

# Energizing & Investing in the Future of Science

## NIH Summer Research Program Immerses High School Students, Undergraduates, and Teachers in Science



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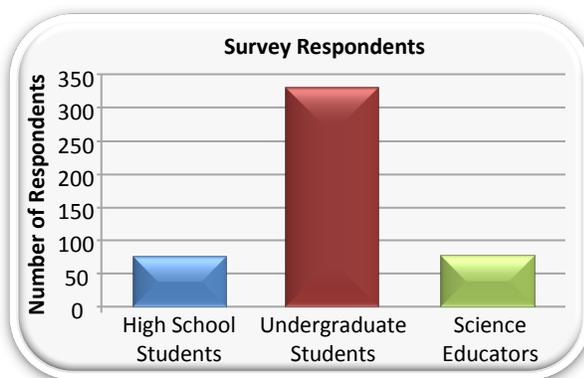


Federation of American Societies for Experimental Biology

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In February of 2009, President Obama signed into law the American Recovery and Reinvestment Act (ARRA) with the goal of creating new jobs, spurring economic activity, and investing in long-term growth, including in science and technology. The bill provided 28 million dollars to the National Institutes of Health (NIH) for the Summer Research Experiences for Students and Science Educators program (1), in which participants actively engaged in biomedical research during the 2009 and 2010 summers. The Federation of American Societies for Experimental Biology (FASEB) conducted an on-line survey of 2010 summer participants to learn how these opportunities helped develop research and laboratory skills, influenced students' decisions to pursue a career in scientific research, and benefitted the work of science educators at the K-12 through undergraduate levels.

During the summer of 2010, the program funded a total of 331 high school students, 1,384 undergraduates, and 299 science educators. Of those, data were collected from 22% of the high school students, 24% of the undergraduates, and 25% of the science educators. This report is a companion to a similar analysis that was published in February 2010 (2) describing results from the summer of 2009.



## ENGAGING FUTURE SCIENTISTS

A majority of students and educators worked full-time during the summer of 2010 immersed in biomedical research. This was the first experience in any structured research opportunity for 65% of the high school students, 41% of the undergraduates, and 38% of the science educators. Alternatively, for 11% of high school students, 18% of undergraduate students, and 35% of teachers, this was the second time they participated in the NIH Summer Research Program.

One hundred percent of high school respondents, of whom a vast majority attended public schools, signified that they plan to attend college, with 84% stating that they intend to major in a science-related field. These numbers are virtually identical to those reported in the 2009 summer participant survey (98% attending college, 82% majoring in science field). Undergraduate students participating in this program attended institutions ranging from community colleges and small liberal arts colleges to four year, research-intensive universities throughout the 50 states and Puerto Rico. A majority of undergrads surveyed indicated that they majored in the biological sciences (63%), while almost 12% listed their academic major as interdisciplinary, many of which included a biological component. Other majors represented included chemistry (9%), the social sciences (4%), mathematics (2%), physics (2%), earth/environmental sciences (2%), computer sciences (2%), and

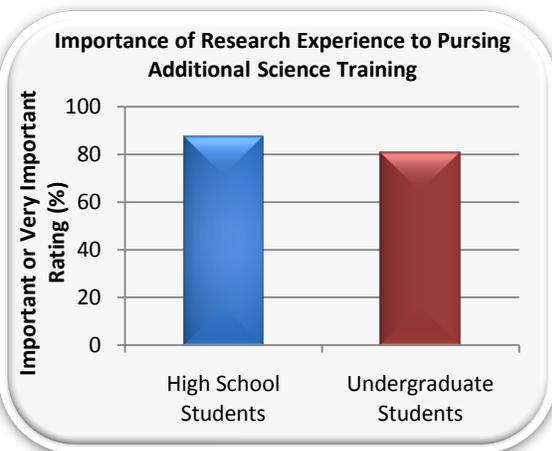
<sup>1</sup>Administrative Supplements Providing Summer Research Experiences for Students and Science Educators. [http://grants.nih.gov/recovery/summer\\_opps.html](http://grants.nih.gov/recovery/summer_opps.html)

<sup>2</sup>Stimulating Science Education: NIH Summer Research Program Engages Students and NIH Teachers in Science. FASEB, February 2010. <http://www.faseb.org/Portals/0/PDFs/opa/stimulating%20science%20education%20report.pdf>

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the humanities (2%).

When asked about their educational plans after college, 64% of undergraduate respondents indicated that they planned to pursue either a master's degree or a PhD, and close to 90% of those students planned to pursue those degrees in a science-related field. Both high school and college students reported that their research experience was an important factor in deciding to further their education in science. Of those who stated that they planned on obtaining a science degree, 88% of high school students and 81% of undergraduates indicated that their summer research experience was either important or very important in making their decision. Not only did students say that their summer program participation contributed to their desire to pursue further scientific training, close to 60% of educators indicated that they were somewhat or much more likely to seek additional science education as a result of the opportunity.



*“Participating in my summer research project made me seriously consider a career in research, which I previously had never thought about.” – Undergraduate student*

## EXCEEDING EXPECTATIONS

Students were excited by their summer research experience, which for most had exceeded their expectations (75%). Interestingly, high schoolers' expectations were exceeded at a higher percentage than those of undergraduates (89% vs. 71%). Counter to our expectations, this difference was not driven by the comparative novelty of the experience to high school students. While students in high school were much less likely to have had a previous research experience (35%) compared to undergraduates (59%), those who had prior exposure to research were more likely to report that that the summer program exceeded their expectations (93%) compared to those who had not participated in research (75%). The opposite pattern emerged for undergraduates: 66% of those with previous research experience reported that the NIH summer program exceeded their expectations, compared to 75% of those who had no prior research experience.

College (90%) and high school students (96%) thought that the person supervising their summer laboratory experience was above average or outstanding as a teacher and mentor. They overwhelmingly indicated that their mentors made sure that they were part of the research team in the laboratory (89%) and encouraged dialogue about career opportunities in the sciences (68%). Both undergraduates (97%) and high school students (99%) pointed out that their experience taught

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them what a career in research would be like. They also indicated that the opportunity to conduct research helped them to improve research skills (99%), gain self confidence (92%), gain a better understanding of the scientific literature (94%), and make new contacts (88%).

Students Find Summer Research Experience Helpful		
<i>This research experience has helped me to...</i>	High School Students	Undergraduate Students
Improve research skills	99%	99%
Learn about research careers	99%	97%
Learn to work independently	93%	96%
Gain self confidence	96%	91%
Learn about the scientific process	93%	93%
Understand scientific literature	91%	94%
Make new contacts, network	92%	87%
Improve laboratory skills	91%	88%
Work with laboratory animals	31%	44%
Work with human research subjects	24%	30%
Learn what graduate school would be like	--	86%
Focus my research interests	--	88%

Aside from working on a particular research project, students were able to participate in a number of additional activities relevant to a career in research. For example, 68% delivered a presentation to their laboratory group, 60% attended scientific seminars, 42% discussed ethics in scientific research with their mentors, and 23% aided in the preparation of a report for publication. In addition, 35% of high school students and 26% of college students had the opportunity to deliver a presentation at a scientific conference.

*"I still find myself awed at what an amazing opportunity I've had over the summer to pursue science at a graduate level even when I was only a high schooler. The quality and amount of experience I have gained with my hands-on opportunity is irreplaceable by any other means..." – High school student*

## ENHANCING SCIENCE EDUCATION

K-12 science educators, community college educators, and college faculty at non-research intensive institutions participated in the 2010 ARRA funded summer research program. Two-thirds of the 75 teachers who responded to the FASEB survey were instructors either at the elementary, middle school, or high school level, and almost 80% worked in public schools. A majority (57%) stated that they taught in the biological sciences, with some—especially elementary school educators—teaching in multiple disciplines. Seventy-two percent said that their research experience was highly or somewhat related to the subject or subjects in which they specialized. With a 10 percentage point

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increase from last year, 62% of educators stated that they had participated in other structured research opportunities prior to the 2010 summer.

The NIH program not only gave science educators practical laboratory experience, it also provided them with opportunities to participate in other scientific activities. For example, they interacted with other scientists and educators (72%), attended seminars at which local or visiting scientists discussed their research (57%), participated in laboratory meetings (52%), delivered a scientific presentation to their laboratory group (47%), or prepared a scientific report for publication (40%). Many others prepared a funding application (29%) or delivered a presentation at a scientific conference (28%).

Teachers Expect Summer Research Experience to be Beneficial	
Enable me to develop new or revised content for lessons	75%
Enable me to develop hands-on classroom activities and/or new laboratory exercises	72%
Expand my network of scientists and science educators	61%
Enable me to discuss science careers and related jobs with more confidence with students	57%
Enable me to raise educational standards in my classes	56%
Enable me to introduce new technologies into classroom/lab exercises	53%
Enable me to identify and take advantage of other science educational opportunities	47%
Encourage me to read science journals more frequently	28%

Instructors who responded to the survey expected their summer research experience to benefit them as they returned to teaching. A large majority (80%) indicated that they would likely apply what they learned in the laboratory to their work in the classroom, and an overwhelming 75% of teachers pointed out that they would be able to develop or revise content for lessons because of the opportunity. They also stated that they would be able to develop new laboratory activities or exercises (72%), and over half (56%) expressed that this experience would enable them to raise standards in their classrooms. Similar to 2009 participants, 95% of educators in this study indicated that they would choose to participate in another research experience given the opportunity.

*“My confidence in teaching molecular biology increased exponentially. I was lucky to have the experience and will be using many of the techniques I learned during lab exercises with my students.” – Science educator*

## FULFILLING THE AIMS OF ARRA

Thanks to ARRA, students and science teachers—many of whom had never had a hands-on research experience—had the opportunity to participate in cutting-edge biomedical science. The experience for many students solidified their desire to pursue a research career and helped science teachers improve both classroom content and methods. We anticipate that many of these newly energized teachers will inspire students to pursue research careers.

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*FASEB is composed of 23 societies with more than 100,000 members, making it the largest coalition of biomedical research associations in the United States. FASEB enhances the ability of biomedical and life scientists to improve – through their research – the health, well-being and productivity of all people. Our mission is to advance health and welfare by promoting progress and education in biological and biomedical sciences through service to our member societies and collaborative advocacy.*