Fall 2009 CURE Report

A Collaborative Project Funded by HHMI

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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Summary for **Washington & Jefferson College** (BIO 319)

	Your Students		*All Students**	
	PreCourse	PostCourse	PreCourse	PostCourse
N**	8	6	1286	949

** The data from "all students" in this report was obtained from the CURE Survey between August 25, 2009 - January 4, 2010.*

*** 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

Gender

	Your Students		*All Students*		
	PreCourse	PostCourse	PreCourse	PostCourse	
	6	4	508	397	**Male**
	1	2	723	531	**Female**
n	7	6	1231	928	

Ethnicity

	Your Students		*All Students*		
	PreCourse	PostCourse	PreCourse	PostCourse	
	0	0	1	0	**Alaskan Native**
	0	0	7	10	**American Indian**
	0	0	n.a.	n.a.	**Asian American**
	0	0	30	28	**Black or African American**
	0	0	29	19	**Filipino**
	0	0	35	23	**Foreign National**
	0	0	8	8	**Hawaiian**
	0	0	268	105	**Hispanic/Latino**
	0	0	31	25	**Pacific Islander**
	6	6	550	429	**White**
	0	0	97	76	**Two or more races**
	0	0	138	159	**Other**
n	6	6	1194	882	

	Your Students		All Students		Current Status
	PreCourse	PostCourse	PreCourse	PostCourse	
	0	0	0	2	**High School**
	0	0	348	285	**First-year college student**
	0	0	259	253	**Second-year college student**
	4	3	264	173	**Third-year college student**
	2	3	329	192	**Fourth-year college student**
	0	0	8	10	**Graduate or medical student**
	1	0	27	17	**Other**
n	7	6	1235	932	

Academic Information

	Your Students		All Students		Declared Major
	PreCourse	PostCourse	PreCourse	PostCourse	
	8	6	1090	803	**Yes**
	0	0	156	135	**No**
n	8	6	1246	938	

	Your Students		All Students		Considering Science Major
	PreCourse	PostCourse	PreCourse	PostCourse	*(excludes those already science majors)*
	0	0	98	82	**Definitely yes**
	0	0	45	34	**It is likely**
	0	0	10	9	**I'm not sure**
	0	0	2	4	**It is unlikely**
	0	0	1	3	**Definitely no**
n	0	0	156	132	

PreCourse Survey: Post-Graduate Plans

	Your Students	All Students	%	
	4	172	14.3%	**Grad school for Ph.D. in biology field**
	0	33	2.7%	**Grad school for Ph.D. in physical science field**
	1	73	6.0%	**Grad school for Masters in life science**
	0	29	2.4%	**Grad school for Masters in physical science**
	0	33	2.7%	**Grad School for Ph.D. or Masters in social science**
	0	2	0.2%	**Grad school for Ph.D. or Masters in humanities or fine arts**
	0	24	2.0%	**Earn certification or degree to qualify for teaching**
	0	394	32.6%	**Go to school for a medical degree (M.D.)**
	0	239	19.8%	**Go to school for an M.D./PhD.**
	0	133	11.0%	**Go to school for other health professions**
	1	31	2.6%	**Go to grad school for professional degree other than above (such as law)**
	2	44	3.6%	**No graduate education in near future**
n	8	1207		

PostCourse Survey: Post-Graduate Plans

	Your Students	All Students	%	
	2	64	8.0%	**I have not considered post-graduate education**
	0	22	2.8%	**I now plan NOT to pursue post-graduate education**
	0	134	16.8%	**I now plan to pursue a Master's degree in science field**
	3	182	22.8%	**I now plan to pursue a Doctoral degree in science field**
	1	19	2.4%	**I now plan to pursue a Master's degree in non-science field**
	0	17	2.1%	**I now plan to pursue a Doctoral degree in non-science field**
	0	350	43.8%	**I now plan to pursue a medical degree**
	0	12	1.5%	**I now plan to pursue a law, architectural, or other degree**
n	6	800		

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*	
3	1	3	*7*	**To fill a distribution requirement**
0	2	6	*8*	**To fill a requirement for my major**
2	1	4	*7*	**I need it for graduate or professional school**
2	1	4	*7*	**I need it for my desired employment after college**
1	2	5	*8*	**Interest in the subject matter**
2	1	4	*7*	**To learn lab techniques**
2	1	4	*7*	**To learn about science and the research process**
0	2	5	*7*	**To get hands-on research experience**
2	3	3	*8*	**It fit in my schedule**
0	3	5	*8*	**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.

Your Students		***All Students***		
PreCourse Experience	PostCourse Gain	PreCourse Experience	PostCourse Gain	
3.63	3.60	3.48	3.15	**Scripted lab or project where students know outcome**
3.38	3.60	3.34	3.29	**Lab or project where only instructor knows outcome**
2.88	3.83	2.46	3.39	**Lab or project where no one knows the outcome**
4.00	3.80	3.58	3.50	**A least one project assigned and structured by instructor**
3.00	4.33	2.92	3.87	**A project where students have input into process or topic**
3.00	4.50	2.43	3.61	**A project entirely of student design**
3.25	3.17	3.55	3.40	**Work individually**
3.00	3.67	3.06	3.07	**Work as a whole class**
3.88	4.00	3.78	3.77	**Work in small groups**
3.88	4.20	3.75	3.89	**Become responsible for a part of the project**
3.88	4.17	3.01	3.58	**Read primary scientific literature**
3.25	4.17	2.54	3.58	**Write a research proposal**
3.75	4.17	3.68	3.83	**Collect data**
3.63	4.00	3.59	3.97	**Analyze data**
3.50	4.17	3.21	3.52	**Present results orally**
3.63	4.00	3.55	3.87	**Present results in written papers or reports**
3.50	4.00	3.04	3.08	**Present posters**
3.25	3.50	2.94	3.30	**Critique work of other students**
3.86	3.50	4.01	3.56	**Listen to lectures**
4.14	3.40	4.08	3.21	**Read a textbook**
3.38	3.50	3.82	3.45	**Work on problem sets**
4.25	3.67	4.17	3.29	**Take tests in class**
4.00	3.83	3.81	3.61	**Discuss reading materials in class**
3.63	3.60	3.63	3.43	**Maintain lab notebook**
2.50	3.50	2.37	3.08	**Computer modeling**

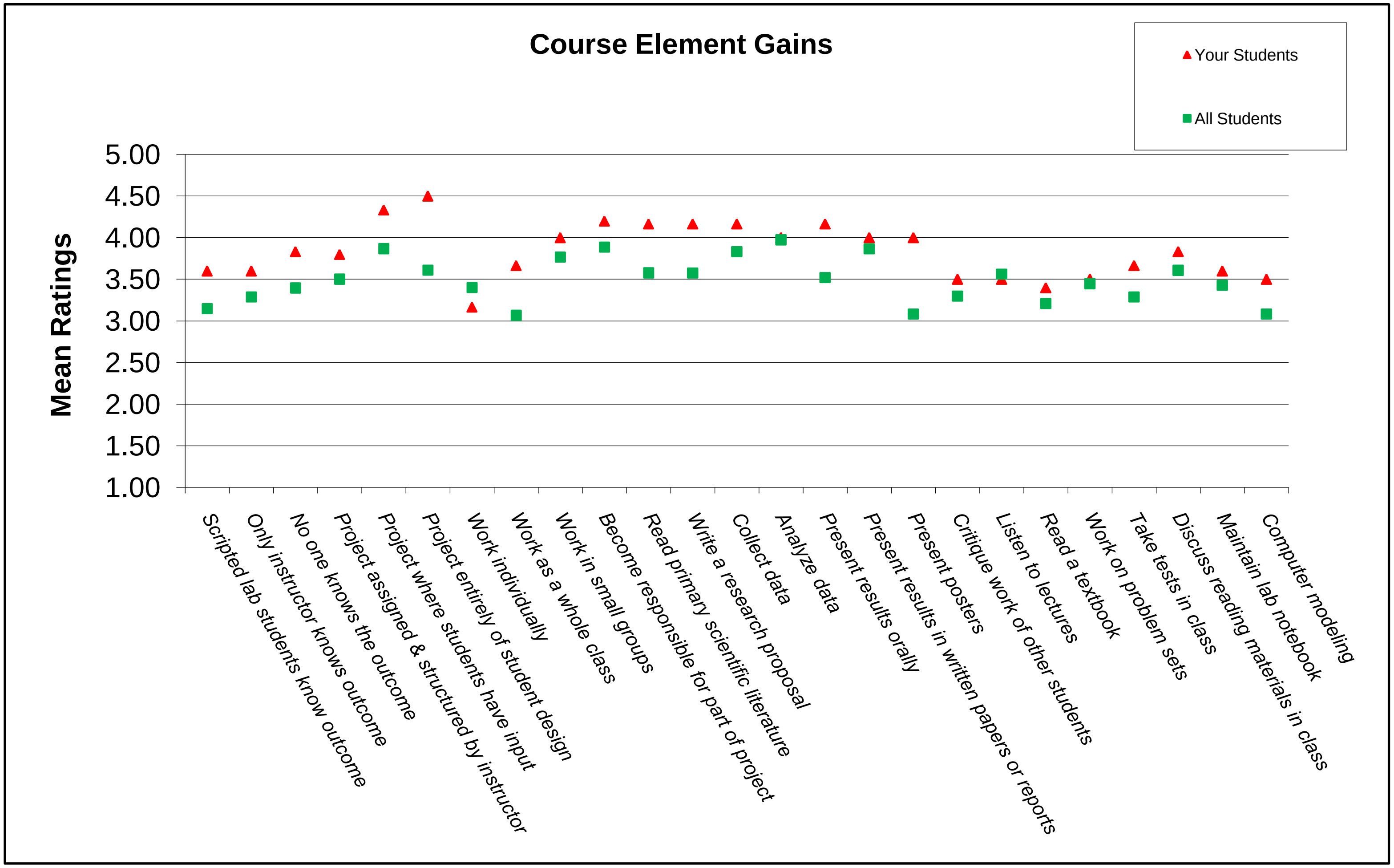

Figure 1. The figure illustrates the mean ratings by students of gains in 25 areas corresponding to the course elements above.

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.*

Your Students	***All Students***	**SD**	
n≤6	**n≤895**		
3.80	3.06	1.15	**Clarification of a career path**
3.83	3.54	0.99	**Skill in interpretation of results**
4.00	3.54	1.00	**Tolerance for obstacles faced in the research process**
3.83	3.48	1.03	**Readiness for more demanding research**
3.67	3.49	1.00	**Understanding how knowledge is constructed**
4.00	3.51	1.03	**Understanding the research process**
3.83	3.48	0.99	**Ability to integrate theory and practice**
4.17	3.61	1.02	**Understanding how scientists work on real problems**
4.17	3.63	1.04	**Understanding that scientific assertions require supporting evidence**
4.33	3.73	0.96	**Ability to analyze data and other information**
4.33	3.59	1.01	**Understanding science**
3.67	3.20	1.16	**Learning ethical conduct**
3.67	3.66	1.09	**Learning laboratory techniques**
4.50	3.49	1.09	**Ability to read and understand primary literature**
4.00	3.14	1.22	**Skill in how to give an effective oral presentation**
4.17	3.52	1.08	**Skill in science writing**
4.00	3.25	1.18	**Self-confidence**
3.83	3.42	1.08	**Understanding how scientists think**
3.83	3.39	1.11	**Learning to work independently**
3.67	3.43	1.12	**Becoming part of a learning community**
3.00	2.98	1.25	**Confidence in my potential as a teacher**

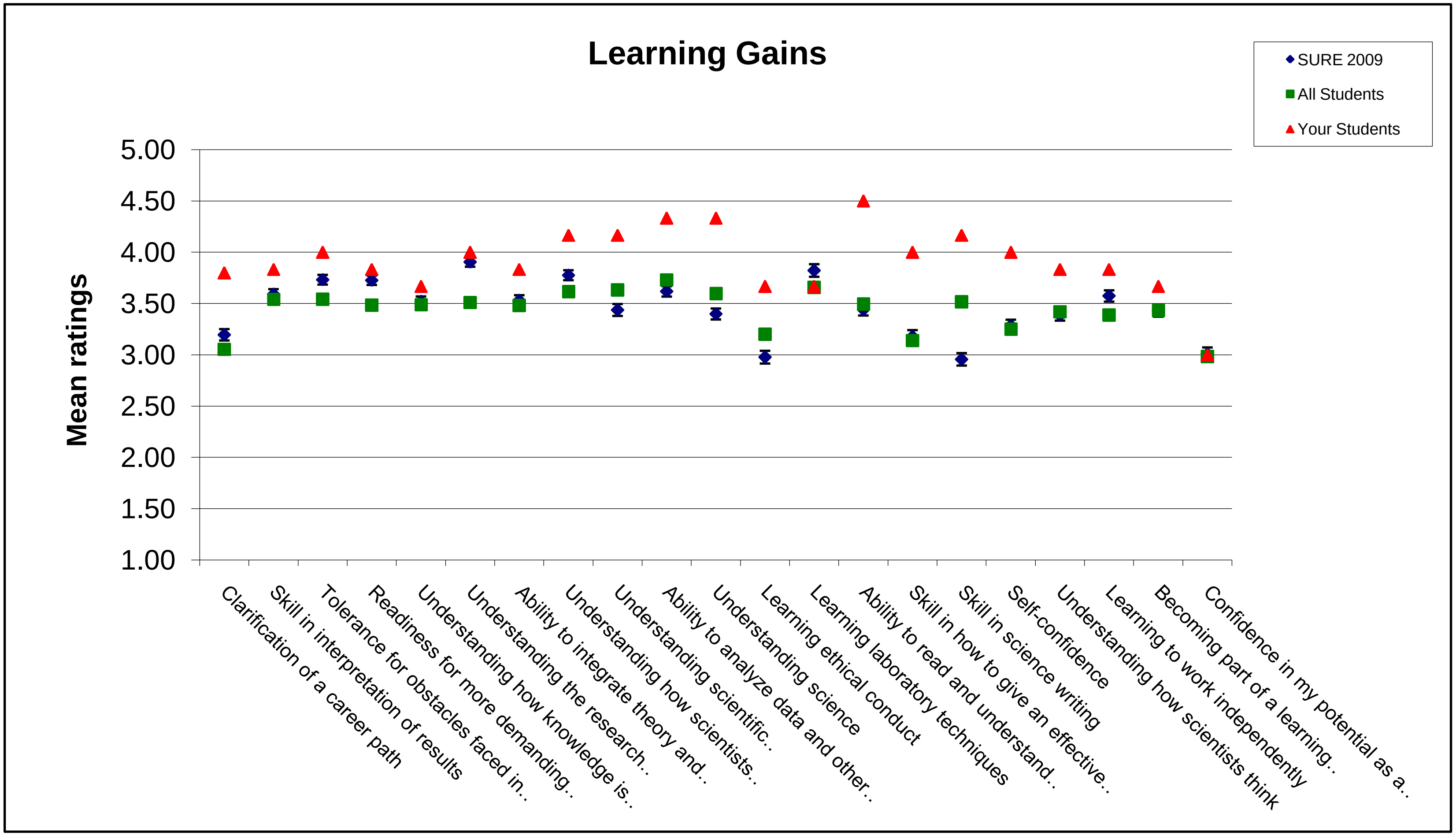

Figure 2. The figure illustrates the mean ratings by students of gains in 21 areas, corresponding to the areas above. As these same items are evaluated by students who participate in summer undergraduate research, the recent results of the Summer Undergraduate Research Experience (SURE) survey are presented for reference. Also presented (green squares) are the overall mean ratings by the reference cohort of students who completed the CURE survey in the fall of 2009. The vertical lines around the SURE means represent 2 standard errors above and below. *Note:* Data from students who completed the pre-course survey and those who did not are indistinguishable.

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.*

Your Students		***All Students***		
PreCourse	PostCourse	PreCourse	PostCourse	
4.29	4.33	4.06	4.14	*Even if I forget the facts, I'll still be able to use thinking skills learned in science*
3.29	3.33	3.22	3.22	You can rely on scientific results to be true and correct
4.00	4.17	3.92	3.98	*The process of writing in science is helpful for understanding scientific ideas*
3.00	3.17	3.10	3.16	When scientific results conflict with my personal experience, I follow my experience in making choices
2.71	2.50	2.26	2.39	Students who do not major/concentrate in science should not have to take science courses
2.71	2.67	2.89	2.96	I wish science instructors would just tell us what we need to know so we can learn it
1.57	2.17	1.88	2.05	Creativity does not play a role in science
1.57	2.83	2.03	2.15	Science is not connected to non-science fields such as history, literature, economics, or art
2.43	2.67	2.93	3.06	When experts disagree on a science question, it's because they don't know all the facts yet
4.14	4.33	4.24	4.22	*I get personal satisfaction when I solve a scientific problem by figuring it out myself*
2.43	2.50	2.67	2.64	Since nothing in science is known for certain, all theories are equally valid
3.14	3.33	3.12	3.06	Science is essentially an accumulation of facts, rules, and formulas
3.29	4.17	4.02	3.99	*I can do well in science courses*
3.14	2.83	3.09	3.27	Real scientists don't follow the scientific method in a straight line

Attitudes about Science (cont.)

Your Students		***All Students***		
PreCourse	PostCourse	PreCourse	PostCourse	
2.43	2.17	2.63	2.76	There is too much emphasis in science classes on figuring things out for yourself
2.14	2.33	2.34	2.47	Only scientific experts are qualified to make judgments on scientific issues
1.43	2.17	1.92	2.09	Scientists know what the results of their experiments will be before they start
4.00	4.33	4.10	4.10	*Explaining science ideas to others has helped me understand the ideas better*
3.29	3.67	3.28	3.36	Main job of the instructor is to structure the work so that we can learn it ourselves
3.14	2.83	2.93	2.91	Scientists play with statistics to support their own ideas
3.57	4.33	3.75	3.65	Lab experiments are used to confirm information studied in science class
1.86	1.83	1.83	1.89	If an experiment shows that something doesn't work, the experiment was a failure

Learning style items

10 pairs of statements

The pre-course survey included 10 self-descriptive items derived from a brief learning style survey published by Romero et al. Each item contained pairs of statements, and the student was to use a 1-6 scale to describe how closely one or the other statement described him or her. Two scales, one a dimension of concrete-abstract information preference and one a dimension of reflective-active learning preference were scored. The diagram below describes the names given to four kinds of learning styles and the majors typically associated with them. We are currently exploring the possible relations between this information and other information from the surveys. See Romero, Tepper, and Tetrault (1992). Development and validation of new scales to measure Kolb's learning style dimensions. *Educational and Psychological Measurement* , 52, 171-180.

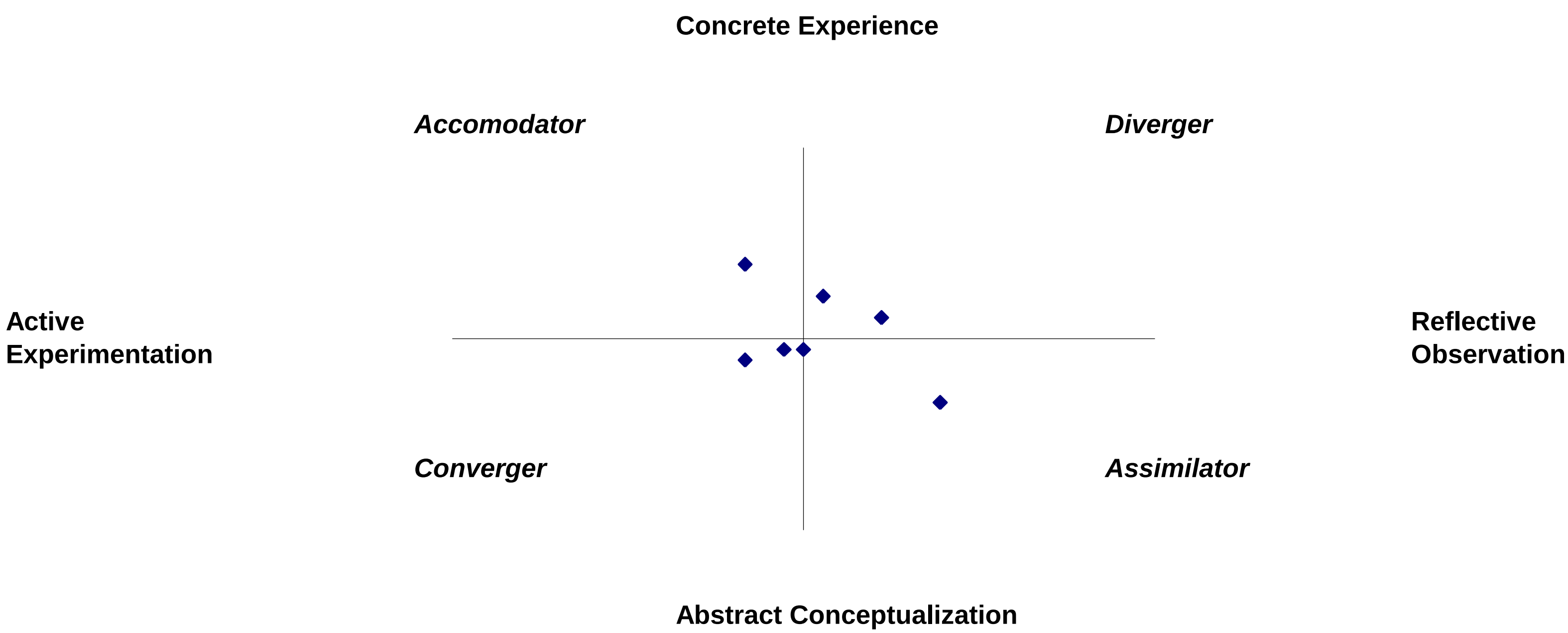

Figure 2. The two dimensions of learning style, with typical majors suggested by Romero, et al. In that report, science majors tended to score in the "Assimilator" or "Converger" quadrants.

Learning Style Quadrants

	Your Students	*All Students*	%	
	2	248	21.5%	**Divergers**
	2	281	24.4%	**Assimilators**
	2	399	34.6%	**Convergers**
	1	226	19.6%	**Accomodators**
n	7	1154		

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 agree). The questions are on the post-course survey only. *Means are used to represent the data.*

Your Students	*All Students*	SD	
4.67	3.95	1.00	**This course was a good way of learning about the subject**
4.17	3.99	1.01	**This course was a good way of learning about the process of scientific research**
4.17	3.73	1.11	**This course had a positive effect on my interest in science**
4.67	4.02	1.04	**I was able to ask questions in this class and get helpful responses**

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