



ACS Scholars Program
1995–2016 Survey Analysis Report

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**Prepared for
Educational Division,
American Chemical Society**

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Introduction

The ACS Scholars Program was initiated in 1995 with 200 students majoring in a chemical science and planning for a career in the field. The program is intended to address the gap in representation in the chemical sciences by awarding scholarships to Black/African-American, Hispanic or Latino, and Native American students majoring in chemistry-focused disciplines at accredited 2- and 4-year higher education institutions. The selected students are highly competitive academically and show promising leadership and technical strengths. In the 20+ year history of the program, there have been nearly 3,000 scholarship recipients and over 1,700 students have successfully completed their undergraduate studies while in the ACS Scholars Program. Of this group, more than half are known to have continued into graduate programs with the balance entering the chemical workforce. Since the program's inception, 280 former ACS Scholars have received a Ph.D. with 40 currently confirmed to be serving in academic roles.

To ensure that the ACS Scholars Program is achieving its desired impact, a survey was conducted of former and current Scholars to gather information about students' academic and mentoring experiences in the program, and to better understand the influence of the ACS Scholars program in their career progression and engagement with ACS.

Methodology

Survey Design and Administration

The ACS Education Division conducted a survey of current and former ACS Scholars in early November 2016. The survey consisted of 47 questions focusing on the influence of the ACS scholarship, experience with the mentoring aspects of the program, and current and future career and educational plans. The survey was administered online via email. Staff from the Education Division of ACS sent an initial email to approximately 4,000 current and former ACS Scholars in late October, which informed the scholars of the upcoming survey opportunity. This process yielded 2099 valid emails. An initial invitation to participate in the survey, including a link to the survey itself, was delivered on November 2, 2016.

Two reminder emails were sent on November 10 and 14. As an incentive for participating in the survey, scholars were offered a chance to win one of two \$1,000 awards for travel support to an upcoming ACS meeting. Additionally, respondents had the opportunity to win one of ten one-year memberships to ACS. The survey was live from November 2-16, 2016

A total of 546 individuals responded to the survey, which was a 25.6% response rate. The final analytical sample included 535 respondents (see Table 1). Of these respondents, 173 indicated that they were currently enrolled in undergraduate programs and enrolled in the program (thus identified as current Scholars). An additional 9% of respondents noted that they had withdrawn from the program at some point during their tenure as a Scholar³.

The respondent sample (n=535) was about 60% female, which closely mirrors the national distribution of ACS Scholars, of whom about 57% are female. Most of the respondents identified as Hispanic (51%)

³ These respondents included those who said they withdrew or did not remember if they withdrew, thus this proportion may be slightly inflated compared to the actual number of Scholars who withdrew over the course of the program. ACS Scholars are expected to be enrolled in a chemistry-related major to maintain their funding eligibility.

or African American (40%) and about 5% identified as American Indian (see Table 1). The response distribution slightly over-represents Hispanic Scholars when compared to the national population of recipients (44% of whom identify as Hispanic) and slightly underrepresents African American Scholars (49% of whom identify as African American). However, the response rate of American Indian students is very close to the national proportion (6% nationally). The ACS Scholars program is only open to individuals who identify as African American, Hispanic, or American Indian at the time of application. However, the survey allowed respondents to identify with multiple races and ethnicities including white and Asian/Asian American. Ninety-five individuals (20%, see Table 1) marked multiple race/ethnicities. Of these, 15 co-marked Asian/Asian-American and 74 co-marked white. In the data analysis, individuals who marked multiple categories were assigned to each category marked (e.g. if someone marked Black and Hispanic, they were included in both categories for analysis), which served to bolster the sample for each of the groups and allowed these data to be analyzed outside of a less useful “Multi-racial” category. All of the respondents who marked Asian also marked another category and 74 of 77 respondents who marked white also marked another category. Since these two groups are not populations of service in the scholarship program and their data are included in other categories, white and Asian/Asian American categories are not included in this report.

Table 1. Description of Sample (N = 535^a)

<u>Sex</u>	N	%
Female	301	58.4
Male	212	41.2
Transgender	1	0.2
<u>Race/Ethnicity</u>		
American Indian or Alaskan Native	29	6.1
Black or African-American	190	40.3
Hispanic, Latino or Spanish Origin	239	50.6
Native Hawaiian or Pacific Islander	5	1.1
Middle Eastern or North African	3	0.3
Other/Decline to State	6	1.3
<i>Marked More than One Category^b</i>	95	20.1%
<u>Institution Enrolled when First Received Scholarship</u>		
2-year or Community College	20	3.7
4-year College or University	514	96.3
<u>Year First Received Scholarship</u>		
1999 or earlier	41	7.7
2000-2004	74	13.9
2005-2009	107	20.1
2010-2012	90	16.9
2013-2015	125	23.6
2016	94	17.7
<u>Withdrew from the Program</u>		
Yes/I don't remember	50	9.4
No	484	90.6
<u>First in Family to attend College</u>		
Yes	170	33.0
No/I'm not sure	341	66.2

^aTotals for each subcategory may sum to less than 535 due to skipped questions. Most questions on the survey were not marked “required,” unless they were needed to determine routing to answer other questions.

^bThe ACS Scholars program is open to those students who identify as African American, Hispanic, or American Indian at the time of their application. However, for the survey individuals were allowed to “mark all that apply” when identifying their race or ethnicity. 95 respondents (about 20% of the sample) marked more than one category. In order to have a larger sample for each individual category, those who marked multiple race/ethnicities were included within each group marked. Without this process some groups, e.g. Middle Eastern/North African, would have had too small a sample to include in the analysis.

Just over half of the respondents received their first year of funding in 2010 or more recently (58.2%), while only a small group received their funding in the first few years of the program (8% in 1999 or earlier). About 18% of the respondents indicated that 2016, the year of the survey, was their first year of funding. Finally, a small portion of respondents, just under 10%, indicated that they withdrew from the program at some point during their undergraduate time in college.

The data contained in this report were examined for differences between current and alumni Scholars, primarily using t-tests for differences of the means, or chi-square to determine differences between distribution of responses on the various items. All statistically significant differences discussed in the text reached statistical significance at $p < .05$. Data were also examined by gender and race/ethnicity, as well as by educational status (e.g. first generation college student) at different points. Due to small sample sizes, some of the data by race/ethnicity were not examined for statistical significance, however, the findings are reported in order to provide more information about these populations in general.

Results

Overall Satisfaction and Experiences

Most participants in the ACS Scholars program are satisfied with their experience. In fact, over two-thirds of current and alumni Scholars (71%) noted they were very satisfied with the program. Only 2% of each group indicated that they were somewhat or very unsatisfied. Likewise, both current and former Scholars indicated they were satisfied with the monetary amount of the scholarship, with 60% of currently-enrolled Scholars saying they were very satisfied and almost two-thirds of alumni answering in the same way. While still a small minority, slightly more were dissatisfied with the monetary award (5% of current Scholars and 4% of alumni saying they were somewhat or very dissatisfied).

Respondents were asked to share about their academic, professional and leadership experiences since being an ACS Scholar, specifically identifying how they have used skills gained by being an ACS Scholar in their academic or professional career. Over 350 respondents answered the question, highlighting numerous ways they have benefited from the ACS Scholars program, including professional development opportunities (e.g. ACS Annual Meeting), networking and internship opportunities, undergraduate research experience, encouragement to pursue chemistry degrees and graduate study, an increased focus on outreach to their local community, increased mentoring opportunities for themselves and an increased desire to mentor others – in particular young students from underserved communities, and more opportunities for other scholarships and awards (through ACS communications).

Responses included comments such as the following:

Being an ACS Scholar enabled me to get research experience as an undergraduate. I very much enjoyed research and so I was excited and prepared to go to graduate school. Being an ACS Scholar was the first step on my path to becoming a research scientist.

After graduating from college, I worked for a year doing vaccine formulations research at a biotech. Then I began an MD/PhD program and am currently in my first year. I think what most helped me as an ACS Scholar was my mentor (who was also just the general mentor for all chemistry majors) who helped get me the summer internships in the pharmaceutical industry

that made it easier to get a job in industry post-grad and helped me through the MD/PhD application process.

I find myself mentoring a lot of youth and exposing them to careers in STEAM as we need them.

Being an ACS Scholar has aided in my financial security which has allowed me to focus on my academics and research... It has also given me the confidence to pursue a PhD in organic chemistry -- a feat I once considered unattainable.

Being an ACS Scholar has motivated me to expose those from traditionally underrepresented groups (like myself) to science and careers in science.

I am currently a Postdoc in Developmental Biology but I got my PhD in Biochemistry and that was in large part due to ACS. And now I am using the biochemistry skills I learned as an undergraduate at Harvard and as a graduate student at UCSF in my current research at UCLA. Even though I am not technically still in a "chemistry-related" field, I still use my chemistry-related knowledge and skills on a daily basis.

I was able to learn a great deal about networking and applying to scholarships. This was translated into valid ways to apply for projects involving cash or expenses at work. This also helped me a great deal in learning to create budgets and stick to them.

Degree Attainment

One of the primary goals of the ACS Scholarship is to increase the Chemistry degree attainment rates of historically underrepresented populations. Nationally, in 2015, women earned 48% of Chemistry degrees, while students of color earned 42% (National Center for Educational Statistics, 2017). By encouraging women and students of color to study Chemistry, ACS is providing an opportunity to students to consider a field where they may not have many role models and to increase diversity in the field.

Table 2. Undergraduate Degrees In Progress or Earned by ACS Scholars (N=511)^a

Major	In Progress (#)	Previously Earned (#)	% of all Degrees
Biochemistry	30	40	13.2
Biomedical Engineering	1	0	0.2
Chemistry	67	163	43.3
Chemical Engineering	72	93	31.1
Chemical Technology	0	2	0.4
Environmental Science and Engineering	2	3	0.9
Food Science	1	1	0.4
Forensic Chemistry	1	0	0.2
Industrial Chemistry	0	1	0.2
Material Science and Engineering	2	8	1.9
Pharmaceutical Chemistry	1	0	0.2
Toxicology	0	2	0.4
Chemistry Majors (total)	177	313	92.3
Non-Chemistry Majors (total) ^b	13	28	7.7

^a Counts represent respondents who are currently enrolled in an Associate's or Bachelor's degree program and alumni Scholars who previously earned an Associate's and/or Bachelor's degree. Individuals who marked non-Chemistry majors tended also to note that they had withdrawn from the ACS Scholars program at some point. Cells total to greater than 511 due to individuals who had received multiple degrees (e.g., A.S. and B.S., multiple B.S., etc.).

^b Non-Chemistry Majors include: Anthropology, Biology, Computer Science, Economics, Geology, General Science, General Studies, Human Nutrition, Health Science, Marine Biology, Mathematics, Mechanical Engineering, Microbiology, Neuroscience, Physical Sciences, Web Design and Development.

As expected, most of the respondents to the survey are enrolled in, or had previously earned, a Chemistry or Chemistry-related degree (92%, see Table 2). Most of the participants in the present study earned or are earning their degree in Chemistry proper (43%), with Chemical Engineering (31%) and Biochemistry (13%) the other most common majors.

Many ACS Scholars continue on to graduate study after completing their undergraduate degree (see Table 3). The Ph.D. is the most frequent graduate degree in progress or attained in this sample (n=144, 57%), with a Master's in Arts & Science the second most frequently earned or attempted degree (n=60, 24%). In the current sample, just over half of the respondents (n=255) were either enrolled in, or had already earned, a graduate degree. Further, based on application data, the rate of current Scholars aspiring to graduate study is much higher – 92%. While it is unlikely that all of these individuals will pursue graduate study in the future, it is encouraging that ACS Scholars have a high expectation for future study, as aspirations are a consistent measure of behavior in college and beyond (Cole, Kennedy, & Ben-Avie, 2009; Konings, Brand-Gruwel, van Merriënboer, & Broers, 2008).

Table 3. Graduate Degrees In Progress or Earned by Alumni Scholars (N=255)^a

Degree Type	In Progress	Previously Earned	Overall
Master's in Arts & Sciences (M.A./M.S.)	8.6%	34.0%	23.5%
Doctorate in Philosophy (Ph.D.)	74.3%	44.0%	56.5%
Master's in Business (M.B.A., etc.)	1.9%	2.7%	3.5%
Other Professional/Master's Degree (M.P.A., M.S.N., M.S.W., etc.)	1.0%	2.7%	2.0%
Medical Doctorate (M.D., O.D., D.D.S., D.V.M., etc.)	3.8%	6.7%	5.5%
Law Degree (J.D., L.L.M., etc.)	0.0%	0.7%	0.4%

^a These data only include those respondents who indicated that they did not withdraw from the ACS Scholars program and who are not currently enrolled as undergraduates.

Of the survey respondents who were pursuing Master's Degrees in the Arts and Sciences or Ph.D.s, most were Chemistry-related (84%, see Table 4). The most common areas of study were Chemical Engineering (14%) and Organic Chemistry (14%). Most of those who continued to graduate study in Chemistry-related areas were pursuing or had previously earned Doctorates, with almost three-quarters (74%) enrolled or previously having earned a Ph.D.

Table 4. Graduate Chemistry Degrees in Progress or Earned by Degree Type (N=223)^a

Major	Masters	Ph.D.	% of all Degrees
Agricultural/Food Chemistry	1	0	0.4%
Analytical Chemistry	4	10	6.3%
Biochemistry	3	14	7.6%
Chemical Biology	3	6	4.0%
Chemical Education	2	2	1.8%
Chemical Engineering	10	22	14.3%
Chemical Toxicology	0	1	0.4%
Colloid and Surface Chemistry	0	0	0.0%
Computational Chemistry	0	1	0.4%
Electrochemistry	0	1	0.4%
Environmental Chemistry	1	2	1.3%
General Chemistry	2	1	1.3%
Geochemistry	1	1	0.9%
Inorganic chemistry	5	10	6.7%
Materials chemistry	5	14	8.5%
Medicinal/Pharmaceutical Chemistry	0	5	2.2%
Nuclear Chemistry	0	2	0.9%
Organic Chemistry	8	23	13.8%
Organometallic Chemistry	0	1	0.4%
Physical Chemistry	2	8	4.5%
Polymer Chemistry	0	6	2.7%
Theoretical Chemistry	0	0	0.0%
Chemistry Majors (total)	44	126	83.8%
Other-Non-Chemistry (total)^b	23	24	21.0%

^a Counts represent Scholars who are currently enrolled in a Masters or Ph.D. degree program or who previously earned a graduate degree. Cells sum to more than 223 due to individuals who reported earning multiple graduate degrees.

^b Non-Chemistry majors include STEM majors (i.e. Biology, Biomedical Science, Neuroscience, Epidemiology, Environmental Science) and Non-STEM majors (i.e. Education, Economics, Spanish).

Mentoring Program

The mentoring aspect of the ACS Scholars program began in 1998. Currently, about 60% of ACS Scholars have been assigned a mentor. In the present sample, about half of the respondents (n=223) indicated that they had a mentor appointed through the ACS Scholars program. Generally speaking, respondents were satisfied with the mentoring program. Almost 50% indicated they were very satisfied with an additional 25% saying they were somewhat satisfied. There were no statistical differences in satisfaction between alumni and current Scholars.

Scholars who are currently enrolled in bachelor degree programs are communicating with their mentors more often than previous Scholars did (Table 5). A full half of currently-enrolled Scholars indicate that they speak with their mentor at least one time per month, with a quarter saying they communicate with their mentor as frequently as 1-2 times per week. In contrast, alumni of the program remember communicating with their mentors much less frequently, with less than a quarter indicating that they spoke to their mentor at least monthly.

Table 5. Frequency of communication with mentor (N = 223)

	Current Scholars (n=80)	Alumni Scholars (n=143)
1-2 times per week	25.0 %	11.0%
1-2 times per month	30.0 %	11.0%
4-6 times per year	13.5 %	26.0%
1-2 times per year	27.5 %	21.0%
Never	3.8 %	3.4%

As noted in Table 5, over half of the current Scholars who participated in the survey indicated that they communicate with their mentor at least once a month. Most of the current Scholars also marked that they are speaking to their mentors about the right amount (60%) or even a little less frequently than they would like (22.5%), while only 10% indicate they would have preferred to speak less often (see Table 6). In contrast, while most of the alumni were happy with the amount of communication they had with their mentor (67.1%), almost a quarter indicated that they communicated with their mentor a little less than they would like. Satisfaction with frequency of communication and actual amount of communication was correlated for both groups, thus showing that as individuals communicated less frequently with their mentors, they also said they had too little communication with them⁴.

Table 6. Satisfaction with Frequency of Communication with Mentor (N = 223)

Frequency of Communication	Current (n=80)	Alumni (n=143)
Much More than I would have liked.	5.0%	2.7%
A Little More than I would have liked.	5.0%	2.1%
About the right amount.	60.0%	67.1%
A Little Less than I would have liked.	22.5%	16.1%
Much Less than I would have liked.	7.5%	11.9%

When asked how their mentors helped them to improve in terms of their academic achievement, interest in chemistry, and pursuit of chemistry-related majors and careers, both current and alumni Scholars reported a positive experience (see Table 7). A full third of respondents in both categories indicated that their mentors contributed to their academic achievement to a considerable or great extent. Over half of both groups reported that their mentor was a positive influence on their academic interests in the chemical sciences to a considerable or great extent. Finally, almost half of both groups said that interactions with their mentors encouraged them to pursue chemistry-related research or a chemistry-related career to a considerable or great extent (Table 7).

Alumni Scholars were more likely to say that their mentors did not help in these areas at all. However, almost all current Scholars (85% or more) reported that their mentors helped in these ways to at least a slight or moderate extent (Table 7). These differences suggest that the mentoring program has become more focused on these areas or more effective in recent years.

⁴ Current Scholars, r=.43 (p<.001); alumni r=.49 (p<.001))

Table 7. To what extent do the following statements describe the influence of your ACS mentor on your academic and professional career? (N=223)

	Current Scholars (n=80)			Alumni Scholars (n=123)		
	Very great or considerable	Slight or moderate	Not at all	Very great or considerable	Slight or moderate	Not at all
My mentor contributed to improving my academic achievement.	36.3%	38.8%	15.0%	36.4%	42.0%	21.7%
My mentor was a positive influence on my academic interests in the chemical sciences.	58.8%	33.8%	7.5%	58.8%	34.3%	13.3%
Interactions with my mentor encouraged me to pursue chemistry-related research.	48.8%	37.6%	13.8%	46.2%	26.6%	27.3%
Interactions with my mentor encouraged me to pursue a chemistry-related career.	47.5%	42.5%	10.0%	46.9%	29.4%	23.8%

Career advice and encouragement were two of the chief influences of the ACS mentors, according to respondents (Table 8). Almost a third of respondents indicated that one of the key influences of their ACS mentor was encouragement regarding goals and career plans and almost a quarter added career planning advice as a key influence. Just about 20% said their mentor's key influence was in networking and graduate school advice, while only 13% noted that the biggest influence of their mentor was the opportunity to collaborate on research and even fewer (9%) noting internship opportunities.

Table 8. What have been the key influences of your ACS mentor? (n=237)

Factors	% marked
Offered encouragement regarding my goals or career plans	30.2%
Offered advice regarding career planning.	23.8%
Provided opportunities for networking.	18.7%
Offered advice regarding graduate school.	17.4%
Provided opportunities to collaborate on research.	13.0%
Provided opportunities for internships.	9.2%
Other	2.4%

Although both current and alumni Scholars showed an overall satisfaction with the mentoring aspects of the program, some offered suggestions for improvement. The most common suggestion from the respondents was to create a more formal mentoring program and structure with clear goals and expectations for communication between mentors and Scholars. Additional suggestions included diversifying the location of mentors (matching students with mentors from different universities), expanding the program to include post-doctoral researchers and graduate students as mentors, and encouraging ongoing contact and relationships after Scholars graduate.

Influence and Value of the ACS Scholars Program

Overall, respondents reported that the ACS scholarship had a positive influence on their opportunity to attend college, with almost half of respondents (48.7%) saying the scholarship was very or extremely influential in this regard. Likewise, about 40% of Scholars reported that the scholarship was very to extremely influential in their opportunity to study a chemistry-related undergraduate degree and over half (58%) indicating that the scholarship was very or extremely influential in their completion of a chemistry-related undergraduate degree.

Scholars were further asked about the specific benefits of the ACS Scholarships (Table 9). The most notable benefits according to the scholars were that it helped them to have fewer financial worries while in college (90%), that it allowed them to focus more on their classes (58%), and provided Scholars with networking opportunities (42%). Only a few Scholars noted that they received internships or career opportunities as a result of their scholarship.

Table 9. Benefits of the ACS Scholarship on Undergraduate Education (N=516)

Benefits	% marked
Helped me to have fewer financial worries in college.	90.3%
Allowed me to focus more on my classes.	58.3%
Provided me with networking opportunities in the chemical sciences.	41.5%
Allowed me to focus more on my classes.	58.3%
Provided me with access to chemists whom I would have not have met otherwise.	24.6%
Provided me with career opportunities in the chemical sciences.	17.6%
Provided me with internship opportunities in the chemical sciences.	17.1%

Table 10. Means showing influence of the ACS Scholarship, by first-generation student status. (N=514)^a

Benefits	First in Immediate Family to Attend College?	
	Yes	No/Not sure
Opportunity to attend college.	3.66*	3.02
Decision to study chemistry-related major.	3.34*	2.80
Opportunity to complete chemistry-related degree.	3.91*	3.40
Encouraged me to consider pursuing a graduate degree in a chemistry-related field.	3.87*	3.63

^a Table only shows benefits that were significantly different between scholars who were the first in their family to go to college and those who were not.

*p<.05

First-generation college students, those who indicated that they were the first in their family to attend college, reported some differences in the influence of their ACS scholarship compared to their peers. Specifically, first-generation students noted that the scholarship was very influential in their opportunity to attend college, moderately to very influential in their decision to study a chemistry-related major, and very influential in their opportunity to complete a chemistry-related degree ($p<.05$) (Table 10). First-generation students were also more likely to say that being an ACS Scholar encouraged them to consider pursuing a graduate degree in a chemistry-related field. Finally, while first-generation students were slightly more likely to say that being a scholar helped them focus on their classes, they were less likely than their peers to note the influence of the ACS Scholar program on networking opportunities (see Table 11).

Table 11. Benefits of the ACS Scholarship by first-generation student status (N=516)

Benefits	First in Family to Attend College? (% Marked)	
	Yes	No/Not Sure
Allowed me to focus more on my classes.	65%	54%
Provided me with networking opportunities in the chemical sciences.	34%	46%

When examining the value of the ACS Scholarship by race/ethnicity, there are some particularly interesting findings (see Table 12). One third to almost half of every group said that the ACS Scholarship was very or extremely influential in the opportunity to attend college (the exception being Middle Eastern/North African identifying respondents). The scholarship was even more influential for Black/African American, Hispanic/Latino, and Native Hawaiian/Pacific Islander students, with at least

40% indicating that the decision to study chemistry-related majors was influenced strongly by being a Scholar. The ACS scholarship also was very influential in helping a majority of American Indian/Alaskan Native (54%), Black/African American (60%), and Hispanic/Latino (55%) to complete their chemistry-related degree. In thinking about chemistry-related future plans, 60% of Hispanic/Latino and Native Hawaiian/Pacific Islander respondents said that the scholarship encouraged them to consider pursuing a graduate degree in chemistry. Finally, the ACS scholarship also was an encouragement to consider a chemistry-related field for a large portion (two-thirds or greater in almost every case) of the respondents.

Table 12. Influence of the ACS Scholarship, by Race/Ethnicity^a. (N=487)^b

Benefits	American Indian/ Alaskan Native (n=29)	Black/ African American (n=179)	Hispanic/ Latino/ Spanish Origin (n= 225)	Native Hawaiian/ Pacific Islander (n=5)	Middle Eastern/ North African (n=3)
<i>Percent indicating Very or Extremely Influential</i>					
Opportunity to attend college.	44.8%	46.4%	46.6%	40.0%	0.0%
Decision to study chemistry-related major.	27.5%	40.7%	39.8%	40.0%	0.0%
Opportunity to complete chemistry-related degree.	53.5%	59.8%	54.7%	40.0%	0.0%
<i>Percent indicating Agree or Strongly Agree</i>					
Encouraged me to consider pursuing a graduate degree in a chemistry-related field.	48.3%	58.2%	61.8%	60.0%	0.0%
Encouraged me to consider a career in a chemistry-related field.	75.9%	69.7%	64.9%	60.0%	33.3%

^a As noted above, the ACS Scholars program is available to individuals who identify as African American, Hispanic, or American Indian, or those who identify as multi-ethnic including one of those identities. Because white students and (broadly-speaking) Asian/Asian American students are more strongly represented in Chemistry at large, and because few to none of these students marked one of these identities solely, Asian/Asian American and white students are not included in the breakdowns of survey data by race. Specifically, almost all white-identifying (n=74) and all Asian American-identifying students (n=15) identified as multi-ethnic. As such, their data is captured in the other race/ethnicity categories. For more information about these data, please contact Dr. Cecilia Hernandez or Dr. Racquel Jemison.

^b Because of small cell sizes, significance testing (chi-square) was unreliable, thus significance testing was not performed for these data.

When looking at the benefits of the ACS scholarship by race/ethnicity, a few findings stand out. For each group, a majority (and in fact, almost all) respondents said that the scholarship helped them to have fewer financial worries in college and a majority of students in most groups said that it helped them to focus more on their classes (see Table 13). Additionally, Native Hawaiians and Pacific Islanders, in particular, were overwhelmingly more likely to say that the scholarship gave them access to chemists who they would not have met otherwise ($p<.05$). However, only a few of each group (less than 25% in all but one case) noted that they had received internship or career opportunities as a result of being an ACS Scholar.

Table 13. Benefits of the ACS Scholarship by Race/Ethnicity. (N=510)

Benefits	% Marked Among				
	American Indian/ Alaskan Native (n=29)	Black/ African American (n=179)	Hispanic/ Latino/ Spanish Origin (n= 225)	Native Hawaiian/ Pacific Islander (n=5)	Middle Eastern/ North African (n=3)
Helped me to have fewer financial worries in college.	89.7%	89.9%	90.7%	80.0%	100.0%
Allowed me to focus more on my classes.	69.0%	57.4%	58.9%	60.0%	33.3%
Provided me with access to chemists whom I would not have met otherwise.	27.6%	23.4%	24.6%	80.0%	0.0%
Provided me with networking opportunities in the chemical sciences	44.8%	42.6%	39.4%	60.0%	100.0%
Provided me with internship opportunities in the chemical sciences.	10.3%	19.1%	16.1%	20.0%	33.3%
Provided me with career opportunities in the chemical sciences.	6.9%	16.5%	20.8%	40.0%	0.0%

Current ACS membership and ACS Project SEED participation:

Just over 40% of the survey sample indicated that they were members of the American Chemical Society. Men and women were equally likely to be members and there were no differences by race/ethnicity. The most notable difference was among those individuals who were employed in a chemistry related field (n=221) versus their peers. Respondents with jobs in chemistry were almost twice as likely to be ACS members than those whose jobs weren't in chemistry-related fields (42.5% and 24.8% respectively). However, among those who were employed in chemistry, individuals were equally likely to be ACS members as not. Only a small portion of respondents had previously engaged with ACS Project SEED (5.4%).

Employment and Careers

About 60% of survey respondents (n= 333) are working either full- or part-time (44% and 18% respectively). Those employed full time are much more likely to be employed in a chemistry related field ($p<.01$) than those employed part-time. In fact, almost three quarters of those who are working full-time indicated that they are working in a chemistry-related field, while the part-time group was more evenly split between chemistry and non-chemistry fields.

A full 70% of those who are working full-time say that they are using their technical skills and education to a considerable or very great extent, with only 4% saying they are not using their technical skills at all. Those who work in chemistry-related fields are most likely to use their technical skills and education in their current role. Almost half of those who work part-time are using their technical skills and education to a considerable or great extent (43%) as well.

The survey asked participants who were employed full- or part-time to identify their sector of employment (see Table 14). Most of those working full-time indicated that they were working in business or industry (40% total), with most of these individuals working in a medium- or large-sized firm. The next largest sector of full-time employment was within higher education. About 28% of those working full-time indicated they worked in higher education, although the survey did not ask them to specify their specific role. Among part-time workers (many of whom are current ACS scholars (n=79,

86%), they are most likely to work in higher education (27%) or in a different category than those listed altogether (with 38% marking “other”⁵).

Table 14. Current sector of employment for current and former ACS Scholars (n=332)

Career Sector	Employment Status	
	Full-Time (n=240)	Part-Time (n=92)
K-12 Education	7.5%	9.8%
Higher Education (e.g., researcher or professor)	28.3%	27.2%
Non-Profit (excluding K-20 education)	4.2%	1.1%
Business/Industry: Start-up or Small-sized firm	6.3%	8.7%
Business/Industry: Medium- or Large-sized firm	31.7%	9.8%
Government/National Lab	9.6%	5.4%
Other	12.5%	38.0%

Among the ACS Scholars in this study, only a small portion had achieved executive or senior leadership positions (e.g. CEO, CTO, EVP, etc.) thus far, with about 2% indicating they currently held such a role. These low numbers may reflect the population of respondents in the survey. As noted above almost 60% of the respondents received their first year of funding in the last 7 years, with less than 10% of respondents receiving their first year of funding prior to 2000 (Table 1). Thus, many of the respondents may not have had time to advance to executive positions. It is likely that if this question were asked in future surveys, the number would increase. An equally small portion of the respondents (n=22, 6.6%) noted that they were currently in a tenured or tenure-track faculty position at a college or university. Not surprisingly, about three-quarters of these individuals said they worked full-time in the Higher Education sector.

When looking at sectors of employment by race/ethnicity, the most likely place for almost every group to work is in business/industry, in a medium or large-sized firm (see Table 15). Thinking about careers in education, about a third of Black/African American respondents are working in education (8% in K-12 and 25% in Higher Education), and almost 40% of Hispanic/Latino respondents are doing so (7% K-12 and 30% Higher Ed). Likewise, of the respondents who identified as American Indian, Alaskan Native, over 40% are working in the education sector (28% in K-12 and 17% in Higher Ed). The proportion of Black and Hispanic respondents in K-12 education is fairly close to the proportion Black- and Hispanic-identifying K-12 educators nationwide. In 2011-2012, Black teachers comprised about 7% of public school teachers, and Hispanic teachers comprised about 8% (State of the workforce report, 2016). Examining the landscape of higher education data nationwide, about 4% of college faculty nationwide identified as Hispanic and 6% as Black (National Center for Educational Statistics, 2016). In the present study, all of the individuals who said they were in tenure-track or tenured faculty positions in Higher Education identified as Black or Hispanic (n=10 and 7, respectively). For Black or African American Scholars, this proportion is slightly higher than the national average (about 8% of Black respondents), suggesting that the ACS Scholars program may have a slight influence in moving Black students into faculty careers.

⁵ These current Scholars who are working part time in “other” sectors mostly noted that they are working in various jobs on campus including in I.T. or food service, or as a T.A. or Lab Assistant.

Table 15. Current Sector of Employment for Current and Former ACS Scholars by Race/Ethnicity (n=314)

Career Sector	American Indian/ Alaskan Native (n=18)	Black/ African American (n=124)	Hispanic/ Latino/ Spanish Origin (n= 158)	Native Hawaiian/ Pacific Islander (n=3)	Middle Eastern/ North African (n=2)
K-12 Education	27.8%	8.1%	7.9%	33.3%	0.0%
Higher Education (e.g., researcher or professor)	16.7%	25.0%	30.4%	0.0%	0.0%
Non-Profit (excluding K-20 education)	11.1%	4.8%	1.9%	0.0%	0.0%
Business/Industry: Start-up or Small-sized firm	5.6%	5.6%	7.0%	33.3%	0.0%
Business/Industry: Medium- or Large-sized firm	11.1%	30.6%	20.9%	0.0%	50.0%
Government/National Lab	11.1%	9.7%	7.6%	0.0%	0.0%
Other	11.1%	16.1%	25.3%	33.3%	50.0%

Future careers

The survey asked current ACS Scholars (those individuals who were enrolled in undergraduate study and receiving ACS Scholarships at the time of the survey) about which fields they were likely to pursue in the future. Most of the current ACS Scholars expect that they will work in industry – regardless of the size of firm – with almost half indicating that it is very or extremely likely they would work in a start-up or small-sized firm (45%) and over half pointing to a medium- or large-sized firm (60%) (Table 16). Just over half of Scholars note that it is very or extremely likely they will end up in a government or national lab and almost a third of current Scholars marked this same response for the higher education sector (32%).

Table 16. Future Career Plans of Current ACS Scholars

Career Sector	% marking “Very” or “Extremely Likely”
K-12 Education (n = 162)	5.5%
Higher Education (e.g., researcher or professor) (n = 166)	32.0%
Non-Profit (excluding K-20 education) (n = 161)	11.8%
Business/Industry: Start-up or Small-sized firm (n = 166)	45.2%
Business/Industry: Medium- or Large-sized firm (n = 168)	59.6%
Government/National Lab (n = 170)	55.3%

When reviewing these data by race/ethnicity, the trends are similar. American Indian, Hispanic and Black Scholars (n = 9, 56, and 92 respectively) are all most likely to say that they are very or extremely likely to work in industry or in a government or national lab, compared to other sectors. However, Hispanic Scholars (n = 92) are most likely to say they may end up working in higher education (36%) compared to only 26% of Black students (and 0% of American Indian students).⁶

Areas for Improvement

Survey respondents were asked what ways the ACS Scholars Program could be improved. The responses related to six main areas: mentoring, ACS Annual Meeting, communication and networking, funding, benefits of the scholarship, and program promotion. These areas are elaborated upon below and exemplar replies from the survey respondents are included as appropriate.

⁶ Sample sizes for current Scholars who identify as Native Hawaiian/Pacific Islander or Middle Eastern North African were too small to evaluate for this question.

Mentoring. Responses related to improvement of the mentoring program coalesced in three main suggestions: to expand the mentoring program such that all ACS Scholars were assigned mentors and to include post-doctoral Scholars and graduate students as mentors, to formalize and increase communication between mentors and mentees, and to more clearly communicate the goals of the mentoring program. One respondent said: *“Due to the location of my university, I was not able to have a mentor during my college years. I think that the mentorship experience is very valuable, and I would suggest all ACS Scholars should be assigned with a mentor that has some professional experience in the Scholar studying area.”*

ACS Annual Meeting. Respondents agreed that attendance at the ACS Annual Meeting was important for Scholars to improve their awareness of ACS programs and offerings, to develop professional networks, and for professional development. However, many expressed concern about their ability to pay for attendance at the meeting and suggested that attendance be subsidized in some way (registration subsidy, travel awards, etc.) to encourage ACS Scholars to attend. Many also suggested providing an opportunity for Scholars to present their research (e.g. in a poster session highlighting ACS Scholars’ work) and for them to meet and network with potential mentors, prospective internship directors, and fellow ACS Scholars. One former Scholar shared his experience: *“In 2010, I was able to attend an oral presentation session for ACS Scholars at the American Chemical Society Meeting. I felt far less nervous knowing that I was presenting alongside my peers and relished the experience of being able to present my work. It was also really nice to be able to meet other ACS Scholars. I am unsure if such opportunities are regularly made available, but I would recommend making it a regular occurrence. Alternatively, perhaps a poster session/social event for ACS Scholars at National Meetings could be arranged at which they could meet each other and present their work in addition to the topics specific poster sessions.”*

Communication and Networking. Survey participants suggested improvements to the existing communication structure and requested increased opportunities to meet and socialize with other ACS Scholars. As regards communication, they suggested improving communication about grades and program eligibility, developing pathways for communication between current and former ACS Scholars, and offering opportunities for Scholars to meet physically – such as an annual retreat or increased local gatherings. An example of such a response noted: *“I think that it would be great if the program had a retreat so that all Scholars can meet and interact with each other or fund travel to an ACS conference for such an event. This would be great for networking as ACS Scholars will/may share similar career paths.”*

Scholarship Benefits. Many respondents suggested that they were unaware of the benefits of the scholarship and that the benefits should be expanded to include professional development opportunities. Scholars noted that improved communication of the benefits – to both prospective and current Scholars – would be an improvement. They also wished that there were more training opportunities, a funding program for research development, and a resource that helped them identify internship experiences. Finally, a few respondents suggested that a subsidized annual membership to ACS, perhaps for the first year or two after graduation, would be a very useful benefit. One respondent suggested a set of training and funding opportunities for past and current Scholars: *“It would be great to have transitional and cross disciplinary programs that focused on entrepreneurial training, intellectual property, and/or certificates. Internships in industry, postdoctoral opportunities, seed grants and small ground zero research funding opportunities would be great too. In hindsight, paying*

for my undergrad education was extremely helpful, but I believe that the other opportunities that could be exclusive to ACS Scholars, past and present, would be great."

Program Promotion. Scholars were glad they had the opportunity to benefit from the scholarship but were concerned that the ACS Scholars Program was not being promoted in the best way. They suggested increasing advertising in high schools and through local ACS chapters and advocated for a more visible presence on social media. For example, one respondent noted: "*I think that key factors that could make the program even better would be [to] increase awareness: making sure that all ACS chapters are aware of it. But also (and perhaps more importantly), since senior high school students about to enter college can apply, more awareness is needed at the high school level, especially considering how the financial landscape can influence not only the school and program the students may opt for, but even the ability to attend college altogether....*"

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