

Working With A Scientist Program (WWASP): A Summative Assessment of Cohort 1

Guadalupe Corral, PhD, Jacqueline Loweree, BA, and Joseph Negron

EXECUTIVE SUMMARY

This report is part of a four-year evaluation assessing the impact that the Working with a Scientist Program at the University of Texas at El Paso (UTEP) had on its first cohort of participants. Participants were students from a regional high school that were selected to take part in research activities every other Saturday during the Spring semester and on weekdays during the summer. The evaluation components included in this report focus on assessing students' academic performance and the gains the students made while in the program. It also focused on an assessment of students' perceptions of the 'self', 'others' and the 'group' during group discussions at two time periods: towards the middle of program participation and towards the end; note that the group discussions are a main component of the program. Assessment was realized through: 1) analysis of academic records, 2) participant survey that focused on program fellows' perceptions of their group discussions, and 3) participant survey modeled after the Undergraduate Research Student Self-Assessment (URSSA).

Evaluation results show that:

- Students who were part of the experimental (cogens) internship group demonstrated a greater increase in average GPA than students who were in the non-internship control group.
 - The internship control group and the group of students who dropped from the program experienced a decrease in average GPA
- Differences between post- and pre-discussion survey scores for various items related to 'self' were significantly greater for the internship control group but not the internship experimental group.
 - Items that scored significantly different ($p < .05$) include: *I try to get others to contribute to what is being discussed; I try to understand different perspectives; As I listen to others, I attempt to put aside my own perspectives and understand theirs; I am willing to consider others' ideas; and I value different perspectives.*
- Average differences between pre- and post-discussion survey scores were greater on a larger number of items related to 'others' for the internship experimental group than for the internship control group, and were significantly larger for the item: *Others in my group have a greater sense of solidarity* ($t(12) = -3.81, p < .05$).
- No significant differences were found between pre- and post-discussion survey scores on most items related to the 'group' for either the internship experimental group or the internship control group,
- A few significant differences were found between the internship control group and the internship experimental group in gains made from the research experience related to: the application of knowledge to research, personal development, and research and professional skill development.
 - The internship control group reported significantly greater gains ($p < .05$) from their research experience than the experimental internship group in: *analyzing data for patterns; figuring out the next step in a research project; problem-*

solving in general; comfort in discussing scientific concepts with others; preparing a scientific paper, and conducting database or internet searches.

- No significant differences were found between the internship control group and the internship experimental group in items related to: frequency of research attitudes and behaviors (scientific identity), perceptions of quality of research experience, level of satisfaction with the research experience, and perceptions of other effects of the research experience (i.e. preparation for advanced course work, preparation for college, motivation to attend college, and clarification of what field of study to pursue)
- All students indicated that they joined the program to gain hands on experience and have a good intellectual challenge
- Overall, the faculty interviewed agreed that the cogens are a very useful tool to engage students in discussion but that they may also become exhaustive and counter-productive after some time of discussion
- Faculty participants suggest that the program should find more ways on how to break the barriers between the students and the faculty

BACKGROUND

The main goal of the Working With a Scientist Program is to increase the effectiveness of informal education in the sciences by using an approach that involves *cogenerative dialogues* (cogens). Cogens are joint-effort conversations among different vested individuals that reflect their collective experiences. The program is also intended to increase student interest in STEM by offering students the opportunity for early involvement in research activities that are guided by professional scientists. To assess the effectiveness of the program for meeting its goal and objectives during the first year of funding, students from a regional high school that met the eligibility criteria (juniors with a 3.0 GPA or greater) were encouraged to apply to the program during the fall of 2013. Thirty six students were selected to participate in activities in four different science labs while they were guided by University of Texas at El Paso (UTEP) faculty scientists and research assistants. An experimental design was used to assess the impact of the program; half of the program student participants and scientist mentors were randomly assigned to a cogens group and the other half were assigned to an internship control group in which they use regular group discussions. On the other hand, the impact of research experience on the students' academic performance and school retention was assessed by using a quasi-experimental design that compared the research internship group with a control group of students (similar in eligibility criteria) that did not apply to the program.

METHODS

Different methods were used to assess the program's impact on its first cohort of students. These methods included: 1) review and analysis of academic performance records; 2) a participant survey that included questions about how they perceive themselves, others and the whole group during group discussions/dialogues (see Appendix A), and 3) a participant survey (modeled after the Undergraduate Research Student Self-Assessment (URSSA) survey) that measured the gains made by participants (e.g. personal and professional gains, gains in research skills, scientist identity, etc.) (see Appendix B) during their research internship. Academic records were assessed on cumulative GPA data for the semester prior to program participation (fall 2013) and for the semester after program participation (fall 2014). Note that at the time of the development of this report, student participants were in their last semester of their senior year. Therefore, graduation rates were still not available. The group discussion survey was administered to participants on the

last day of their Spring semester research activities (May 31, 2014) and the last day of their research activities in the summer (July 25, 2015). The URSSA survey was administered to participants during the last day of their research internship. The methods used are explained in more detail in each associated section below.

RESULTS

The academic performance data for program participants (including non-internship control group) was provided by the regional high school from which all participants were recruited. The data included participants’ cumulative GPA for the term prior program participation (Fall 2013) and for the term post-program participation (Fall 2014). Note that program activities did not span through the post-program participation semester for which GPAs were obtained, which was a fall semester. The activities started during the spring semester and ended towards the end of the summer. None of the students enrolled in courses during the summer; therefore, academic data was not available for the post-program summer semester.

Data was sorted and analyzed separately for the following groups: Experimental Internship Control Group (research experience with cogens); Control Internship Group (research experience with traditional discussions); Un-retained Internship Group (started with research experience with traditional discussions or cogens but dropped from the program); and Non-internship Control Group (had no research experience or dialogues/discussions). Note that program attrition analysis results (on un-retained internship participants) were presented in a previous program report (Working with a Scientist Program 2013-2014 Annual Progress Evaluation Report) and, therefore, are not covered in this report.

Results from descriptive analysis show that the Experimental Internship Group had an average GPA increase of 1.12 (based on a 100-point scale) from the semester prior program-participation to the semester post-program participation (Table 1). This is a 1.58 GPA difference, on average, over the Non-internship Control Group (which experienced a 0.46 GPA decrease) and a 1.10 GPA difference over the Non-internship Control Group (which only experienced a 0.02 GPA increase) during the same period of time. Students from the Un-retained Internship Group, on average, experienced a 1.22 GPA decrease. These findings suggest that there is a potential academic benefit to students who take part in experiences that include cogenerative dialogues.

Table 1. Academic Performance

Group	Fall 2013 Mean GPA	STD	Fall 2014 Mean GPA	STD	Post/Pre- Program Mean Difference
Experimental Internship Group (n = 13)	87.78	5.52	88.90	4.80	1.12
Control Internship Group (n = 14)	91.36	4.05	90.91	4.11	-.46
Un-retained Internship Group (n = 12)	89.50	5.79	88.29	5.01	-1.22
Non-internship Control Group (n = 15)	85.48	3.37	85.50	3.63	.02

GPAs are based on a 100-point scale.

Discussion Group Survey

The Discussion Group Survey is based on a Cogenerative Dialogue Heuristic instrument that was developed by Dr. Kenneth Tobin, an expert on cogens and a consultant to the project. The survey provides an assessment of how students perceive themselves, others, and their groups during discussion time. The instrument contains positive statements (items) related to self, such as: ‘when others talk, I listen to what they have to say’ and ‘I feel like I belong in this group’. Positive statements on the instrument related to ‘others’ are very similar to those related to ‘self’ but are modified to fit perceptions of the ‘others’, for example: ‘When I talk, others in my group listen to what I have to say’ and ‘others in my group have a sense of solidarity’. Positive statements related to perception of the ‘group’, on the other hand, are slightly different in that they focus on the participants’ perceptions of the group as a whole and may not fully align with the items related to ‘self’ or ‘others’; for example, items related to the ‘group’ include: ‘Different perspectives are valued by the group’ and ‘There is shared mood in the group’. Participants were provided with a 5-point scale that ranged from ‘Never’ (1) to ‘Always’ (5) to rate the positive statements on frequency. The instrument includes 15 items in each category of ‘self’ and ‘others’, and 10 in the ‘group’ category.

As mentioned in the method’s section above, the survey was administered to students the last day of their spring semester internship (pre-) and again the last day of their summer internship (post-). During the spring semester, participants in the internship experimental group engaged in cogens once every two weeks, while during the summer semester they engaged in cogens twice a week. Participants in the internship control group, on the other hand, engaged in traditional discussions (not cogens) at the same times. To examine any differences in perceptions about discussions between the group engaging in cogens and the group engaging in traditional discussions, group mean scores that were obtained for each survey item during the summer (post-survey) were subtracted from group mean scores obtained for each item during the spring (pre-survey). Thus, a negative mean difference signifies that the post-survey score obtained on the particular item was greater than the score obtained for that item on the pre-survey, while a positive mean difference signifies that the post-survey score obtained on an item was less than the score obtained for that item on the pre-survey.

Results show that the mean difference between post- and pre-survey scores was greater on more items (10 out of 15) related to how participants perceive their ‘self’ during group discussion for the internship control group (Table 2). In addition, mean score differences for the control group were found to be statistically significant for the following pre- and post-survey items: *I try to get others to contribute to what is being discussed* $t(13) = -2.87, p < .05.$; *I try to learn from other’s talk* $t(13) = -2.48, p < .05.$; *I try to understand different perspectives* $t(13) = -2.83, p < .05.$; *As I listen to others, I attempt to put aside my own perspectives and understand theirs* $t(13) = -3.29, p < .01.$; *I am willing to consider other’s ideas* $t(13) = -2.48, p < .05.$; and *I value different perspectives* $t(13) = -2.55, p < .05.$.

A few notable items obtained a greater mean score difference between pre- and post-surveys in the experimental group than in the control group; these include: *When I talk, I build on what others have to say*; *I value different perspectives of those in my group*; *I maintain focus during dialogue*; and *My oral contributions are thoughtful*. Note also that the experimental mean score for the item, *I feel as if I belong with this group* increased by almost half a point on the post survey (compared to the pre-survey) for the experimental group while it decreased by almost half a point for the control group. None of the mean differences, however, were found to be statistically significant.

Table 2. Perception of Self during Group Discussion

Experimental (n=13; df = 12)

Control (n=14; df = 13)

Items	Pre Mean	Post Mean	Mean Diff	SD Diff	t	p	Pre Mean	Post Mean	Mean Diff	SD Diff	t	p
<i>I strive to make sense of what others are saying.</i>	3.69	4.00	-.31	.855	-1.298	.219	3.93	4.21	-.29	1.33	-.806	.435
<i>I try to get others to contribute to what is being discussed.</i>	3.69	3.62	.07	1.115	.249	.808	3.71	4.71	-1	1.30	-2.876	.013
<i>I feel like I have the opportunity to speak as much as others to contribute to what is being discussed.</i>	4.54	4.00	.54	1.127	1.723	.110	4.64	4.86	-.21	.700	-1.147	.272
<i>My talk is respectful.</i>	4.62	4.38	.23	.439	1.897	.082	4.64	4.64	.00	.960	.000	1.00
<i>When others talk, I listen to what they have to say.</i>	4.55	4.55	.00	.775	.000	1.000	4.62	4.92	-.30	.850	-1.298	.219
<i>When I talk, I build on what others have to say.</i>	4.31	4.62	-.31	.947	-1.171	.264	4.36	4.71	-.36	.929	-1.439	.174
<i>I try to learn from other's talk.</i>	4.46	4.69	-.23	.832	-1.000	.337	4.43	4.86	-.43	.646	-2.482	.028
<i>I try to understand different perspectives.</i>	4.69	4.54	.15	.689	.805	.436	4.29	4.86	-.57	.760	-2.828	.014
<i>I value different perspectives of those in my group.</i>	4.69	4.62	.07	.954	.291	.776	4.71	4.64	.07	.620	.427	.671
<i>I feel as if I belong with this group.</i>	4.31	4.69	-.38	.768	-1.806	.096	4.79	4.36	.43	.938	1.710	.111
<i>I maintain focus during dialogue.</i>	3.85	4.00	-.15	1.068	-.519	.613	4.00	4.07	-.07	1.328	-.201	.844
<i>My oral contributions are thoughtful.</i>	3.85	4.00	-.15	1.068	-.519	.613	4.14	4.07	.07	1.328	.201	.844
<i>As I listen to others, I attempt to put aside my own perspectives and understand theirs.</i>	3.92	4.23	-.31	.751	-1.47	.165	3.57	4.36	-.79	.893	-3.294	.006
<i>I am willing to consider others' ideas.</i>	4.62	4.69	-.07	.494	-.562	.584	4.50	4.93	-.43	.646	-2.482	.028
<i>I value different perspectives.</i>	4.42	4.58	-.17	.718	-.804	.438	4.29	4.85	-.61	.870	-2.551	.025

Note: Mean scores are based on a 5-point scale that ranged from 'Never' (1) to 'Always' (5)

Results from the items on the ‘perceptions of others during group discussions’ section of the pre- and post-surveys show that the experimental group obtained a greater mean difference in scores on the majority of the items, 12 out of 15 (Table 3). While scores on those items were generally lower for the experimental group than for the control group on the pre-survey, the mean score difference results, nonetheless, suggest that the cogens had a positive effect on how participants perceived others in their groups during the discussions. Items worth noting that obtained a greater mean difference in the experimental vs. control group include: *Others in my group show respect for one another*; *When others in my group talk, they build on what I have to say*; *Others in my group strive to learn from my oral contributions*; *Others in my group have a sense of solidarity*; *Others in the group maintain focus during dialogue*; and *Others in my group are willing to consider my ideas*. Note, however, that the only item that showed a significant difference between the pre-survey and post-survey experimental group means was: *Others in my group have a sense of solidarity*, $t(12) = -3.81, p < .05$.

Table 3. Perceptions of Others during Group Discussions

Items	Experimental (n=13; df = 12)						Control (n=14; df = 13)					
	Pre Mean	Post Mean	Mean Diff	SD Diff	t	p	Pre Mean	Post Mean	Mean Diff	SD Diff	t	p
<i>Others in my group try to make sense of what I am saying.</i>	3.77	3.92	-.15	1.068	-.519	.613	3.71	3.64	.07	1.269	.211	.836
<i>Others in my group try to get me to contribute during discussions.</i>	4.08	3.85	.23	.832	1.000	.337	4.00	4.29	-.29	1.326	-.806	.435
<i>Others in my group have the opportunity to speak as much as I do.</i>	4.62	4.62	.00	.577	.000	1.000	4.71	5.00	-.29	.611	-1.749	.104
<i>Others in my group show respect for one another.</i>	4.46	4.69	-.23	.927	-.898	.387	4.79	4.64	.15	.363	1.472	.165
<i>When I talk, others in my group listen to what I have to say.</i>	4.69	4.62	.07	.641	.433	.673	4.29	4.64	-.35	1.216	-1.099	.292
<i>When others in my group talk, they build on what I have to say.</i>	4.08	4.38	-.30	.630	-1.760	.104	4.50	4.29	.21	1.051	.763	.459
<i>Others in my group strive to learn from my oral contributions.</i>	3.69	4.08	-.38	.870	-1.594	.137	4.21	3.86	.35	.929	1.439	.174
<i>Others in my group try to understand different perspectives.</i>	4.00	4.15	-.15	.801	-.693	.502	4.36	4.43	-.07	1.141	-.234	.818
<i>Others in my group value my perspective.</i>	4.17	4.25	-.08	.793	-.364	.723	4.36	4.36	0	1.109	.000	1.000
<i>Others in my group have a sense of solidarity.</i>	3.31	4.15	-.84	.801	-3.811	.002	4.00	4.29	-.28	1.383	-.773	.453
<i>Others in the group maintain focus during dialogue.</i>	3.69	4.00	-.31	1.109	-1.000	.337	4.36	3.93	.43	1.399	1.147	.272
<i>Others' oral contributions are thoughtful.</i>	4.08	4.31	-.23	.599	-1.389	.190	4.21	4.43	-.22	1.251	-.641	.533
<i>Others set aside their perspectives when they listen to me.</i>	3.77	4.23	-.46	.967	-1.720	.111	3.86	4.21	-.35	1.393	-.960	.355
<i>Others in my group are willing to consider my ideas.</i>	3.92	4.23	-.31	1.182	-.938	.367	4.14	4.21	-.07	1.33	-.201	.844
<i>Others value different perspectives.</i>	4.08	4.38	-.30	1.109	-1.000	.337	4.21	4.50	-.29	.994	-1.075	.302

Note: Mean scores are based on a 5-point scale that ranged from 'Never' (1) to 'Always' (5)

Results from the pre- and post-survey scores on items in the section on ‘perceptions of the group during group discussions’ show that the experimental group obtained greater mean differences on half the items (Table 4). Notable items include: *Dialogue in the group is timely*; *During group discussion, there is at least one review of what was accomplished*; and *Different perspectives from members of the group have contributed to my own learning*. None of the mean differences, however, were found to be significant.

A decrease in scores from pre-test to post-test was also observed on the other half of the items for the experimental group; the control group, however, also experienced an average decrease on scores on various items (Table 4). The control group obtained greater scores on two particular items: *The group strives to incorporate all perspectives* and *There is harmony with discussions in the group*. Only the mean difference of the latter item (*There is harmony with discussions in the group*), however, was found to be significant, $t(13) = 2.28, p < .05$.

Table 4. Perceptions of the Group during Group Discussions

Items	Experimental (n=13; df = 12)						Control (n=14; df = 13)					
	Pre Mean	Post Mean	Mean Diff	SD Diff	t	p	Pre Mean	Post Mean	Mean Diff	SD Diff	t	p
<i>The group strives to have all voices heard.</i>	4.69	4.46	.23	.832	1.000	.337	4.64	4.07	.57	.938	2.280	.040
<i>Different perspectives are valued by the group.</i>	4.85	4.54	.31	.630	1.760	.104	4.57	4.29	.28	.726	1.472	.165
<i>The group strives to incorporate all perspectives.</i>	4.54	4.38	.15	.555	1.000	.337	4.07	4.43	-.35	1.277	-1.046	.315
<i>There is a shared mood in the group.</i>	4.46	4.31	.15	.899	.617	.549	4.29	4.21	.08	1.439	.186	.856
<i>There is harmony with discussions in the group.</i>	4.54	4.38	.16	.899	.617	.549	4.21	4.36	-.14	1.231	-.434	.671
<i>Dialogue in the group is timely.</i>	4.08	4.15	-.07	.760	-.365	.721	4.07	4.14	-.07	1.072	-.249	.807
<i>Dialogue on the group is appropriate.</i>	4.69	4.69	.00	.707	.000	1.000	4.64	4.36	.28	1.326	.806	.435
<i>Dialogue on the group is predictable.</i>	3.85	4.15	-.30	.855	-1.298	.219	3.71	4.07	-.36	1.447	-.924	.373
<i>During group discussions there is at least one review of what was accomplished.</i>	4.31	4.46	-.15	.987	-.562	.584	4.69	4.69	.00	.707	.000	1.000
<i>Different perspectives from members of the group have contributed to my own learning.</i>	4.23	4.46	-.23	.927	-.898	.87	4.57	4.50	.07	.829	.322	.752

Note: Mean scores are based on a 5-point scale that ranged from 'Never' (1) to 'Always' (5)

Data from the pre- and post-participation Discussion Group Survey produced mixed results. In general, the 'self' perspective of participants in the control group seems to have been more positively impacted by the traditional discussions than the 'self' perspective of the participants in the experimental group. However, the 'other' and 'group' perspectives of participants in the experimental group was more positively impacted in general than the perspective of the participants in the control group. These findings suggest that while having traditional discussions with group members may improve perceptions of the 'self' (how one thinks and behaves) during the discussions, engaging in cogens may improve perceptions of the 'others' and the 'group' overall (how others and the group thinks and behaves). Note, however, that significant differences were found only for a number of items and also that there are specific items in each section that don't follow the same trend as other items. Thus, items in each section merit individual attention and analysis in order to portray a more complete picture.

Undergraduate Research Student Self-Assessment (URSSA)

In order to assess the effects of the research experience, the students who took part in the research internship and engaged in research activities were asked to complete a modified shorter version of the Undergraduate Research Student-Self Assessment (URSSA). Development and testing of URSSA was funded by the National Science Foundation through its Divisions of Chemistry and Undergraduate Education, the Biological Sciences Directorate, and the Office of Multidisciplinary Affairs, under grant #CHE-0548488. Additional support was provided by the Biological Sciences Initiative and the NIH Scholars program, both at CU Boulder, through their grants from the Howard Hughes Medical Institute and the National Institutes of Health. The instrument has been validated in assessing student outcomes related to student research (for more information on the instrument, please visit the URSSA website hosted at <http://www.colorado.edu/eer/research/undergradtools.html>).

Respondents were first asked to indicate how much they had gained in regards to their application of knowledge to research work as a result of their participation in the program (see Table 5). Participants were provided with a 5-point scale showing the following points: No Gain (1), A Little Gain (2), Moderate Gain (3), Good Gain (4), and Great Gain (5), to indicate their answer. Results show that, on average, participants made 'moderate' to greater than 'good' gains on the different areas related to application of knowledge to research. Results also show that the control group averaged greater gains than the experimental group in all areas. Notably, the experimental group indicated that they made close to 'great' gains in: *Analyzing data for patterns*, *Figuring out the next step in a research project*, and *Problem solving in general*; independent sample *t*-test analysis indicate that the mean difference between the control group and the experimental group was statistically significant for all three items ($p < .05$; Table 5). No other mean differences were found to be significant.

Table 5. Gains in Thinking and Working Like a Scientist: Application of Knowledge to Research

Items	Experimental (n = 13)		Control (n = 14)		df = 25	
	Mean	Std. Dev.	Mean	Std. Dev.	t	p
<i>Analyzing data for patterns</i>	3.69	1.032	4.57	.646	2.675	.013
<i>Figuring out the next step in a research project</i>	4.00	.408	4.64	.745	2.749	.011
<i>Problem-solving in general</i>	3.92	.641	4.64	.633	2.935	.007
<i>Formulating a research question that could be answered with data</i>	4.15	.801	4.43	.646	.985	.334
<i>Identifying limitations of research methods and designs</i>	4.15	.689	4.43	1.016	.816	.422
<i>Understanding the theory and concepts guiding my research project</i>	4.38	.650	4.64	.497	1.164	.255
<i>Understanding the connections among scientific disciplines</i>	4.15	.555	4.21	1.369	.148	.883
<i>Understanding the relevance of research to my coursework</i>	4.23	.725	4.29	.994	.163	.872

Five-point scale ranging from No Gain (1) to Great Gain

Using the same scale described above, the participants were then asked to indicate the personal gains they made in connection to their research experience. Results, again showed that, on average, participants made gains that ranged from ‘moderate’ to greater than ‘good’ in the different areas listed (Table 6). Participants in the control group averaged greater gains than participants in the experimental group in all areas except for one, *Confidence in working collaboratively with others*. Independent sample *t*-test analysis, however, show that means obtained for one item, *Comfort in discussing scientific concepts with others*, were found to differ only at a marginal level ($t(25) = 1.99, p = .057$) between the control group and the experimental group. No other differences were found.

Table 6. Personal Gains Related to Engagement in Research

Items	Experimental (n = 13)		Control (n = 14)		df = 25	
	Mean	Std. Dev.	Mean	Std. Dev.	t	p
<i>Confidence in my ability to contribute to science</i>	3.69	1.316	4.29	.914	1.370	.183
<i>Comfort in discussing scientific concepts with others</i>	3.85	1.405	4.64	.497	1.994	.057
<i>Confidence in working collaboratively with others</i>	4.00	1.414	3.86	1.791	-.229	.821
<i>Confidence in my ability to do well in future in future science courses</i>	4.00	1.414	4.36	.842	.804	.429
<i>Ability to work independently</i>	3.92	1.382	4.36	1.082	.912	.370
<i>Developing patience with the slow pace of research</i>	3.85	1.345	4.50	.941	1.473	.153
<i>Understanding what every day research is like</i>	3.92	1.320	4.43	.938	1.154	.260
<i>Taking greater care in conducting procedures in the lab or field</i>	4.15	1.345	4.79	.579	1.607	.121

Five-point scale ranging from No Gain (1) to Great Gain (5)

In relation to skills gained from the research experience, results show a similar trend to that of the sections discussed above (Table 7). All participants reported average gains ranging from ‘moderate’ to greater than ‘good’ gains, and the control group reported greater gains in the different skills than the experimental group. Comparisons of means reveal that the control group obtained significantly greater means on the following items: *Explaining my project to people outside the field* ($t(25) = 2.06, p = .05$); *Preparing a scientific poster* ($t(25) = 2.16, p < .05$); and *Conducting database or internet searches* ($t(25) = 2.23, p < .05$). No other significant differences between control group and experimental group means were observed.

Table 7. Gains in Skills

Items	Experimental (n = 13)		Control (n = 14)		df = 25	
	Mean	Std. Dev.	Mean	Std. Dev.	t	p
<i>Writing scientific reports or papers</i>	3.62	1.387	4.14	.663	1.276	.214
<i>Making oral presentations</i>	3.69	1.494	4.36	1.151	1.301	.205
<i>Defending an argument when asked questions</i>	3.62	1.446	4.36	.929	1.598	.123
<i>Explaining my project to people outside the field</i>	3.54	1.561	4.50	.760	2.06	.050
<i>Preparing a scientific poster</i>	3.85	1.281	4.64	.497	2.161	.040
<i>Keeping a detailed lab notebook</i>	3.85	1.345	4.07	1.439	.419	.679
<i>Conducting observations in the lab or field</i>	3.92	1.256	4.29	1.383	.711	.483
<i>Using statistics to analyze data</i>	3.85	1.405	4.43	.852	1.314	.201
<i>Calibrating instruments needed for measurement</i>	3.85	1.463	4.50	.760	1.473	.153
<i>Working with computers</i>	3.77	1.363	4.71	.469	2.446	.022
<i>Understanding journal articles</i>	3.85	1.281	4.00	1.414	.295	.770
<i>Conducting database or internet searches</i>	3.69	1.377	4.57	.514	2.23	.035
<i>Managing my time</i>	4.08	1.320	4.43	.938	.803	.430

Five-point scale ranging from No Gain (1) to Great Gain (5)

Participants were then asked to indicate how much they thought and behaved in ways related to being a scientific researcher. Participants were provided with a 5-point scale that included the following points: None (1), A Little (2), Some (3), A Fair Amount (4), and A Great Deal (5), to indicate their answers. Continuing with the same trend as above, results show that the control group, on average, thought/behaved more like scientific researchers than the experimental group (Table 8). There is one exception, however; the experimental group on average reported engaging more in: *Working extra hours because they were excited about the research*. Note, however, that independent sample *t*-test analysis did not reveal significant differences between experimental and control group means obtained for any of the items.

Table 8. Frequency of Research Attitudes and Behaviors

Items	Experimental (n = 13)		Control (n = 14)		df = 25	
	Mean	Std. Dev.	Mean	Std. Dev.	t	p
<i>Engage in real-world science research</i>	4.15	.987	4.50	.650	1.084	.289
<i>Feel like a scientist</i>	4.31	1.109	4.64	.633	.973	.340
<i>Think creatively about the project</i>	4.08	.760	4.43	.938	1.066	.297
<i>Try out new ideas or procedures on your own</i>	4.15	.689	4.29	.825	.449	.657
<i>Feel responsible for the project</i>	4.23	.725	4.50	.760	.941	.356
<i>Work extra hours because you were excited about the research</i>	3.85	1.144	3.29	1.49	-1.09	.286
<i>Interact with scientists from outside your lab</i>	3.54	1.561	4.00	.961	.933	.360
<i>Feel a part of a scientific community</i>	3.92	1.320	4.43	1.089	1.088	.287

Five-point scale ranging from None (1) to A Great Deal (5)

Participants were also asked to rate the quality of different elements of their research experience using a five-point scale that included the following points: Poor (1), Fair (2), Good (3), and Excellent (4). Results show that participants provided ratings that averaged greater than ‘good’, with most leaning towards ‘excellent’ (Table 9). Participants in the experimental group provided average ratings that were greater than those from the control group on two items: *My working relationship with research group members* and *The amount of time I spend doing meaningful research*. On the other hand, participants in the control group provided greater average ratings to all other items, and excellent or nearly excellent ratings to the items: *My working relationship with my research lab scientist* and *The research experience overall*. Mean comparison tests, however, did not reveal any significant differences between the two groups for any of the items.

Table 9. Quality of Research Experience

Items	Experimental (n = 13)		Control (n = 14)		df = 25	
	Mean	Std. Dev.	Mean	Std. Dev.	t	p
<i>My working relationship with my research lab scientist</i>	3.77	.439	3.93	.267	1.150	.261
<i>My working relationship with research group members</i>	3.77	.599	3.36	1.082	-1.211	.237
<i>The amount of time I spend doing meaningful research</i>	3.54	.519	3.29	.726	-1.033	.311
<i>The amount of time I spend with my research lab scientists</i>	3.62	.506	3.79	.426	0.949	.352
<i>The advice my research lab scientists provide about college</i>	3.54	.519	3.71	.611	0.803	.430
<i>The research experience overall</i>	3.62	.650	3.93	.267	1.659	.110

Four-point scale ranging from Poor (1) to Excellent (4)

The next section of the URSSA asked participants to provide their level of agreement or disagreement with various statements about the effects of their research experience. Participants were provided with a 4-point scale ranging from Strongly Disagree (1) to Strongly Agree (4) to indicate their agreement/disagreement. Results for this section were mixed (see Table 10); that is, the control group indicated greater levels of agreement on half of the items, while the experimental group indicated greater levels of agreement on the other items (Table X). Notably, participants in the experimental group were in higher agreement with *My research experience has prepared me for college*, while participants in the control group were in higher agreement with *My research experience has motivated me to attend college*. Mean differences observed for all the items, however, were not found to be statistically significant.

Table 10. Effects of Research Experience

Items	Experimental (n = 13)		Control (n = 14)		df = 25	
	Mean	Std. Dev.	Mean	Std. Dev.	t	p
<i>My research experience has prepared me for advanced coursework in science</i>	3.00	1.080	3.43	.514	1.333	.195
<i>My research experience has motivated me to attend college</i>	3.15	1.068	3.71	.611	1.689	.104
<i>My research experience has prepared me for college</i>	3.31	.630	3.21	1.051	-0.277	.784
<i>Doing research clarified for me which field of study I want to pursue</i>	2.38	1.557	2.29	1.637	-0.161	.874

Four-point scale ranging from Strongly Disagree (1) to Strongly Agree (4)

Participants were then asked to indicate their level of satisfaction with various characteristics of the research experience (see Table 11). Results show that participants in the control group, on average, indicated greater levels of satisfaction with all but two of the characteristics listed. Participants in the control group were ‘Very Satisfied’ with the *Ease in asking questions/talking with their lab research scientists*, the *Support and guidance from their lab research scientists* and *Lab or field equipment*. Participants in the experimental group, on the other hand, indicated greater ratings of satisfaction with the *Support and guidance from program staff* and *The lab safety training they received*. Note, however, that none of the mean differences were found to be statistically significant.

Table 11. Level of Satisfaction with Research Experience Characteristics

Items	Experimental (n = 13)		Control (n = 14)		df = 25	
	Mean	Std. Dev.	Mean	Std. Dev.	t	f
<i>Information available to help me choose a research project</i>	3.23	.83	3.57	.514	1.291	.209
<i>Ease in asking questions/talking with my lab research scientists</i>	3.77	.60	3.93	.267	0.904	.375
<i>Lab or field equipment</i>	3.54	1.20	3.93	.267	1.188	.246
<i>Support and guidance from program staff</i>	3.62	1.19	3.79	.426	0.502	.620
<i>Support and guidance from my lab research scientists</i>	3.62	1.19	3.92	.277	0.906	.374
<i>Support from other research group members</i>	3.77	1.24	3.29	1.069	-1.09	.286
<i>Discussion group meetings</i>	3.38	1.33	3.79	.426	1.076	.292
<i>The lab safety training I received</i>	3.54	1.27	3.29	1.437	-0.483	.633

Four-point scale ranging from Very Dissatisfied (1) to Very Satisfied (4)

To end the survey, participants were asked to indicate the reason(s) for taking part in the program (see Table 12). The main reasons indicated by participants in both the experimental and control groups, were to: *Gain hands on research experience* and *Have a good intellectual challenge*. Participants in the control group were also very motivated to participate in the program by the idea of *Working closely with scientists*.

Table 12. Reasons for Participating in the Program

Reasons	Experimental (n=13)	Control (n=14)	Total
<i>Explore my interest in science</i>	61.5%	84.6%	73.1%
<i>Gain hands on research experience</i>	92.3%	100.0%	96.2%
<i>Clarify which field I wanted to study</i>	46.2%	23.1%	34.7%
<i>Clarify whether college would be a good choice for me</i>	15.4%	30.8%	23.1%
<i>Clarify whether I wanted to pursue a science research career</i>	61.5%	53.8%	57.7%
<i>Have a good intellectual challenge</i>	92.3%	84.6%	88.5%
<i>Work closely with scientists</i>	53.8%	92.3%	73.1%
<i>Participate in a reputable program</i>	61.5%	53.8%	57.7%
<i>Get good letters of recommendation</i>	53.8%	92.3%	73.1%
<i>Enhance my resume</i>	69.2%	92.3%	80.8%

PARTICIPATING FACULTY INTERVIEWS

To acquire a more holistic understanding of the impacts of the program, the faculty who were involved with the high school students were also allowed the opportunity to provide feedback during in-depth interviews. Three out of the four faculty invited, were interviewed in person by the evaluator. The interviews were conducted in April 13th and 14th of 2015 and took no more than 30 minutes each. The purpose of the interviews were to learn from the perspective of the faculty the impacts of the program on the students and on themselves, their opinions on the cogenerative dialogues and suggestions on how to improve the program. To structure the interviews and ensure that they maintained consistency with all three individuals, the following questions were asked:

1. What was your favorite part of the program? What about least favorite?
2. Think back to the first days that the students became engaged in lab activities, then think about their engagement through the end of the program. In your view, how did the research experience impact the participants while in the program?
3. For those of you who took part in the cogenerative dialogues, what is your opinion of them? Did you find them helpful/useful? Why or why not?
4. Have you continued interacting with any of the student participants in any way (i.e. writing letters of recommendation for them, advising them on: any research topics, college, scholarship opportunities, internships, etc.)?
5. Have you made any changes in your training/mentoring of students as a result of your involvement with the program? If so, what changes did you make?
6. Do you have any suggestions to improve Working With a Scientist?
7. Any other comments?

The feedback from all three interviews was analyzed by content and is displayed in Figure 1 below. Six major categories were assessed from the interviews and are the following: favorite aspects, least favorite aspects, impacts to students, impacts to faculty, opinions on cogens and suggestions for improvement.

Regarding the favorite aspects of Working With a Scientist, the faculty shared that working with the students was their most rewarding experience. One of the individuals mentioned that they particularly enjoyed working with high school students because they were more receptive to information and were curious to learn. Witnessing how the students evolved in their learning and eventually how they took ownership of their research projects was also mentioned. Some of the least favorite aspects of the program, on the other hand, included: a difficulty with time management (not having enough time due to outside obligations), the lack of student engagement and initiative to network with other students during the beginning of the program and the fact that they kept losing students (participant attrition) as the program continued (this was attributed by two of the faculty as maybe due to the activities being held on Saturdays during the Spring semester, which is when the attrition occurred).

From the perspective of the faculty, Working With a Scientist had several impacts on the students as well as on the faculty. The faculty thought that the program impacted the students mostly on their professional development. As the program continued, students began to feel more comfortable with research because they began to understand the scientific process better. During their research presentations and during the cogens, the students also demonstrated more confidence in their oral skills. Therefore, the students' perspectives of how they saw themselves changed during the program; they went from seeing themselves only as high school students to seeing themselves as researchers. The faculty also shared about being impacted by the program. One of the interviewees, for example, said that by interacting with high school students, they were

able to understand some of their university students more. Another faculty participant mentioned that they were inspired by the cogens to begin to hold weekly meetings with their university students to engage in dialogue about their research.

In regard to the cogens, the faculty had mostly positive strong opinions about their usefulness. They were described as being “fantastic tools” to engage the students and learn their feedback about the activities. All of the interviewees agreed that the cogens were useful in that they helped “break barriers” between the faculty and student participants. They also helped identify some of the challenges associated with their personal research projects. But on that same note, the cogens were also described as being exhaustive due to their length and eventually turned into sessions to complain about topics unrelated to their research. For example, one of the faculty expressed frustration because students began to discuss challenges with the bus being late and getting lost on campus; all those type of problems the faculty felt were out of their control. The faculty participants believed that students often felt forced to come up only with negative issues to discuss during the cogens time and, therefore, this was counterproductive. These opinions about the cogens were, thus, followed by suggestions to improve the cogens and the program itself. The faculty shared that they would prefer that the significance of cogenerative dialogues and prior research on the topic be discussed more in depth in the beginning of the program so they better understand how to participate in them. The faculty acknowledge that they participated in a cogens training prior to the start in the program but agreed that they would have benefitted from additional training and information on the topic. Finding more ways to break the barriers between the students and the faculty early in the program was also recommended. One of these ways, they mentioned, would be to encourage students to bond with each other, the research assistants and later the faculty during the initial stages of the program. Note that this change has already taken place for the second cohort of students who started taken part in the program in January of 2015. The faculty also expressed the need for more research assistants to help the students. And finally, one of the professors felt strongly that student participants should be allowed to return to the program for a second year so they can continue to develop and apply the research skills they learned in the first year.

Figure 1. Faculty Feedback from Interviews

Favorite aspects of the program:

- Working with high school students who were more **receptive** and **curious**
- The **process** of seeing **students evolve** in their learning by working closely with the scientist
- Witnessing how students begin to **take ownership** and plan their own projects

Least favorite aspects of the program:

- Not enough time to devote program due to too many outside obligations
- The lack of student participation / engagement during the beginning
- Students not having enough initiative to get to know their team members
- Losing students because the research activities were held on Saturdays

How students were impacted by the program:

- Understand the process of research better and are less intimidated once they are exposed to scientific approaches
- Oral communication skills improve (i.e. during presentations and when asking questions)
- Perspectives about how they see themselves change from thinking they are just high school students to seeing themselves as researchers

How faculty were impacted by the program:

- By interacting with local high school students, faculty learned more about their own students in the university
- Began to hold weekly meetings, that acted like cogens, with their university research students

Opinions on program's cogens:

- Fantastic tools to get feedback from students
- Dialogues help break the barriers between the students and the scientist
- Students are able to identify challenges with their research
- They become exhaustive and eventually turn into sessions to complain about non-research related topics

Suggestions to improve program:

- Communicate the significance of cogens in the beginning of the program
- Find more ways to break the barrier between the students and scientists
- Let students return a second year so they can develop from what they learned the first year
- Provide more research assistants to the faculty
- Find ways for students to bond with each other and with the research assistants in the beginning

DISCUSSION AND SUGGESTIONS

The student academic data comparisons and the survey feedback for the Working With a Scientist program show mixed results in regard to student impacts from the experimental study on using cogenerative dialogues (cogens) in research settings. Analysis from the academic data indicates that the internship experimental group, or students who took part in the cogens demonstrated greater average GPA increases than all their counterparts (internship control group, non-internship control group, and the group of students who dropped from the program).

The mixed results, however, are visible when comparing the students' feedback from the Group Discussion Survey and the Undergraduate Research Student Self-Assessment. Students in the internship experimental group generally reported feeling a greater 'sense of belonging' during discussions with their groups and perceived others in their groups more positively, but mean differences were no significant. Regarding the research experience, the internship control group possessed more positive perceptions about the gains they made while in the program. For example, those in the control group reported greater gains in items related to their application of knowledge to research and in their personal and skill development, and ratings provided for some of the ratings were significantly greater than those provided by the internship experimental group. The internship control groups also provided greater average ratings on items related to developing a scientific identity (i.e. thinking and acting like researchers) than the internship experimental group; the ratings provided by both groups, however, were not significantly different. When relating the impacts of the WWASP research experience to their college aspirations, students in the internship experimental group indicated that the program prepared them for college while those in the control group indicated that the program motivated them to attend college.

The faculty also had mixed feelings about the cogens. On the one hand, they agreed that they are useful feedback mechanisms to engage students in discussions but because of their length, they can become exhaustive and counter-productive. They suggested that the program relax their rules regarding the cogens so they do not exhaust the students. The cogens were also helpful in breaking the barriers between and amongst all group participants (students, research assistants and the faculty) but they are not enough and recommend that WWASP invest in other mechanisms to enhance student to faculty solidarity.

The findings from the first cohort of WWASP student participants show that the internship experience overall has had a positive impact on students. Findings also show that the use of cogens may positively impact students, especially on their academic performance. However, it is yet not clear whether the use of cogens increases students' interest in research, or their perceptions of the gains made through their research experience. All participant interns reported making valuable gains in different areas and skills related to conducting research, and findings suggest that providing high school students with research experiences may be very beneficial to students. However, more research is needed to effectively assess whether including cogens in research experiences will serve to increase the value of the experiences overall.

Appendix A

Working with a Scientist Program: Discussion Group Survey

First Name: _____ Middle Name: _____ Last Name: _____

Select the lab that you belong to:

- Lab 1 - Geology
- Lab 2 - Chemistry
- Lab 3 - Chemistry
- Lab 4 - Engineering

1. While reading the statements below, keep in mind your own thoughts and actions during the after-lab group discussions. Please rate each statement by circling the answer that best reflects your perceptions about the after-lab group discussions (ranging from 'Never' to 'Always').

Statements	Never	Rarely	Sometimes	Most of the Time	Always
a. I strive to make sense of what others are saying.	1	2	3	4	5
b. I try to get others to contribute to what is being discussed.	1	2	3	4	5
c. I feel like I have the opportunity to speak as much as others in my group.	1	2	3	4	5
d. My talk is respectful.	1	2	3	4	5
e. When others talk, I listen to what they have to say.	1	2	3	4	5
f. When I talk, I build on what others have to say.	1	2	3	4	5
g. I try to learn from other's talk.	1	2	3	4	5

h. I try to understand different perspectives.	1	2	3	4	5
i. I value different perspectives of those in my group	1	2	3	4	5
j. I feel as if I belong with this group.	1	2	3	4	5
k. I maintain focus during dialogue.	1	2	3	4	5
l. My oral contributions are thoughtful.	1	2	3	4	5
m. As I listen to others, I attempt to put aside my own perspectives and understand theirs.	1	2	3	4	5
n. I am willing to consider others' ideas.	1	2	3	4	5
o. I value different perspectives.	1	2	3	4	5

2. Please provide any comments you may have concerning any of the statements or anything related to your discussions in the group that applies to your ratings.

3. While reading the statements below, keep in mind other group members' behavior during the after-lab group discussions. Please rate each statement by circling the answer that best reflects your perceptions of occurrence (ranging from 'Never' to 'Always').

Statements	Never	Rarely	Sometimes	Most of the Time	Always
a. Others in my group try to make sense of what I am saying	1	2	3	4	5
b. Others in my group try to get me to contribute during discussions	1	2	3	4	5
c. Others in my group have the opportunity to speak as much as I do.	1	2	3	4	5
d. Others in my group show respect for one another.	1	2	3	4	5
e. When I talk, others in my group listen to what I have to say.	1	2	3	4	5
f. When others in my group talk, they build on what I have to say.	1	2	3	4	5
g. Others in my group strive to learn from my oral contributions.	1	2	3	4	5
h. Others in my group try to understand different perspectives.	1	2	3	4	5
i. Others in my group value my perspective.	1	2	3	4	5
j. Others in my group have a sense of solidarity.	1	2	3	4	5
k. Others in the group maintain focus during dialogue.	1	2	3	4	5
l. Others' oral contributions are thoughtful.	1	2	3	4	5
m. Others set aside their perspectives when they listen to me.	1	2	3	4	5
n. Others in my group are willing to consider my ideas.	1	2	3	4	5
o. Others value different perspectives.	1	2	3	4	5

4. Please provide any comments you may have concerning any of the statements or anything related to your discussions in the group that applies to your ratings.

5. Think back to your group discussion time; please rate each statement below by circling the answer that best reflects your perceptions of occurrence (ranging from 'Never' to 'Always').

Statements	Never	Rarely	Sometimes	Most of the Time	Always
a. The group strives to have all voices heard.	1	2	3	4	5
b. Different perspectives are valued by the group	1	2	3	4	5
c. The group strives to incorporate all perspectives.	1	2	3	4	5
d. There is a shared mood in the group.	1	2	3	4	5
e. There is harmony with discussions in the group	1	2	3	4	5
f. Dialogue in the group is timely.	1	2	3	4	5
g. Dialogue in the group is appropriate.	1	2	3	4	5
h. Dialogue in the group is predictable.	1	2	3	4	5
i. During group discussions there is at least one review of what was accomplished.	1	2	3	4	5
j. Different perspectives from members of the group have contributed to my own learning.	1	2	3	4	5

6. Please provide any comments you may have concerning any of the statements or anything related to your group that applies to your ratings.

7. Do you have any other comments or concerns about the Working with a Scientist Program, or suggestions for improving the program?

Thank you for your time!

Appendix B

Working With A Scientist Program

Research Experience Survey

First Name: _____ Middle Name: _____ Last Name: _____

Select the lab that you belong to:

- Lab 1 - Geology
- Lab 2 - Chemistry
- Lab 3 - Chemistry
- Lab 4 - Engineering

Please be as precise as you can in your answers. Please choose 'not applicable' for any activity you did not do. You may find one or more questions at the end of some sections that invite an answer in your own words. Please be open and honest with your answers, keeping in mind that future students who participate in the program will benefit from your thoughtfulness. Remember that all your answers will be kept confidential; the program staff and program scientists will not know what any individual student has answered or written.

1. Gains in Thinking and Working Like a Scientist: Application of Knowledge to Research

How much did you gain in the following areas as a result of your research experience?	No gain	A little gain	Moderate gain	Good gain	Great gain	Not Applicable
a. Analyzing data for patterns	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Figuring out the next step in a research project	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Problem-solving in general	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Formulating a research question that could be answered with data	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Identifying limitations of research methods and designs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Understanding the theory and concepts guiding my research project	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Understanding the connections among scientific disciplines	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. Understanding the relevance of research to my coursework	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. Personal Gains Related to Engagement in Research

How much did you gain in the following areas as a result of your research experience?	No gain	A little gain	Moderate gain	Good gain	Great gain	Not Applicable
a. Confidence in my ability to contribute to science	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Comfort in discussing scientific concepts with others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Comfort in working collaboratively with others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Confidence in my ability to do well in future science courses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Ability to work independently	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Developing patience with the slow pace of research	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Understanding what every day research is like	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. Taking greater care in conducting procedures in the lab or field	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. Gains in Skills

How much did you gain in the following areas as a result of your research experience?

	No gain	A little gain	Moderate gain	Good gain	Great gain	Not Applicable
a. Writing scientific reports or papers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Making oral presentations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Defending an argument when asked questions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Explaining my project to people outside the field	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Preparing a scientific poster	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Keeping a detailed lab notebook	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Conducting observations in the lab or field	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. Using statistics to analyze data	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i. Calibrating instruments needed for measurement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j. Working with computers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
k. Understanding journal articles	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
l. Conducting database or internet searches	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
m. Managing my time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4. The following questions ask about your overall research experience and about any changes in your attitudes or behaviors as a researcher.

During your research experience HOW MUCH did you?	None	A little	Some	A fair amount	A great deal	Not Applicable
a. Engage in real-world science research	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Feel like a scientist	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Think creatively about the project	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Try out new ideas or procedures on your own	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Feel responsible for the project	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Work extra hours because you were excited about the research	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Interact with scientists from outside your lab	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. Feel a part of a scientific community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5. These questions ask about your research experience

Please rate the following	Poor	Fair	Good	Excellent	Not Applicable
a. My working relationship with my research lab scientists	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. My working relationship with my research group members	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. The amount of time I spend doing meaningful research	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. The amount of time I spend with my research lab scientists	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. The advice my research lab scientists provide about college	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. The research experience overall	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6. These question continue to ask about your research experience

Rate how much you agree or disagree with the following statements	Strongly disagree	Disagree	Agree	Strongly Agree	Not Applicable
a. My research experience has prepared me for advanced coursework in science	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. My research experience has motivated me to attend college	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. My research experience has prepared me for college	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Doing research clarified for me which field of study I want to pursue	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please comment on any of these statements.

7. These questions also continue to ask about your research experience

How satisfied were you with the following aspects of the research program?	Very dissatisfied	Somewhat dissatisfied	Somewhat satisfied	Very satisfied	Not Applicable
a. Information available to help me choose a research project	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Ease in asking questions/talking with my lab research scientists	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Lab or field equipment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Support and guidance from program staff	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Support and guidance from my lab research scientists	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Support from other research group members	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Discussion group meetings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. The lab safety training I received	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please comment on any of these aspects.

8. What motivated you to apply to take part in the program?

I wanted to participate in this research experience to:	Select all that apply
a. Explore my interest in science	<input type="checkbox"/>
b. Gain hands on research experience	<input type="checkbox"/>
c. Clarify which field I wanted to study	<input type="checkbox"/>
d. Clarify whether college would be a good choice for me	<input type="checkbox"/>
e. Clarify whether I wanted to pursue a science research career	<input type="checkbox"/>
f. Have a good intellectual challenge	<input type="checkbox"/>
g. Work closely with scientists	<input type="checkbox"/>
h. Participate in a reputable program	<input type="checkbox"/>
i. Get good letters of recommendation	<input type="checkbox"/>
j. Enhance my resume	<input type="checkbox"/>
k. Other (please specify in the space below)	<input type="checkbox"/>

Other:

9. What would have made your research experience better?

10. What would improve the Working With A Scientist Program overall?

Please note that this survey is based on the Undergraduate Research Student Self-Assessment (URSSA). Information on URSSA can be found at:

<http://www.colorado.edu/eer/research/undergradtools.html>