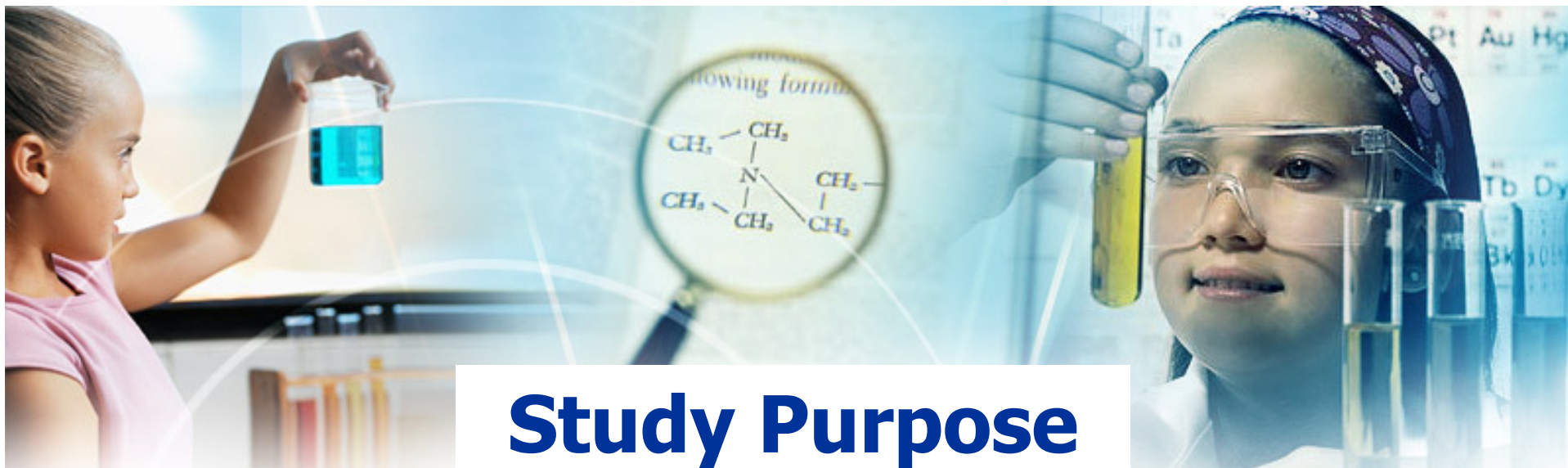




UNDERGRADUATE RESEARCH PARTICIPATION AT UC BERKELEY

CAIR Annual Conference
November 16, 2007
Monterey, CA

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Study Purpose

- Investigate the pervasiveness of undergraduate research participation at UC Berkeley using the UCUES database (2006 data)
- Investigate the correlation between undergraduate research participation and student-perceived learning gains using the UCUES database (2006 data)



**Raise your hand if you ever worked
WITH A FACULTY MEMBER
on a research project.**



Phase 1 Research Questions

1. What is the percentage of undergraduates who assist faculty in research that take a student research credit? (e.g. Berkeley 99 course)
2. What is the percentage of undergraduates who assist faculty in research that take independent study credit? (e.g. Berkeley 199 course)
3. What is the percentage of undergraduates who assist faculty in research that another kind of course credit?
4. What is the percentage of undergraduates who assist faculty in research for pay, without course credit?
5. What is the percentage of undergraduates who assist faculty in research without pay (as a volunteer) and without course credit?



UCUES 2006

Research Involvement Questions

Indicate your past, current or planned involvement in the following research activities. [Upper-Division Only]

	Doing now or have done	Plan to do
Completed at least one student research course (e.g., course 99)	<input type="checkbox"/>	<input type="checkbox"/>
Completed at least one independent study course (e.g., 199)	<input type="checkbox"/>	<input type="checkbox"/>
Assisted faculty in research, with course credit	<input type="checkbox"/>	<input type="checkbox"/>
Assisted faculty in research for pay, without course credit	<input type="checkbox"/>	<input type="checkbox"/>
Assisted faculty in research as a volunteer, without course credit	<input type="checkbox"/>	<input type="checkbox"/>



Phase 2 Research Questions

Is there a significant difference in the mean student-perceived learning gain between undergraduate researchers and non-researchers in...

analytical and critical thinking skills

ability to write clearly and effectively

read & comprehend academic material

understand a specific field of study

quantitative skills

computer skills

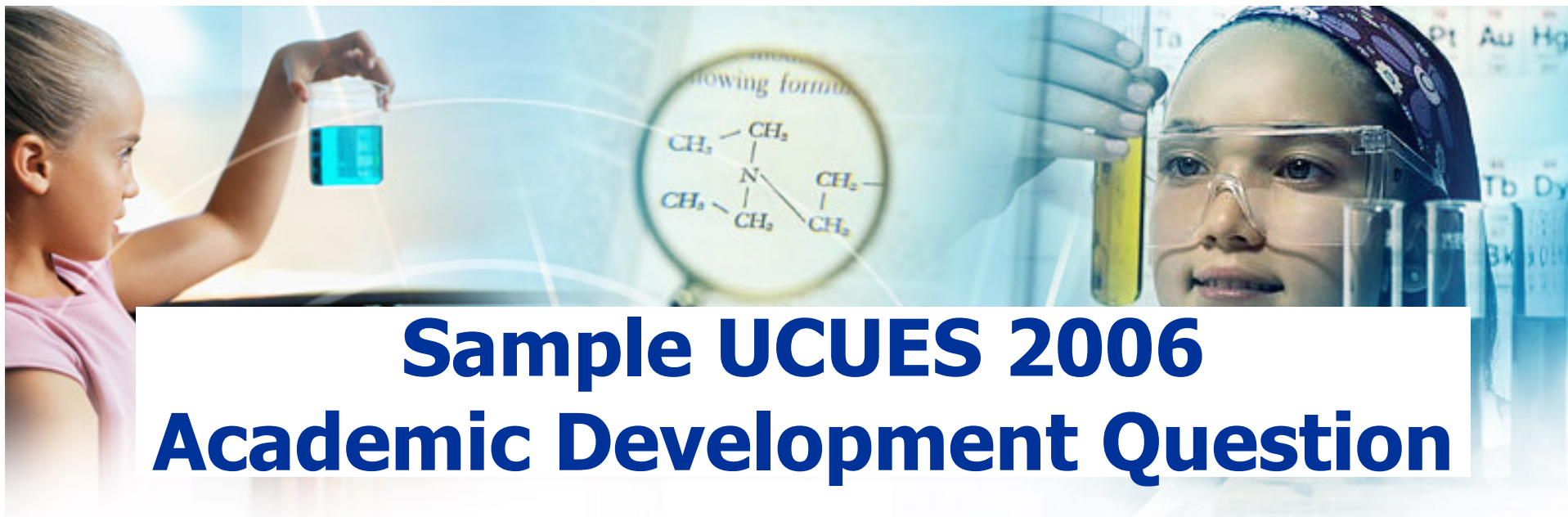
internet skills

library research skills

other research skills

presentation skills

interpersonal skills

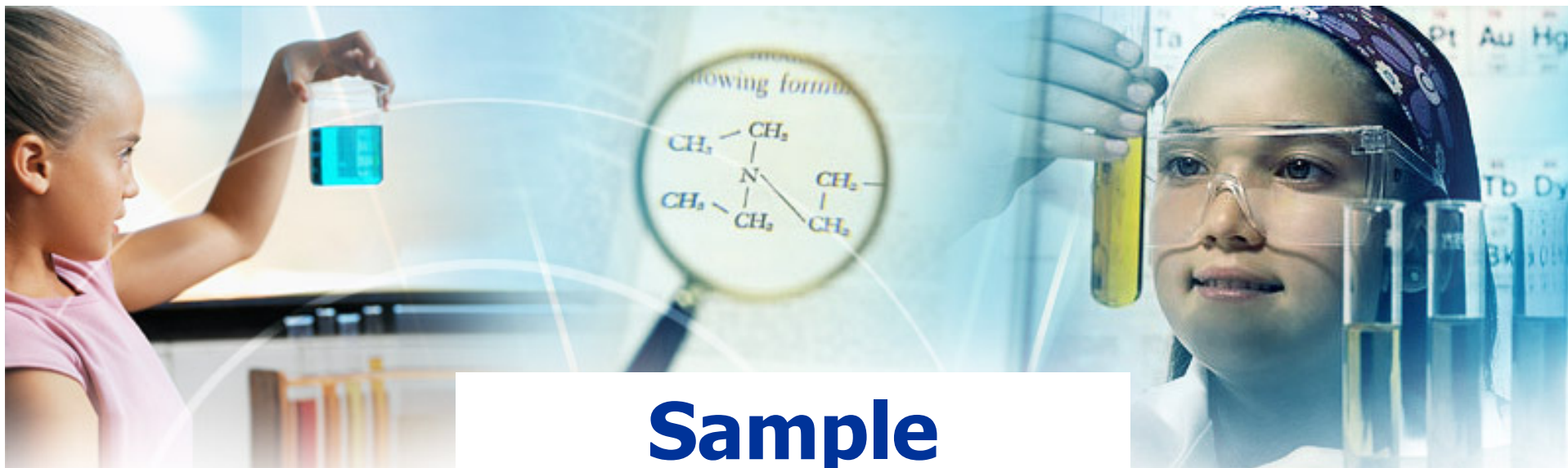


Sample UCUES 2006

Academic Development Question

Please rate your level of proficiency in the following areas when you started at this campus and now.

	When you started here	Current ability level
Analytical and critical thinking skills	Very poor <input type="checkbox"/>	Very poor <input type="checkbox"/>
	Poor <input type="checkbox"/>	Poor <input type="checkbox"/>
	Fair <input type="checkbox"/>	Fair <input type="checkbox"/>
	Good <input type="checkbox"/>	Good <input type="checkbox"/>
	Very good <input type="checkbox"/>	Very good <input type="checkbox"/>
	Excellent <input type="checkbox"/>	Excellent <input type="checkbox"/>



Sample

- Upper-division students at UC Berkeley
- N=5,347 students
- Researchers are students who indicated receiving student research credit or independent study credit, received pay for research internships or who were volunteer researchers.
- Comparison group indicate never participating in faculty-driven research as defined above.



Frequency of Research Participation

	Frequency of participation	Percentage of Total
Student Research Credit (course 99)	1299	24%
Independent Study Credit (course 199)	1370	26%
Other Course Credit	1155	22%
Research for pay	614	12%
Volunteer Researcher	886	17%

Frequency of Research Participation by Type of Major

	STEM Major Participation	Percent Of Total N	Non-STEM Major Participation	Percent Of Total N	Total Research Participants
Student Research Credit (course 99)	538	10%	754	14%	1292
Independent Study Credit (course 199)*	607	11%	755	14%	1362
Other Course Credit*	669	13%	481	9%	1150
Research for pay*	392	7%	220	4%	612
Volunteer Researcher*	515	10%	365	7%	880

*=Pearson Chi-Square significant to the 0.01 level.

Frequency of Research Participation by Ethnicity

	Researchers	Non-Researchers
African American	63	65
Chicano-Latino	237	257
Asian, Filipino, Pacific Islander	1091	1181
White	840	869
Am Indian, Other, Unk.	272	276
International Visa	107	89

Frequency of Research Participation by Father's Education (US only)

	Researchers	Non-Researchers
Less than High School	189	178
High School Degree	258	266
Assoc. Degree or Postsecondary Cert.	116	124
Bachelor's Degree	335	366
Master's Degree	391	314
Professional Degree	159	143
Doctorate	255	190

Pearson Chi-Square significant to the 0.02 level.

Frequency of Research Participation by High School GPA

	Researchers	Non-Researchers
Very Low (Below a 2.0)	38	34
Low	66	53
Low-Medium	193	224
Medium	503	547
Medium-High	705	617
High	281	213
Very High (Above 4.5)	46	39

Pearson Chi-Square significant to the 0.01 level.

Frequency of Research Participation by Total SAT I Score

	Researchers	Non-Researchers
Low	86	89
Low-Medium	159	188
Medium	337	398
Medium-High	523	567
High	628	559
Very High	296	221

Pearson Chi-Square significant at < 0.01 .



Self-Efficacy Theory

- The personal perception that one has the ability to accomplish certain tasks (Bandura, 1977).
- Part of motivational literature within Social Cognitive Learning Theory.
- Found to affect behavior in terms of choices, attitudes, effort, and persistence in a specific task.

Difference in Mean Learning Gain Btw Researchers and Non-Researchers

	Learning Gain	N	Mean	Std. Dev.	F	Sig.
Researchers	Analytical and critical thinking skills	2563	1.07	.93	43.58	.00
Non-Researchers		2638	.90	.91		
Researchers	Ability to write clearly and effectively	2562	.83	1.04	5.81	.02
Non-Researchers		2636	.76	1.08		
Researchers	Read and comprehend academic material	2565	1.09	1.00	61.22	.00
Non-Researchers		2632	.88	.97		

Difference in Mean Learning Gain Btw Researchers and Non-Researchers


	Learning Gain	N	Mean	Std. Dev.	F	Sig.
Researchers	Understanding of a specific field of study	2558	1.79	1.10	39.11	.00
Non-Researchers		2625	1.60	1.12		
Researchers	Quantitative skills	2566	.21	1.05	6.74	.01
Non-Researchers		2624	.13	1.00		
Researchers	Computer skills	2564	.71	.887	31.50	.00
Non-Researchers		2630	.58	.846		

Difference in Mean Learning Gain Btw Researchers and Non-Researchers

	Learning Gain	N	Mean	Std. Dev.	F	Sig.
Researchers	Internet skills	2560	.78	.96	40.87	.00
Non-Researchers		2623	.61	.87		
Researchers	Library research skills	2566	1.18	1.11	43.92	.00
Non-Researchers		2629	.97	1.07		
Researchers	Other research skills	2560	1.21	1.09	212.83	.00
Non-Researchers		2603	.79	.96		

Difference in Mean Learning Gain Btw Researchers and Non-Researchers

	Learning Gain	N	Mean	Std. Dev.	F	Sig.
Researchers	Ability to prepare and make a presentation	2563	.90	1.04	36.20	.00
Non-Researchers		2621	.73	.95		
Researchers	Interpersonal (social) skills	2572	.76	1.14	16.05	.00
Non-Researchers		2627	.64	1.10		



Difference in Mean Learning Gain Btw STEM Researchers and STEM Non-Researchers

STEM researchers report small but significant learning gains over STEM non-researchers in the following areas:

ability to write clearly and effectively
read & comprehend academic material
understand a specific field of study
quantitative skills
computer skills

library research skills
other research skills
presentation skills
interpersonal skills
internet skills

However, there is no significant difference between STEM researchers and STEM non-researchers in **analytical and critical thinking skills.**



Difference in Mean Learning Gain Btw Non-STEM Researchers and Non-STEM, Non-Researchers

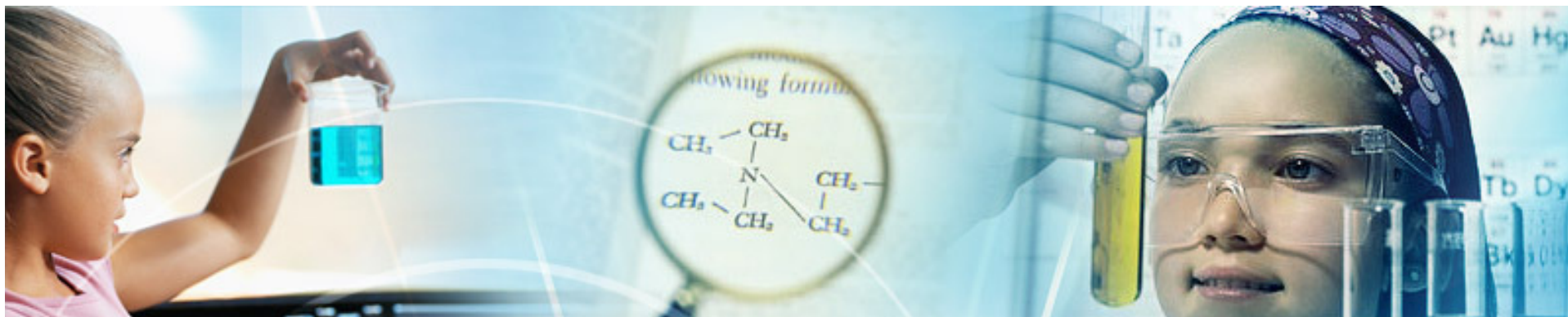
Non-STEM researchers report small but significant learning gains over non-STEM, non-researchers in the following areas:

analytical and critical thinking skills
ability to write clearly and effectively
understand a specific field of study
library research skills
read & comprehend academic material

other research skills
presentation skills
internet skills

However, there is no significant difference between non-STEM researchers and non-STEM, non-researchers in **computer skills** or **interpersonal (social) skills**.

Furthermore, non-STEM researchers report a small but significant **LOSS** of **quantitative skills**.



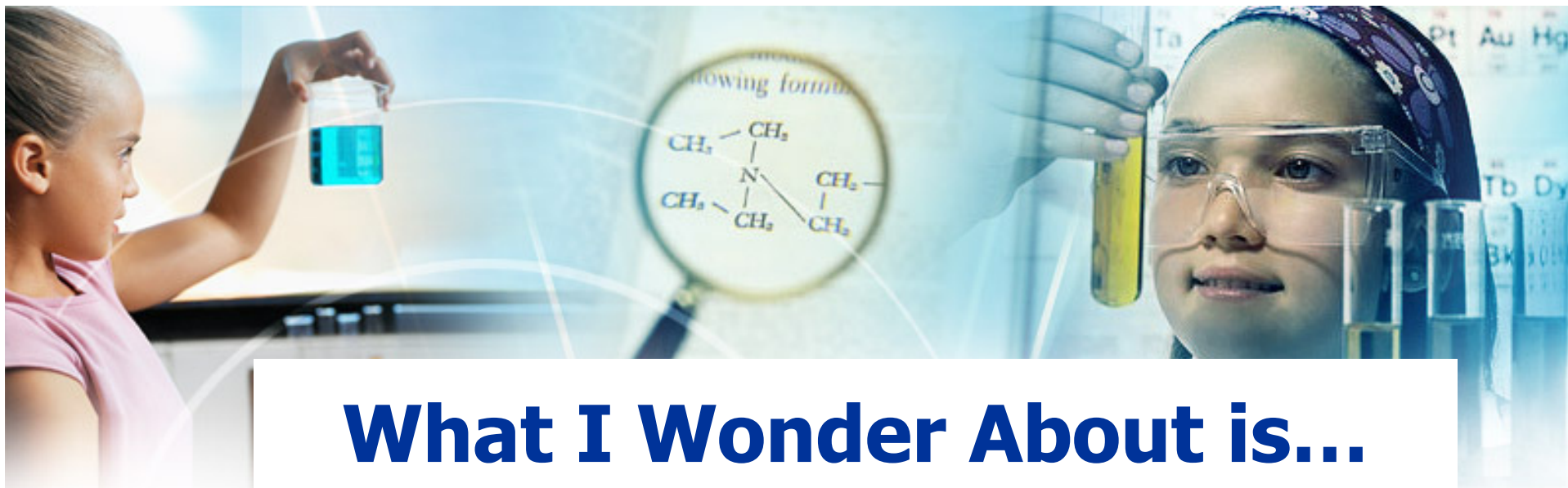
Study Limitations & Future Work

- Need a matched comparison sample (year in school, STEM/non-STEM, gender)
- Need an outside check on non-researcher status
- Longitudinal data using 2004, 2005, & 2007 UCUES data
- Expand beyond UC Berkeley
- Combine with another data set to understand graduation rates and graduate school enrollment



Take Home Message

- UCUES offers a very useful way to study the effects of undergraduate research participation.
- Undergraduate research internships are a value-added component of the college experience.
- The value-added is discipline specific.
- More large-scale studies using valid comparison groups are needed to understand the various impacts of undergraduate research internships on student learning, traditional academic success, and students' lives.



What I Wonder About is...

If the research continues to show that undergraduate research internships have significant value for students, what goes on in these internships that creates this value?

AND

Can we bring (at least some of) the practices that make undergraduate research internships so valuable for students into the lecture halls so that more students can benefit?