BIO-REU Second Year Report: Summary

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The *Undergraduate Research Student Self Assessment* (URSSA) for Summer 2010 and Summer 2011 is summarized in this report with:

- Comparisons between 2010 and 2011 BIO REU programs
- Comparisons with other students taking URSSA
- Results for demographic groups taking the survey
- Self-identified benefits of REU's
- Ratings of student satisfaction

Other questions from the survey ask students to report their research activities, how they learned about their REU program, and if the program changed future educational or vocational plans.

What is URRSA?

The *Undergraduate Research Student Self Assessment* is a survey for students in Research Experiences for Undergraduates (REU) programs. The biggest users of URSSA are organizations like BIO-REU where undergraduates participate in REU's at multiple institutions.

The survey has 132 questions in 17 sections. Students rate the first four groups of questions on how much they gained in skills, understandings, and attitudes during their research experience. Students also answer questions about their research activities, their satisfaction with the program, their motivation for joining REU's, and other demographic information. Students respond anonymously to the survey online at Salgsite.org.

How is URSSA used by the BIO-REU program?

BIO-REU administrators receive both *descriptive* and *comparative* information about their program.

We *describe* student ratings of their gains in understandings and skills, how many students participated in research activities (such as attending conferences), and ratings of satisfaction with program activities and mentors. Students also answered open-ended questions about the benefits of the REU experience and their plans for the future after graduating.

Comparisons are made with the four core sections of URSSA. We developed these questions from extensive interviews with REU students. These indicators assess what students gain and benefit from participation in REUs. Core areas include *Thinking and Working Like a Scientist*, *Personal Gains*, *Skills* and *Scientific Attitudes and Behaviors.* We compared averages of items from these sections with the national pool of over 1200 students. To make fair comparisons, we adjusted scores for differences in demographics and other characteristics of students and institutions.

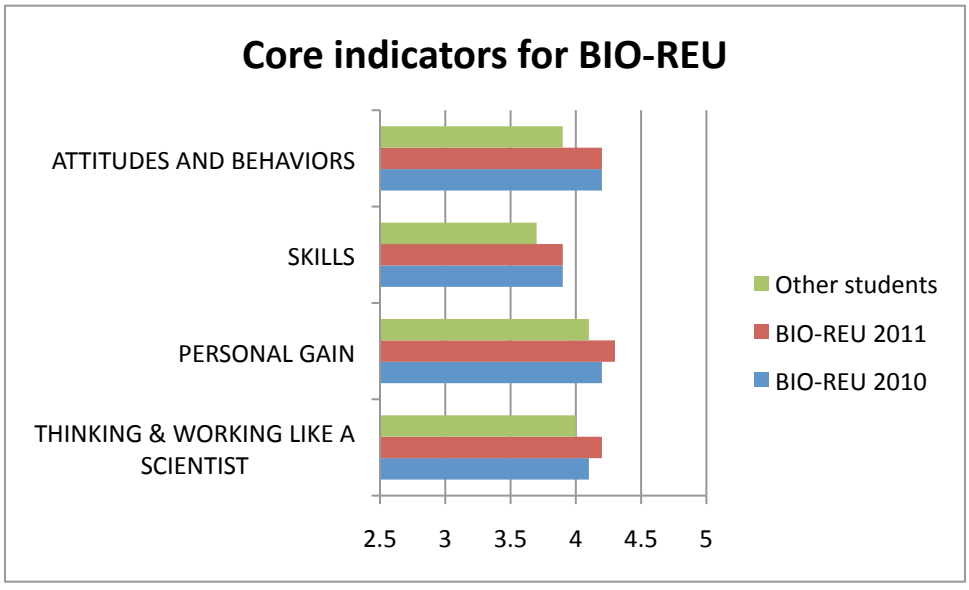
Who took URSSA?

Two-hundred and –thirty-two (232) students at 23 institutions took URSSA during Summer 2010; in 2011 this number more than doubled to 538 students at 43 institutions. Some institutions had students at multiple laboratories taking the survey. Of the 61 institutional sites taking URSSA in 2011, 26 sites repeated the administration and 35 took the survey for the first time in 2011.

During 2010, 64% of the students were either Juniors or Seniors. Students were 46% White, 20% African-American and 17% Hispanic. A majority of the students were female (61%). Student characteristics changed little during 2011 with 59% either Junior or Senior, with 46% White and 62% female.

What did the core indicators on URSSA show for 2010 and 2011?

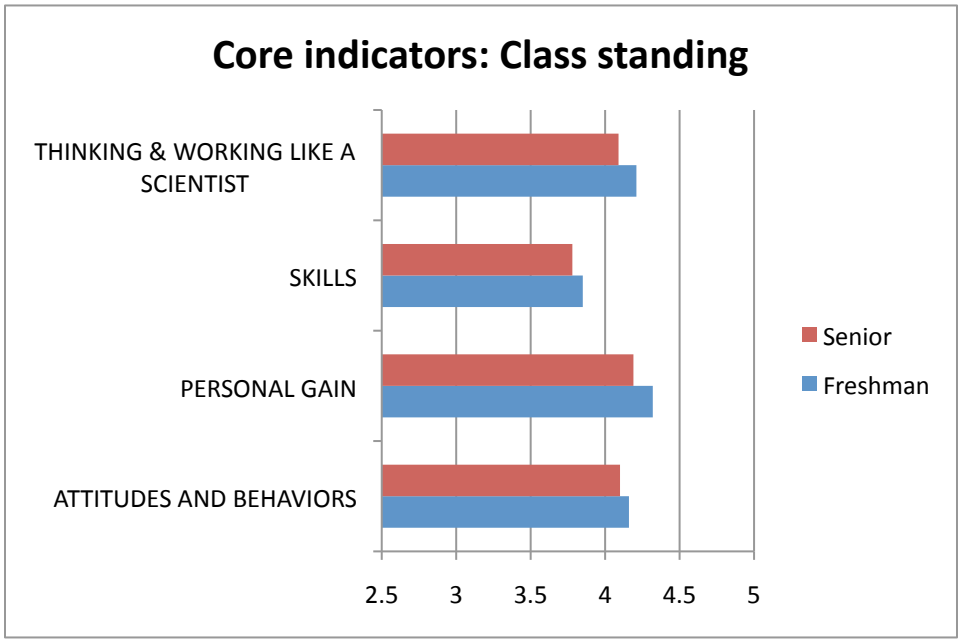
The core indicators for URSSA are averages (on a scale of 1-5) of student ratings in four areas. (See last page for items in each category). When we compared averages with the larger pool of URSSA users, we found statistically significant differences favoring BIO-REU groups on all core indicators. Although students did better on several indicators in 2011, no statistically significant differences were seen between 2010 - 2011 for the BIO-REU group.



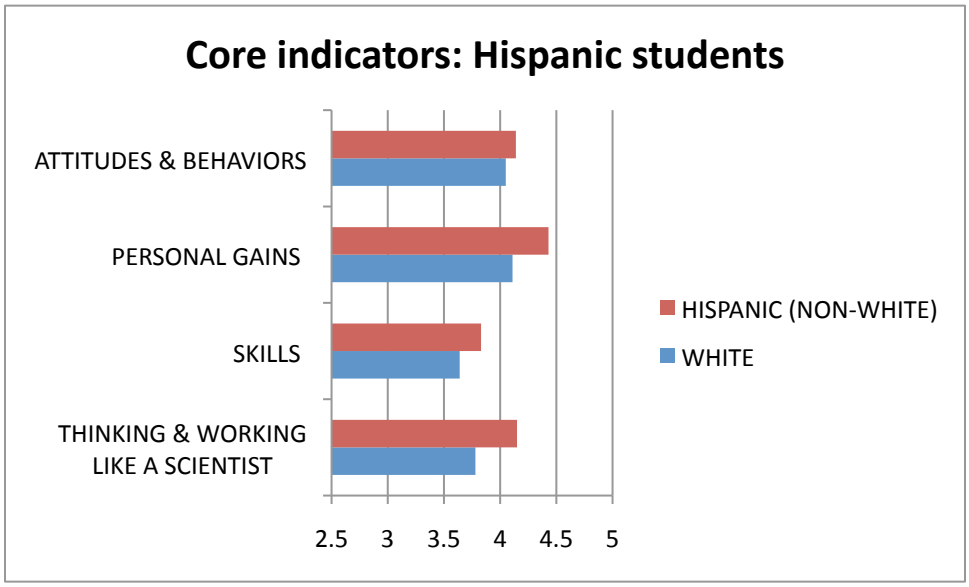
Did some groups gain more than others on core indicators?

We saw statistically significant differences between some of the groups taking the survey:

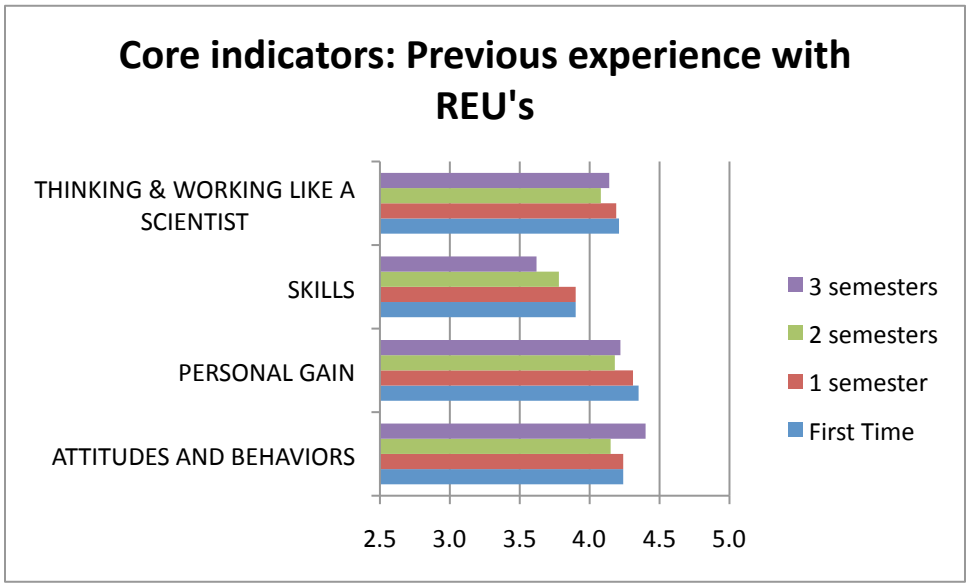
- First year students gained more on *Personal Gains* than Seniors.



- Hispanic students reported gaining more than Whites on all core indicators.

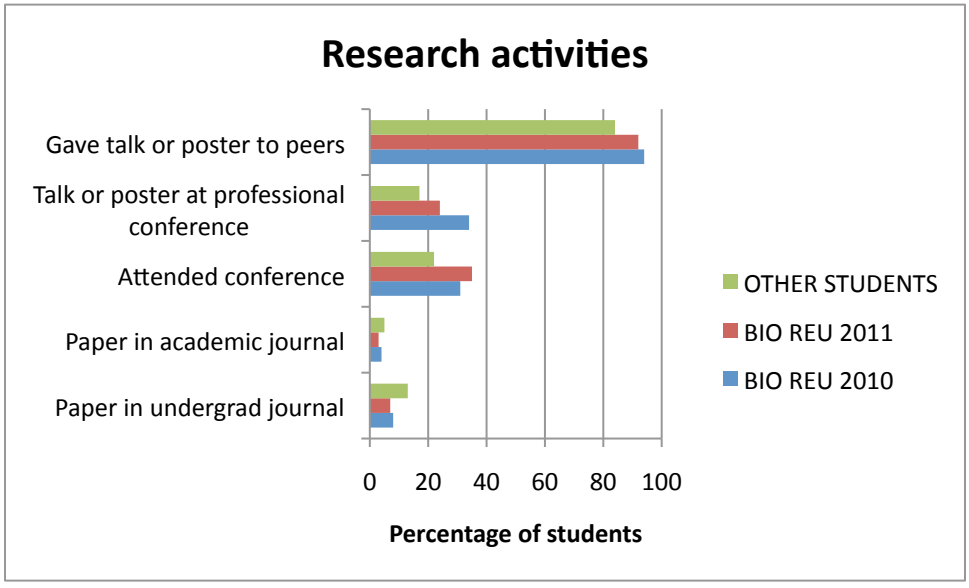


- Students who never participated in previous REU's ("first time students") said they gained more on the *Skills* indicator than students who had attended three or more times.



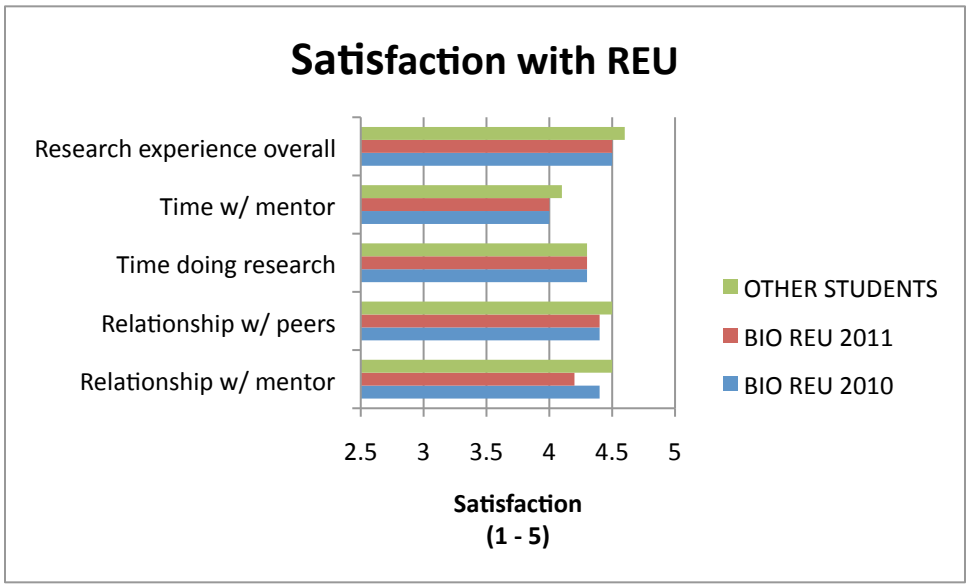
What types of research activities do undergraduates report?

BIO-REU students reported attending conferences more often than students in other programs, and planned to present and attend conferences at greater rates than students in other programs.



How satisfied are students with REU programs?

Students gave activities and mentors very high ratings, with averages between 4 and 5 (on a scale of 1 -5). Lower ratings were seen for some activities such as safety training, and for training for human subjects' research.



How do students learn about REU's?

The most common places students learned about their REU program were:

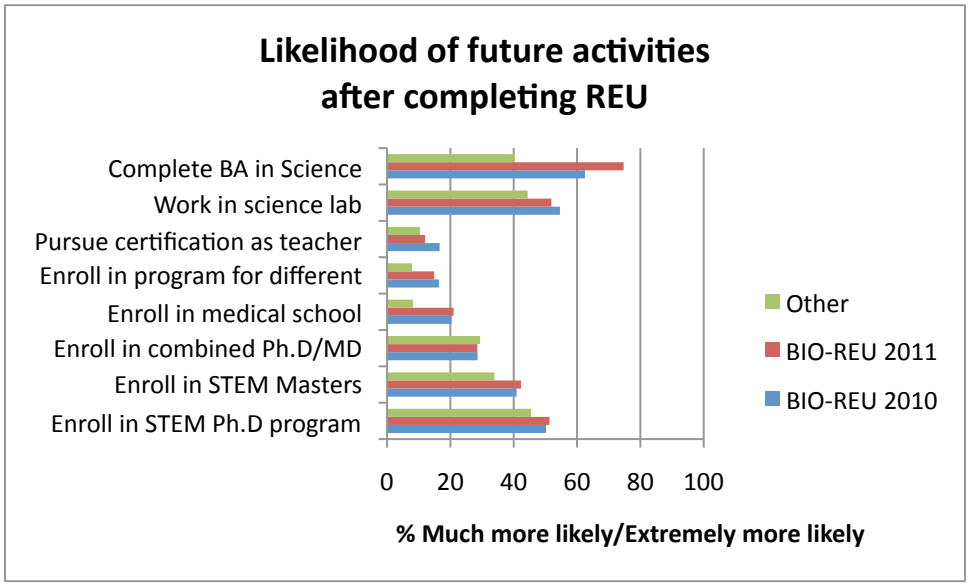
- Announcements (63% - 67%),
- The NSF website (60% - 54%),
- Academic advisors (60% - 73%).

Less common sources were web searches (25% -28%).

What do students say about future plans after they have completed the REU?

High numbers of students in BIO-REU said they were *much more* or *extremely more likely* to participate in activities such as work in a science lab (54%-52%), enroll in a Master's program (41%-42%), or enroll in a Ph.D. program in science, mathematics and engineering (51%) after finishing the REU.

Lower numbers of students responded that they were more likely to enroll in medical school (20%), or enroll in a program for a different professional degree (16%).



What other benefits did students identify from participating in REU's?

Students described these benefits from participating in REU programs:

- Networking with peers, mentors and graduate students (25%-26% by year),
- Skills such as lab techniques, data analysis, computer skills, and personal skills such as time management (23% - 21%),
- Increased confidence in students' ability to do science (17% - 14%),
- Familiarization with practical scientific activities (12% - 8%),
- Clarification of plans for the future (9% - 3%).

What did students say about their future plans?

- Twenty-one percent of students in 2010 and 26% in 2011 said their experience confirmed or strengthened an existing decision to attend graduate school.
- Twenty percent the first year, and 14% the next year said they changed their mind during the REU and did not want to attend graduate school.

Items for the four core indicators on URSSA. "*How much did you GAIN in the following areas as a result of your most recent research experience?"* (Scale 1 -5, no gain – great gain).

Thinking and Working Like a Scientist	**Personal Gains**
Analyzing data for patterns.	Confidence in my ability to contribute to science.
Figuring out the next step in a research project.	Comfort in discussing scientific concepts with others.
Problem-solving in general.	Comfort in working collaboratively with others.
Formulating a research question that could be answered with data.	Confidence in my ability to do well in future science courses.
Identifying limitations of research methods and designs.	Ability to work independently.
Understanding the theory and concepts guiding my research project.	Developing patience with the slow pace of research.
Understanding the connections among scientific disciplines.	Understanding what everyday research work is like.
Understanding the relevance of research to my coursework.	Taking greater care in conducting procedures in the lab or field.
Understanding the importance of ethics and the responsible conduct of research.	
Understanding how data are collected.	
Skills	**Attitudes and Behaviors**
Writing scientific reports or papers.	Engage in real-world science research
Making oral presentations.	Feel like a scientist.
Defending an argument when asked questions.	Think creatively about the project.
Explaining my project to people outside my field.	Try out new ideas or procedures on your own.
Preparing a scientific poster.	Feel responsible for the project.
Keeping a detailed lab notebook.	Work extra hours because you were excited about the research.
Conducting observations in the lab or field.	Interact with scientists from outside your school.
Using statistics to analyze data.	Feel a part of a scientific community.
Calibrating instruments needed for measurement.	
Understanding journal articles.	
Conducting database or internet searches.	
Managing my time.	

Appendix: Supplementary Tables

Table 1.1 Thinking and Working Like a Scientist

How much did you GAIN in the following areas as a result of your most recent research experience? (Five point scale: No gains – Great gains)	BIO REU 2010	BIO REU 2011	Other Programs
	Mean	Mean	Mean
Analyzing data for patterns.	4.00	4.03	3.87
Figuring out the next step in a research project.	4.16	4.21	4.13
Problem-solving in general.	4.19	4.17	4.06
Formulating a research question that could be answered with data.	3.95	4.08	3.82
Identifying limitations of research methods and designs.	4.21	4.26	4.25
Understanding the theory and concepts guiding my research project.	4.43	4.44	4.31
Understanding the connections among scientific disciplines.	4.05	4.12	4.18
Understanding the relevance of research to my coursework.	4.10	4.17	3.91
Understanding the importance of ethics and the responsible conduct of research.	4.18	4.03	.
Understanding how data are collected.	4.31	4.21	.

Table 1.2 Personal Gains

How much did you GAIN in the following areas as a result of your most recent research experience? (Five point scale: No gains – Great gains)	BIO REU 2010	BIO REU 2011	Other Programs
	Mean	Mean	Mean
Confidence in my ability to contribute to science.	4.21	4.17	4.03
Comfort in discussing scientific concepts with others.	4.25	4.24	4.06
Comfort in working collaboratively with others.	4.21	4.21	4.11
Confidence in my ability to do well in future science courses.	4.29	4.23	3.96
Ability to work independently.	4.31	4.33	4.20
Developing patience with the slow pace of research.	4.07	4.11	4.05
Understanding what everyday research work is like.	4.48	4.59	4.45
Taking greater care in conducting procedures in the lab or field.	4.30	4.36	4.20

Table 1.3 Skills

How much did you GAIN in the following areas as a result of your most recent research experience? (Five point scale: No gains – Great gains)	BIO REU 2010	BIO REU 2011	Other Programs
	Mean	Mean	Mean
Writing scientific reports or papers.	3.78	3.78	3.44
Making oral presentations.	4.10	4.10	4.02
Defending an argument when asked questions.	3.77	3.71	3.62
Explaining my project to people outside my field.	4.24	4.21	4.15
Preparing a scientific poster.	4.11	4.05	3.94
Keeping a detailed lab notebook.	3.96	3.74	3.72
Conducting observations in the lab or field.	4.06	3.99	3.89
Using statistics to analyze data.	3.52	3.43	3.13
Calibrating instruments needed for measurement.	3.41	3.42	3.42

Understanding journal articles.	3.94	3.88	3.81
Conducting database or internet searches.	3.69	3.76	3.58
Managing my time.	3.87	3.94	3.59

Table 1.4 Attitudes and Behaviors

During your research experience HOW MUCH did you: (Five point scale: None – a great deal)	PROGRAM		
	BIO REU 2010	BIO REU 2011	Other Programs
	Mean	Mean	Mean
Engage in real-world science research	4.59	4.62	4.48
Feel like a scientist.	4.41	4.37	4.31
Think creatively about the project.	4.22	4.20	4.05
Try out new ideas or procedures on your own.	3.67	3.74	3.73
Feel responsible for the project.	4.45	4.50	4.32
Work extra hours because you were excited about the research.	4.03	4.08	3.81
Interact with scientists from outside your school.	3.95	4.08	3.90
Feel a part of a scientific community.	4.33	4.35	4.19

Table 1.5a. Class standing and averages for composite variables (2010)

		Class Standing				
		Freshman /Rising Sophomore	Sophomore /Rising Junior	Junior /Rising Senior	Senior	Other
THINKING & WORKING LIKE A SCIENTIST	Mean	4.05	4.01	4.05	3.92	4.45
	SD	1.21	.85	.92	1.23	.52
	N	16	59	90	59	7
PERSONAL GAINS	Mean	4.39	4.44	4.30	4.07	4.92

	SD	1.16	.80	.89	1.28	.29
	N	17	59	94	63	5
SKILLS	Mean	4.13	3.92	3.87	3.70	4.63
	SD	1.09	.93	.92	1.14	.50
	N	14	45	62	52	3
ATTITUDES & BEHAVIORS	Mean	4.46	4.28	4.21	4.04	4.49
	SD	.69	.84	1.06	1.17	.45
	N	19	59	88	62	7

Table 1.5b. Class standing and averages for composite variables (2011)

		Class Standing				
		Freshman/ Rising Sophomore	Sophomore /Rising Junior	Junior/Rising Senior	Senior	Other
THINKING & WORKING LIKE A SCIENTIST	Mean	4.21	4.10	4.09	4.09	4.25
	Standard Deviation	.70	.70	.76	.82	.61
	Valid N	159	527	616	496	53
PERSONAL GAIN	Mean	4.32	4.20	4.16	4.19	4.32
	Standard Deviation	.71	.72	.78	.83	.63
	Valid N	159	526	616	494	53
SKILLS	Mean	3.85	3.78	3.77	3.78	4.00
	Standard Deviation	.81	.78	.86	.90	.89
	Valid N	158	526	616	493	53
ATTITUDES AND BEHAVIORS	Mean	4.16	4.01	4.13	4.10	4.26
	Standard Deviation	.72	.79	.79	.84	.73
	Valid N	158	523	615	489	53

Table 1.6a. Gender and averages for composite variables (2010)

		GENDER	
		Male	Female
THINKING & WORKING LIKE A SCIENTIST (ADJ MEAN)	Mean	4.04	4.01
	SD	.95	1.04
	N	91	139
PERSONAL GAINS (ADJ MEAN)	Mean	4.28	4.31
	SD	1.03	1.00
	N	94	143
SKILLS (ADJ MEAN)	Mean	3.78	3.93
	SD	1.01	1.00
	N	75	101
ATTITUDES & BEHAVIORS (ADJ MEAN)	Mean	4.17	4.23
	SD	.98	1.03
	N	90	144

Table 1.6b. Gender and averages for composite variables (2011)

		Gender	
		Female	Male
THINKING & WORKING LIKE A SCIENTIST	Mean	4.11	4.11
	Standard Deviation	.77	.74
	Valid N	916	808
PERSONAL GAIN	Mean	4.20	4.19
	Standard Deviation	.78	.77
	Valid N	915	806
SKILLS	Mean	3.81	3.77
	Standard Deviation	.86	.83
	Valid N	915	804
ATTITUDES AND BEHAVIORS	Mean	4.08	4.09
	Standard Deviation	.81	.79
	Valid N	912	799

Table 1.8a. Race/Ethnicity and averages for composite variables (2010)

		RACE ETHNICITY				
		WHITE	AFRICAN-AMERICAN	ASIAN-AMERICAN	NATIVE AMERICAN	HISPANIC (NON-WHITE)
THINKING & WORKING LIKE A SCIENTIST	Mean	3.78	4.34	4.13	4.31	4.15
	SD	1.04	.58	.97	.98	.87
	N	83	43	8	11	28
PERSONAL GAINS	Mean	4.11	4.69	4.61	4.28	4.43
	SD	.99	.63	.59	1.31	.89
	N	85	47	8	12	29
SKILLS	Mean	3.64	4.29	4.00	3.97	3.83
	SD	.97	.71	1.43	1.19	.90
	N	60	33	6	12	22
ATTITUDES & BEHAVIORS	Mean	4.05	4.42	4.23	4.23	4.14
	SD	1.05	.79	1.47	.96	1.09
	N	85	42	8	12	28

Table 1.8a. Race/Ethnicity and averages for composite variables (2011)

		Race Ethnicity					
		Native American	Asian American	African American	Pacific Islander	White	Hispanic
THINKING & WORKING LIKE A SCIENTIST	Mean	4.18	4.16	4.26	4.19	4.00	4.33
	Standard Deviation	.88	.70	.68	.76	.78	.62
	Valid N	55	210	202	29	1027	270
PERSONAL GAIN	Mean	4.30	4.24	4.41	4.26	4.08	4.46
	Standard Deviation	.87	.76	.63	.77	.78	.62
	Valid N	55	210	202	29	1023	271
SKILLS	Mean	3.90	3.91	4.08	3.77	3.64	4.07
	Standard Deviation	1.00	.85	.75	.89	.83	.75

	Valid N	55	210	202	29	1021	271
ATTITUDES AND BEHAVIORS	Mean	4.13	4.07	4.26	4.23	3.99	4.36
	Standard Deviation	.80	.84	.70	.68	.82	.66
	Valid N	54	210	201	29	1015	271