CURE Benchmarks 2015-2018

Readers are free to use the statistics to make comparisons to their own data.
Questions should be directed to David Lopatto (lopatto@grinnell.edu).
I am grateful to Leslie Jaworski for her outstanding work on the survey program.
For this document we follow the format of the reports we shared over the years.

The CURE survey offers a comparison of learning benefits between course experiences and undergraduate research experiences. The pre-course survey collects student data based upon demographic questions, reasons for taking the course, level of experience on various course elements, science attitudes, and learning style. The post-course survey parallels the pre-course survey and includes additional questions that focus on student estimates of learning gains in specified course elements, estimates of learning benefits that parallel questions in the SURE surveys, overall evaluation of the experience, and science attitudes.

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CURE Report 2015-2018
Overall aggregate results for matched pre- and post-CURE surveys.

	All Students*
N**	18062

** The data from "all students" in this report are matched surveys (pre- and post) obtained from the CURE Survey between Jan 1, 2015 - May 13, 2018.*

*** N represents the total number of respondents. Note that not every respondent answered each question in the survey, resulting in Ns smaller than the total (participation) postcourse N. In such instances, the total is represented by a lower case n.*

Demographics

° Pre-survey results for demographics are listed. Although data is matched, post-survey statistics may have changed due to missing data.

All Students		**Gender**
PreCourse°	%	
6298	35.4%	**Male**
11512	64.6%	**Female**
n 17810		

All Students		**Ethnicity**
PreCourse	%	
4	0.0%	**Alaskan Native**
124	0.7%	**American Indian**
2068	11.7%	**Asian American**
1260	7.1%	**Black or African American**
171	1.0%	**Filipino**
270	1.5%	**Foreign National**
9	0.1%	**Hawaiian**
1754	9.9%	**Hispanic/Latino**
30	0.2%	**Pacific Islander**
10492	59.5%	**White**
967	5.5%	**Two or more races**
489	2.8%	**Other**
n 17638		

	Your Students		Current Status
	PreCourse	%	
	80	0.4%	**High School**
	6103	34.1%	**First-year college student**
	4547	25.4%	**Second-year college student**
	3496	19.5%	**Third-year college student**
	3182	17.8%	**Fourth-year college student**
	123	0.7%	**Graduate or medical student**
	358	2.0%	**Other**
n	17889		

Academic Information

	Your Students			Declared Major
	PreCourse	PostCourse	%	
	14882	15543	87.4%	**Yes**
	2931	2231	12.5%	**No**
n	17813	17778		

	Your Students			Considering Science Major
	PreCourse	PostCourse	%	*(excludes those already science majors)*
	1799	1357	60.6%	**Definitely yes**
	739	477	21.3%	**It is likely**
	203	213	9.5%	**I'm not sure**
	90	111	5.0%	**It is unlikely**
	55	80	3.6%	**Definitely no**
n	2886	2238		

PreCourse Survey: Post-Graduate Plans

All Students	%	
2163	12.7%	**Grad school for Ph.D. in biology field**
437	2.6%	**Grad school for Ph.D. in physical science field**
1193	7.0%	**Grad school for Masters in life science**
611	3.6%	**Grad school for Masters in physical science**
588	3.5%	**Grad School for Ph.D. or Masters in social science**
86	0.5%	**Grad school for Ph.D. or Masters in humanities or fine arts**
244	1.4%	**Earn certification or degree to qualify for teaching**
4753	27.9%	**Go to school for a medical degree (M.D.)**
2483	14.6%	**Go to school for an M.D./PhD.**
3021	17.8%	**Go to school for other health professions**
436	2.6%	**Go to grad school for professional degree other than above (such as law)**
999	5.9%	**No graduate education in near future**
n 17014		

PostCourse Survey: Post-Graduate Plans

Your Students	%	
1810	11.4%	**I have not considered post-graduate education**
436	2.8%	**I now plan NOT to pursue post-graduate education**
3163	20.0%	**I now plan to pursue a Master's degree in science field**
3409	21.5%	**I now plan to pursue a Doctoral degree in science field**
659	4.2%	**I now plan to pursue a Master's degree in non-science field**
241	1.5%	**I now plan to pursue a Doctoral degree in non-science field**
5881	37.1%	**I now plan to pursue a medical degree**
255	1.6%	**I now plan to pursue a law, architectural, or other degree**
n 15854		

PreCourse Survey: Reasons for Taking Course

10 reasons for taking a course **1 = Not important, 3 = very important**

Your Students

Level of Importance				
Not	***Moderate***	***Very***	N*	
3453	4975	7156	*15584*	**To fill a distribution requirement**
1742	2652	12723	*17117*	**To fill a requirement for my major**
2550	3817	10078	*16445*	**I need it for graduate or professional school**
2650	5022	9057	*16729*	**I need it for my desired employment after college**
1268	6197	10132	*17597*	**Interest in the subject matter**
2415	6447	8552	*17414*	**To learn lab techniques**
1488	5943	10155	*17586*	**To learn about science and the research process**
1698	4847	10581	*17126*	**To get hands-on research experience**
5561	6635	4757	*16953*	**It fit in my schedule**
3470	6823	6452	*16745*	**The course and/or the instructor has a good reputation**

** Each student was asked to rate each reason for taking the course.*

Course Elements

25 items about course elements

On the pre-course survey, students were asked to assess their prior experience on each element. They were asked to rate their experience on a scale where 1 means no experience or that the student feels inexperienced and 5 means much experience or that the student feels that she or he has mastered the element. These data are most useful, first, descriptively, and second, as covariates that aid in the interpretation of other data. On the post-course survey, the students were asked to "rate the gains you may have made as a result of taking this course." The 5-point scale, where 1 = no or very small gain to 5 = very large gain, is consistent with the scale used to rate other learning gains.
Means are used to represent the data.

	All Students			
	PreCourse	PostCourse		
SD	Experience	Gain	SD	
0.90	3.48	3.36	1.05	**Scripted lab or project where students know outcome**
0.89	3.31	3.45	1.05	**Lab or project where only instructor knows outcome**
1.09	2.48	3.51	1.21	**Lab or project where no one knows the outcome**
0.88	3.66	3.74	0.95	**A least one project assigned and structured by instructor**
1.03	2.98	3.92	1.00	**A project where students have input into process or topic**
1.14	2.48	3.60	1.20	**A project entirely of student design**
1.02	3.62	3.43	1.10	**Work individually**
1.02	3.14	3.29	1.14	**Work as a whole class**
0.75	3.88	3.96	0.95	**Work in small groups**
0.84	3.83	4.01	0.94	**Become responsible for a part of the project**
1.06	3.13	3.72	1.11	**Read primary scientific literature**
1.15	2.49	3.56	1.21	**Write a research proposal**
0.87	3.68	4.01	0.96	**Collect data**
0.87	3.59	4.11	0.91	**Analyze data**
1.04	3.15	3.70	1.17	**Present results orally**
0.97	3.43	3.83	1.07	**Present results in written papers or reports**
1.11	2.90	3.37	1.32	**Present posters**
1.03	2.94	3.34	1.19	**Critique work of other students**
0.83	4.09	3.61	1.11	**Listen to lectures**
0.81	4.07	3.10	1.25	**Read a textbook**
0.90	3.88	3.45	1.19	**Work on problem sets**
0.71	4.22	3.36	1.19	**Take tests in class**
0.81	3.94	3.59	1.13	**Discuss reading materials in class**
1.03	3.62	3.60	1.20	**Maintain lab notebook**
1.09	2.30	3.12	1.25	**Computer modeling**

PostCourse Survey: Benefits

21 items about learning gains

The learning gain items below are the same as a list of gains students assess when they complete the SURE survey, an assessment of summer undergraduate research experiences. The parallel between the two surveys permits an analysis of how well the course experience emulates the gains of a research experience. A consistent result is that CURE means on most items, except for writing and ethics, are lower than SURE means. In addition, courses with a research-like component yield means higher than courses with no research-like component. The means shown for the benchmark on the right are for all CURE participants, regardless of course. The scale is 1 to 5, with 5 being the largest gain. These items appear only on the post-course survey. *Means are used to represent the data.*

	All Students	SURE 2012-2018		
SD	**n≤17680**	**n≤3281**	**SD**	
1.22	3.13	3.26	1.10	**Clarification of a career path**
0.98	3.70	3.60	0.96	**Skill in interpretation of results**
1.00	3.67	3.80	0.94	**Tolerance for obstacles faced in the research process**
1.04	3.59	3.71	0.94	**Readiness for more demanding research**
1.01	3.60	3.55	0.98	**Understanding how knowledge is constructed**
1.06	3.66	3.84	0.94	**Understanding the research process**
1.01	3.61	3.54	0.98	**Ability to integrate theory and practice**
1.00	3.75	3.75	0.97	**Understanding how scientists work on real problems**
1.01	3.78	3.50	1.14	**Understanding that scientific assertions require supporting evidence**
0.96	3.86	3.66	1.03	**Ability to analyze data and other information**
0.99	3.77	3.49	1.08	**Understanding science**
1.18	3.38	3.21	1.22	**Learning ethical conduct**
1.05	3.86	3.66	1.26	**Learning laboratory techniques**
1.12	3.56	3.48	1.14	**Ability to read and understand primary literature**
1.23	3.36	3.35	1.22	**Skill in how to give an effective oral presentation**
1.13	3.53	3.14	1.18	**Skill in science writing**
1.17	3.43	3.40	1.15	**Self-confidence**
1.05	3.60	3.45	1.05	**Understanding how scientists think**
1.13	3.48	3.60	1.11	**Learning to work independently**
1.09	3.61	3.50	1.11	**Becoming part of a learning community**
1.27	3.11	3.05	1.26	**Confidence in my potential as a teacher**

Attitudes about Science

22 questions about science

These items appear on both the pre-course survey and the post-course survey. The scale is 1 (strongly disagree) to 5 (strongly agree). We have not found large changes from pre- to post-course survey. Note that 5 items are printed in italics. In exploratory factor analysis these 5 items load on a factor that we have named "engagement". Engagement scores, whether pre-course or post-course, have correlated in our first findings with higher reported learning gains and a greater likelihood to declare a science major. *Means are used to represent the data.*

All Students		
PreCourse	PostCourse	
4.11	4.22	*Even if I forget the facts, I'll still be able to use thinking skills learned in science*
3.38	3.41	You can rely on scientific results to be true and correct
3.99	4.03	*The process of writing in science is helpful for understanding scientific ideas*
2.95	3.12	When scientific results conflict with my personal experience, I follow my experience in making choices
2.25	2.45	Students who do not major/concentrate in science should not have to take science courses
2.88	2.88	I wish science instructors would just tell us what we need to know so we can learn it
1.84	2.05	Creativity does not play a role in science
1.96	2.17	Science is not connected to non-science fields such as history, literature, economics, or art
2.94	3.07	When experts disagree on a science question, it's because they don't know all the facts yet
4.24	4.21	*I get personal satisfaction when I solve a scientific problem by figuring it out myself*
2.66	2.78	Since nothing in science is known for certain, all theories are equally valid
3.19	3.21	Science is essentially an accumulation of facts, rules, and formulas
4.04	4.06	*I can do well in science courses*
3.03	3.26	Real scientists don't follow the scientific method in a straight line

Attitudes about Science (cont.)

All Students		
PreCourse	PostCourse	
2.68	2.77	There is too much emphasis in science classes on figuring things out for yourself
2.41	2.58	Only scientific experts are qualified to make judgments on scientific issues
1.95	2.17	Scientists know what the results of their experiments will be before they start
4.12	4.13	*Explaining science ideas to others has helped me understand the ideas better*
3.28	3.39	Main job of the instructor is to structure the work so that we can learn it ourselves
2.84	2.84	Scientists play with statistics to support their own ideas
3.74	3.71	Lab experiments are used to confirm information studied in science class
1.83	1.97	If an experiment shows that something doesn't work, the experiment was a failure

PostCourse Survey: Overall Assessment

These four questions serve as an overall assessment of the course. Note that the scale is 1 (strongly disagree) to 5 (strongly

All Students	**SD**	
4.15	0.93	**This course was a good way of learning about the subject**
4.22	0.90	**This course was a good way of learning about the process of scientific research**
4.01	1.07	**This course had a positive effect on my interest in science**
4.21	0.94	**I was able to ask questions in this class and get helpful responses**