one of the values factors as the outcome, with classroom experiences, research experience, major, and university as predictors. Although University 4 was excluded from the models in the main text because race, ethnicity, and gender variables were not available, it is included in these models as data was available for this set of predictors. Overall, these models perform similarly to those in the main text, with the models' adjusted R^2 differing by .02 at most. However, in order to include a richer set of covariates, we elected to present the findings for the models with Universities 1-3 in the main text and present those for the final analysis.

Table A1. Regression Model Coefficients for Values Factors Outcomes

Predictor variables	Values outcome variable											
	Research & Writing			Memorization			Conceptual & Data Application			Nature of the Discipline		
	B	SE	Semi-partial r^2	B	SE	Semi-partial r^2	B	SE	Semi-partial r^2	B	SE	Semi-partial r^2
Experiences:												
Interactive	.64***	.07	.13	.55***	.07	.07	.26***	.05	.06	.48***	.05	.11
Procedural	-.11	.07	.003	-.07	.07	.001	.14**	.05	.01	.01	.04	0
Research experience	.20**	.07	.01	-.02	.07	0	.05**	.02	.002	-.02	.03	0
Major:												
Other	-.16	.09	.07	.28*	.14	.02	.10***	.02	.05	.10***	.02	.01
Biochemistry	.26**	.08	--	-.06	.04	--	.15***	.01	--	.17***	.02	--
Chemistry	.26***	.05	--	-.21	.13	--	.19***	.02	--	.13	.07	--
Comp. Sci.	-.84***	.14	--	-.07	.21	--	-.38***	.07	--	-.13	.08	--
Math	-.56**	.20	--	.35*	.15	--	.02	.04	--	-.11**	.04	--
Physics	.07	.10	--	-.25	.16	--	.09	.05	--	-.06	.09	--
University:												
University 2	-.10	.07	.01	.32***	.06	.01	-.13***	.02	.01	-.21***	.02	.01
University 3	.16***	.02	--	.11***	.02	--	-.11***	.02	--	-.05***	.01	--
University 4	-.13*	.05	--	.45***	.02	--	-.12***	.02	--	-.26***	.01	--
Adjusted R^2	.45	--	--	.13	--	--	.20	--	--	.21	--	--

Note: Standard errors are cluster-robust standard errors. Biology was the reference category for Major. For all models, n = 1162. University 1 is the reference category for University. Significant * $p < .05$ ** $p < .01$ *** $p < .001$