



I N S T I T U T E F O R
Learning Innovation

Impact of the New York Hall of Science Career Ladder Program on its former participants

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May 2002

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(Phase 2 of the two-staged evaluation)

**Submitted by:
Institute for Learning Innovation**

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Preface

This evaluation was conducted between late December 2001 and March 2002. Most of the respondents were residents of New York. We believe that the tragedy of September 11 might have influenced this study to some extent, since particularly in New York, life had not yet fully returned to normal. However, both as a reminder of the strong spirit that seems to prevail in New York and amongst New Yorkers, and also as a telling indicator for the way in which the New York Hall of Science's Career Ladder Program might have touched individual lives, we would like to start this report with a letter written by the widow of a program alumnus:

I am sorry to inform you in this way, but my husband, Tom Gardner, was one of the firefighters who heroically died in the World Trade Center tragedy. He was working with the Hazardous Material Unit of the FDNY. He was able to apply his love of science with his firefighting career and was very successful. He traveled around the country teaching about hazardous materials and terrorism.

He received a B.A. in Biology and Education from Queens College and had planned on becoming a high school science teacher upon retirement from FDNY. He spoke fondly of his time at the New York Hall of Science and was always proud of his work there as an explainer. Our family enjoys visiting the Hall of Science and I'm glad to hear of the many successful programs being offered there. Best of luck in the future.

*Sincerely,
Elizabeth Gardner*

INTRODUCTION

The New York Hall of Science (NYHS) engaged the Institute for Learning Innovation, an Annapolis, MD-based non-profit learning research organization, to conduct an evaluation study of two education programs. This study was designed to be carried out in two phases: Phase I examined the impact of the after-school programs on participants in grades 5-8 and was completed in June 2001; Phase II assessed the long-term impact of participation by high school and college students in the NYHS Science Career Ladder program. This report summarizes the findings of Phase II of the study, the summative evaluation of the Science Career Ladder Program.

NYHS has contact information for almost 600 young people who are considered alumni of the program. This report summarizes the findings, which is based on that pool of alumni.

The guiding research question for this evaluation was:

What is the long-term impact of participating in the NYHS Science Career Ladder program in the areas of personal attitudes and personal lives; perception of science and scientists; academic career goals and directions; and leisure time choices?

Specifically, the evaluation attempted to address the following four primary areas of interest:

1. Assess the short-term and long-term effect of the Program on participants' knowledge and skills (self-reported), specifically their problem-solving skills, their critical thinking skills, and their math-literacy. Examine the transfer of those skills to their everyday and professional life.
2. Detail the ability of the Program to shift participants' perception of science and scientists.
3. Verify the influence of the Program on participants' career planning, including the ability of the Program to evoke interest in teaching and science.
4. Document the influence of the Program on participants' leisure time choices, with respect to lifelong learning and cultural enrichment.

As part of the evaluation, and where relevant, comparisons were drawn to state statistics, such as high school graduation rates, post-secondary school attendance and graduation rates, or percent of college graduates with education majors.

METHODS

Survey

Based on discussions between NYHS Education staff and Institute staff, a list of hierarchically organized objectives for this study were defined. Based on this list, Institute staff developed an initial draft for a survey instrument to be mailed to all former Explainer Alumni who are currently listed in the NYHS alumni data base (approximately 610 people). The original survey instrument was refined in an iterative process between NYHS staff and Institute staff, and a final, agreed-upon version of the survey questionnaire (Appendix A) was printed and mailed around December 18, accompanied by a cover letter (Appendix B), and a self-addressed, stamped envelope. Respondents were asked to return completed surveys in the enclosed self-addressed envelope by January 15, 2002.

Follow-up reminder postcards were mailed around mid-February to about 570 former participants. The survey was closed in mid-March 2002. One hundred and seven survey responses, representing a return rate of almost 19%, were finally received.

In addition, an abbreviated survey questionnaire (Appendix C) was administered to a control group of 67 young adults who participated in various activities at the NYHS (but were not affiliated with the Explainer/Career Ladder Program).

All data was entered into Survey Pro (a survey analysis computer software program) for further analysis. The major results are presented in selected tables in Appendix D.

The survey provided for opportunity to write in open-ended answers to a variety of questions. The answers were used jointly with those from the interviews to record how the program influenced its participants.

Interviews

The survey questionnaire provided primarily quantitative data on the self-reported impact of the Explainer Program on its participants. However, the survey instrument could not necessarily establish in detail in what ways the program influenced participants. In order to better describe the link between the program and the self-reported outcome, Institute researchers conducted semi-standardized, open-ended telephone interviews with a stratified sample of 16 former participants out of a pool of 81 participants who were willing to be interviewed. Institute researchers ensured that the sample included current teachers and former participants who claimed on the survey to be highly impacted in at least some of the areas asked for on the questionnaire.

The interview guide was based on an initial analysis of the quantitative data, and interviewees were specifically questioned based on answers they gave on the survey questionnaire. For instance, if a former participant checked “yes” on the question whether participation in the program helped him/her gain self-confidence, he or she would be asked to give an example of how this occurred or to directly explain in what ways the program helped them gain more self-

confidence. Since the interviews were conducted to provide explanations, not to establish a statistically significant correlation, Institute researcher biased the sample towards respondents who generally expressed positive influences of the program on various aspects of their lives. In that sense, the qualitative part of the evaluation focuses on the realized potential of the program on those participants who were influenced, rather than establish an average impact score on all former participants.

Sample Bias and Sample Description

Sample bias

A return rate of 19% might indicate a sample bias towards those former participants who might hold favorable opinions about the NYHS Career Ladder Program, since these alumni arguably might be more inclined to complete and mail a survey that inquires about former participants' opinions about the program. Since we do not know the specific reasons for those 81% who did not return the survey, a conservative interpretation of the data would suggest that the results reported in here indicate the impact of the Program on those former participants who were generally pleased with it. This does not mean, though, that the "silent" majority of 81% was not influenced by the Program in similar ways; however, we would generally assume that the overall Program impact on former participants is equal or lower than reported in here.

Control group versus sample

The sample consisted of 69% females and 31% male Program participants; the control group was similarly composed. Almost all respondents in the control group were 25 or younger, while this was the case for just 55% of the sample. In that sense, control and sample group did not match (Chi-Square with $p < 1\%$). Similar for race/ethnicity: 30% of the sample were self-identified Caucasians, while this was true for 46% of the control group. The difference, though, was not significant in a Chi-Square Test for $p < 5\%$. The control group is on average younger and maybe ethnically less diverse and hence potential differences between the two groups have to be interpreted with caution.

Yet, despite the demographic differences between the control group and the Program alumni who responded to the survey, we do not find strong difference between the two groups with respect to their involvement and interest in art, history, politics, or current affairs. Statistically insignificant, the younger control group finds music somewhat more important than the sample group, as 63% rather than 47% claim that music is very important in their everyday life. For both groups, politics is very or somewhat important to about half the respondents, and little to not important to the other half. Current events, while not significantly different between the groups, seem to achieve a high level of importance, most likely due to September 11th. The areas "history" and "art" both are of limited importance to both groups.

Table 1: Demographic data for sample and control group

	Career Ladder (n=107)	Control (n=67)
Gender		
Female	69% (n=69)	68% (n=45)
Male	31% (n=31)	32% (n=21)
Totals	100% (n=100)	100% (n=66)
Age*		
Under 20	15% (n=16)	46% (n=30)
20-25	40% (n=42)	51% (n=33)
26-30	16% (n=17)	3% (n=2)
31-35	19% (n=20)	0
36-40	6% (n=6)	0
Over 40	3% (n=3)	0
Totals	100% (n=104)	100% (n=65)
Race		
Caucasian	30% (n=31)	46% (n=30)
African American	10% (n=10)	12% (n=8)
Latino	27% (n=27)	22% (n=14)
Asian American	24% (n=24)	19% (n=12)
Other/immigrant	15% (n=16)	2% (n=3)
Totals	104	67

* Significant difference in a Chi-Square Test for $p < 1\%$

In summary, despite the fact that the control group is younger and ethnically less diverse, no large differences were found in the area of art, history, music, politics, or current events, suggesting that the two groups are culturally similar. However, a dramatic difference between the alumni and the control group was found on the item “how much is science part of your everyday life.” 88% of the Career Ladder alumni state that science is important or very important as part of their everyday life, in contrast to 66% of the control group sample. 64% of Career Ladder alumni say that science is very important, in contrast to 20% of the control group. The difference is statistically significant for $p < 1\%$. Since the other domains suggest that the two groups do not differ much in their cultural interests, this result strongly suggests that Career Ladder alumni are more attentive to science than the general public.

This interpretation is substantiated by the finding that two-thirds of Science Career Ladder alumni claim to read science-related books regularly or at least occasionally, while just 21% of the control group makes similar claims. Similarly, two thirds of alumni read science-related articles in newsprint, with 38% doing so regularly. In contrast, the control group finds just 3% reading science-related articles in newsprint.

Science Career Ladder Sample Description

About 17% of the alumni sample joined the Program in 1990 or before; 41% joined between 1991 and 1995; 23% joined between 1996 and 1998; and 18% joined between 1999 and 2001 (and are hence likely still Program participants).

The majority of our respondents (56%) joined the Program as college students, 22% as interns, and 16% as general volunteers. When asked in what capacity respondents joined the Program, 60% stated as College Explainers, 31% as High School Explainers, and 10% as Public Programs

Assistants.

The majority of respondents (90 out of 107) answered the question of their academic status at the time they joined the program. Slightly less than half were high school students, and slightly more than half were in college.

Table 2: Academic status of Program participants at the point of joining the Program

High School 48% (n=43)		College 52% (n=47)	
9th Grade	10% (n=9)	College Freshman	22% (n=20)
10th Grade	16% (n=14)	College Sophomore	0% (n=0)
11th Grade	14% (n=13)	College Junior	16% (n=14)
12th Grade	8% (n=7)	College Senior	14% (n=13)

Total number of replies: 90

Since we currently lack original enrollment data for the program, we cannot assess to what extent the high percentage of College Explainer constitutes a further bias in the data.

Over half (60%) of the sample respondents stayed in the program for two years or less, 16% stayed three to four years in the Program, 15% spent more than four years in the Program, and 9% of respondents were still active.

Table 3: How long did you stay active in the Program?

	Percentage	Count
0-1 year	29%	31
1-2 years	31%	33
3-4 years	16%	17
5-6 years	8%	9
Over 6 years	7%	7
I am still active	9%	10
Totals	100%	107

We asked respondents why they wanted to be Explainer at the NYHS. Since we allowed for multiple answers, the total exceeded 100%. The majority (64%) stated that they joined (at least partly) because it was a paying job. However, 57% also stated that they joined because they loved science, indicating that the NYHS offered science-interested youth an opportunity to earn money while following their interest. Since 57% stated that they (at least partly) joined because they loved science, the cohort of Science Career Ladder participants can be considered highly selected for science interest. In other words, Career Ladder Program participants likely differ in their science attitudes from their peers already when entering the program. Interestingly, only 9% mentioned that they joined the Program because it involved teaching, suggesting that the Program did not necessarily attract a cohort of students that was already positively biased towards teaching and instruction.

Table 4: Why did you want to be an Explainer at the NYHS?

	Percentage	Count
It was a paying job	64%	67
I love Science	57%	60
To be with my friends / meet people	27%	28
Something to do	24%	25
Because it was teaching related	9%	9
Requirement/Community Service	8%	8
Personal connection	6%	6
Wanted to learn more about science	5%	5
Wasn't really my decision	3%	3
Convenience	2%	2
Other	5%	5
Totals	n/a	105

Almost half of the respondents (47%) currently work full-time, 37% are working towards a bachelor's or associate degree, another 14% is working towards a graduate degree, 8% are still in high school, and 6% are stay-at-home parents. Overall, 61% of the respondents are still pursuing a degree at various stages.

Table 5: Where are you now?

	Percentage	Count
Working full-time	47%	50
College/University	34%	36
Working part-time	15%	16
Graduate School	14%	15
High School	8%	8
Stay-at-home parent	6%	6
Community College	3%	3
Between jobs	3%	3
Looking to attend Graduate school.	2%	2
Other	2%	2
Totals	n/a	107

Just under half (47%; n=49) of the respondents took advanced placement courses in science or mathematics while they attended high school. The majority of those who took AP courses took math/calculus (68%; n=30), and most took more than one (average = 1.8). This compares favorably with New York State education statistics. In 1998, 10% of Grade 12 students in New York took AP exams in Calculus, and another 14% in Science¹.

Again, the data suggest that the Program attracted a cohort that was already strongly interested in math and science.

¹ Blank, R.K & Langesen, D. (1999), State Indicators of Science and Mathematics Education, Washington, DC: Council of Chief State School Officers.

We asked respondents their current highest degree received. Twenty-seven percent hold high school diplomas, 8% hold an Associate Degree, 37% hold BS/BA degrees, 16% hold a Master's degree, and 9% hold a doctorate. In other words, former Career Ladder Program participants are extraordinarily highly educated. In 1990, just 23% of adults in New York held a Bachelor's degrees or above²; in 1999, this number had risen to 28.5%³ while 62% of the respondents in our sample did. While this disparity is in part due to increased enrollment levels in higher education over the last 20 to 30 years (the alumni sample on average is younger than the general population), the numbers are still above average.

² US Department of Commerce, Bureau of Census, Decennial Census, 1990

³ 1999 SIS Data (http://www.columbia.edu/cu/ssw/projects/surcent/nyc_factsheet/table2b.pdf)

RESULTS AND DISCUSSION

“[The Program is] a "must" for all young people. There isn't a better type of job for a high schooler and a college student to prepare to teach, communicate and learn the applicability of science in our everyday lives, and make friends while they are at it.”

Program participant's comment at the end of the survey

Overall ratings for the Program

Overall, participants highly appreciated their experience at the NYHS. Seventy-nine percent of the respondent gave the Program a “6” or “7” on a Likert-scale where 7 was the highest score between the two choices “I did not enjoy it” and “I enjoyed it a lot.” Nearly all (89%; n=93) of the participants who responded felt that they regularly draw on what they learned in the Program.

Almost all participants (96%) enjoyed teaching science at the NYHS, and 95% rejected the statement that they did not like the teaching part of their work as Explainer at the NYHS. Consequently, only 9% would not participate in the Program again if they had the choice.

The further study results are detailed here in four sections, corresponding with the four major research questions:

- I. Effects on Knowledge and Skills, Specifically Problem-Solving Skills, Critical Thinking, and Math-Literacy**
- II. Perception of Science and Scientists**
- III. Impact on Career Planning, Including The Interest in Teaching And Science**
- IV. Influence on Leisure Time Choices**

I. Effects on Knowledge and Skills, Specifically Problem-Solving Skills, Critical Thinking, and Math-Literacy

One of the significant impacts of the Program on its participants was that it afforded them a chance to develop communication skills, that it promoted their self-confidence, and enabled them to speak (up) in public. Sixty-one percent of the respondents stated that the Program gave them self-confidence, with 94% mentioning elsewhere in the survey that they improved their skills in interacting with people.

Gaining Self-Confidence

An important impact of the Program was creating self-confidence in its participants. Self-confidence did not arise from “just doing the work,” it developed when participants had a sense of doing their work competently. In other words, any aspect of the Program that allowed

participants to engage with the public in a competent and knowledgeable fashion also boosted the participants' self-confidence and self-assuredness. Another aspect that contributed to the self-confidence boosting ability of the Program was the fact that participants were out to practice their skills, even skills which participants believed to have had before they joined the Program. The following quotes from the telephone interviews are representative of that sentiment:

Creating self-confidence

“When I first came here, I was really shy, I couldn't talk to anybody. How do I go up to somebody I don't even know? I couldn't do it. Now I can talk to people. Sometimes they can't shut me up.” [Female Latina, 20-25, college student]

Self-confidence through competence

“I may have often started out not knowing much about a concept and people would ask questions I could not answer. But after a while I was so pleased with myself that I truly, fully understood a concept and was able to just rattle off things to kids. That was great, and a real confidence booster. I remember one group of important people came in all dressed up in suits, looking very official. I did the mirror demonstration and they walked away looking very impressed. They came in serious and walked away smiling. That gave me a huge boost.” [Female Caucasian, under 20, high school student]

Reinforcing effects of the Program

“Yes, I gained self-confidence. What helped was dealing with visitors, and being able to speak in public. I was pretty much self-confident already, but the experience re-affirmed it.” [Female Pacific Islander, under 20, college student]

“I was older than most explainers. Although I could see how the Program could boost someone's self confidence, I was really already quite confident. I was already in education and in an education program. Still, the NYHS Program made me realize my potential.” [Female Caucasian, 31-35, teacher]

The nature of the work is conducive to boost or create self-confidence

“I'm very shy, sheltered, but working in the public area made me be more confident, helped me to express what I'm thinking and feeling. It really brought me out of my shell. When you're working in a public area, you talk to people, you get to know them. It helps anyone to interact, great way to get them to open up.” [Female Caucasian, 26-30, college student, babysitter]

“I was always gaining self-confidence by seeing how others handled themselves. Just being able to walk up to someone and say, “Let me tell you about this” required a lot of self confidence. But once you learn something, you really know it.” [Female Caucasian, 26-30, teacher]

“Doing demos certainly had an impact on your self confidence. We had to often stand up in front of people and talk to them. The first demo I had to speak in front of adults and

kids I was so nervous. But it was fun, and after getting over those initial nerves you see how great it is to get kids' reactions, and to teach them something new." [Female Asian American, 20-25, college student]

Communication Skills

Presenting in front of a crowd of visitors, approaching visitors to allow them to ask questions, explaining complex issues to children, simplifying science while keeping it interesting and correct: All these tasks were integral part of the Program and all of them allowed Program participants to grow and develop, no matter where they wanted to go later on in life. In addition, the Program also allowed participants to practice inquiry-based teaching methods, and the repetitive nature of the teaching situation allowed participants to learn quickly, by constantly applying the newly-learned and adjusting to the experience that resulted from it.

Public speaking skills are perceived as an important general Program outcome

"It's an excellent Program for any and everybody whether they're interested in leadership skills, public speaking skills or whatever, There are a lot of characteristics of the Program that are not strictly science-based." [Female Asian American, 31-35, professional]

"I know that a lot of explainers have gone into education or some area of science. It helps people to go onto that path, particularly helps with speaking in public skills. That's the big one. That's important in all areas, not just teaching and science. And that is probably the most important thing." [Female Pacific Islander, under 20, college student]

Public speaking skills are a long-term outcome of the Program

"I am still drawing on my public speaking skills, even though I am not in science." [Female Asian American, 20-25, college student]

The Program enabled participants to develop public speaking and presentation skills

"I wasn't very good at public speaking, but having to do the demonstrations taught me to do some public speaking." [Female Caucasian, 20-25, paramedic]

"Beyond the science at the Hall I picked up presentation skills, I wouldn't be able to make presentation, I was very fearful but the Hall really brought it out, taught me how to prepare. I need to know what I'm talking about and be prepared for the questions, think ahead of time what questions be asked, anticipate them." [Female Asian American, 31-35, professional]

"It helped me, to convey what I want to say to people. It helped me to think things through before I said them." [Female Asian American, 20-25, college student, SAT teacher]

"My experience there showed me how to make science simple for the entry level person." [Female Caucasian, 31-35, teacher]

Ways in which the Program fostered public speaking and other communication skills

“At first, when you first start out, you’d just ask questions that were clueless, that had yes or no answers. Then you learn to make your questions more open-ended, to ask better questions and get the person involved.” [Female Latina, 20-25, college student]

“Again, speaking in front of large groups, seeing what your audience is, figure out in advance what outcome will be of some things, so that you don’t have a disaster. Predicting how the class is going to go.” [Female Caucasian, 31-35, teacher]

“My position now is a senior explainer, I have to run trainings. I have to understand more about exhibits, find ways to make others, kids and adults, scientists and other visitors understand. I have to communicate better about all sorts of topics.” [Female Latina, 20-25, college student]

“It increased my ability to impart knowledge. Before I would speak about a topic and go off on tangents. After the NYHS experience I learned to concentrate on one topic while I am explaining something to listeners. And you have to learn how to do that before they get bored, increase their interests, and get them to want to listen more. It helped to watch other people who were able to do better than you. And of course, to be able to experience it ourselves.” [Female Caucasian, under 20, high school student]

Communicating with Children

One of the specific communications skills that participants developed was the ability to converse with children, targeting their lessons and making learning interesting. Descriptions of these skills are documented in the following participant comments:

“I learned how to get children’s attention...how to get people interested even when it seems they have a short attention span.” [Female Caucasian, 31-35, teacher]

“Learning how to talk about science and teach science in a way that is not boring, like demonstrations. I learned how to speak to specific audiences, and especially how to speak to children.” [Female Asian American, 20-25, college student].

“When we explained things, especially to small children, we were forced to make concepts more simple. Sometimes people didn’t get it the first time, and it really forced you to evaluate over and over again different ways to get a message across.” [Female Caucasian, 31-35, teacher]

Analytic and Critical Thinking Skills

Just 5% of former and current Program participants supported the statements that participation in the Explainer Program did not help them to better tackle and solve problems, or that participation in the Explainer Program did not provide them with better strategies for looking deeper into issues and for asking critical questions. Again, it was the nature of the experience (teaching and interpretation) that fostered these outcomes. Some, particularly those not involved in teaching or scientific pursuits, expanded on that thought:

“Because we had to know the science beyond what we had to provide to public. It had a lot of analytic understanding beyond the science. ...and you have to be very analytical. (Laughs) I wasn’t that way before, but now my boss thinks I’m too analytical at times.” [Female Asian American, 31-35, professional]

“In the Explainer Program they had us do projects. Really we were taught creative ways of applying different concepts to the exhibits. That sort of work always makes you stop and think. Now I am always thinking, “What does this really show, and how can we apply the findings?” [Female Caucasian, 31-35, teacher]

“... You had to learn actual information behind it and describe in easiest way possible so the kids coming in could understand it. It helped me to be able to outline and break it up and examine information.” [Female “Mixed”, 20-25, college student, fundraiser, library office aide]

Part of the ability to “ask critical questions” involves being able to step back, see a bigger picture, or to combine seemingly unrelated facts into a new perspective that points to the interrelatedness and diversity of life.

“It shifted my point of view, like a book or movie, how does this relate to the environment around it, how does it effect that. Looking at the larger picture to see the environment and the factors that have impact. Like that giant spider web on the playground, when someone moves, it moves on the other side. Being on the [Capital] Hill that’s huge, you need to look at all different factors,-you’re able to step back, and look at the large picture- seeing how things influence each other. That’s so important.” [Female Latina, 20-25, special assistant to a US congressman]

“It opened my eyes to other viewpoints - that things aren’t just black and white. You can change one variable sometimes and it makes the world totally different.” [Female Caucasian, 20-25, paramedic]

“I think it helped with learning how to go step by step fashion in explaining something, from the big picture down to the core of a topic. Showing different applications, something doesn’t stop where you think it might. That there are all sorts of connections. [Female “Mixed”, 20-25, college student, fundraiser, library office aide]

Analytical skills were identified as being highly transferable to places other than science situations, as illustrated by a Program respondent who stated, “Analytical skills are probably those that I use everyday. In English we analyze texts and believe it or not I use similar logic to science to figure out what is going on.”

The Career Ladder Program instilled critical thinking skills in many of its participants by allowing them to ask questions, by involving them in asking the participants questions, and by encouraging participants to think in new and creative ways. As two respondents suggest below, this afforded them with new capabilities.

“I remember one teacher from the science Career Ladder program that really taught me how to think in a different way. He made you think, did not just give a lecture.” [Female Asian American, 20-25, college student]

“People at the NYHS always asked interesting questions. And it gave me time to think. I guess it really sped up my thought process, and helped with my ability to think outside the box. It is hard to explain, beyond the fact that it gave me lots of new abilities.”
[Female Caucasian, under 20, high school student]

Learning in the Science Career Ladder Program Is Different From School Learning, and So Is Knowledge Gained

The Program had both specific skills-based outcomes and larger, more holistic impacts on participants’ personal growth and development. The atmosphere at the NYHS was conducive to learning, since camaraderie, challenges, and fun created a mixture for participants that allowed participants to engage more intensely in science than they could have in school. Also, science came to life for participants, primarily because it was closer to participants’ own life experiences. That learning at the NYHS, and specifically through participation in the Science Career Ladder Program, was facilitated by personal connections, enjoyment, and real experiences, might have contributed to the former participants’ overall believe that learning is not necessarily classroom-centered. An overwhelming majority of the respondents (99%; n=105) said that they believe learning is on-going and never stops being part of their life. Seventy-nine percent (n=81) disagreed with the idea that learning is primarily centered around schools, classrooms, and teachers.

The NYHS versus school

“I have all kinds of memories, but the social piece was big for me. You know, you really have to enjoy what it is you are doing, then you are able to learn. We were always challenged to take it to the next level. There I wanted to learn. In school it is different. There were great people at the NYHS running workshops etc.” [Female Caucasian, 26-30, teacher]

“The SCL is better than a college, because it provides skills better than just learning from lectures- you’re learning from discussions, seeing how you do science with someone. They’re great. The workshops are great.” [Female Asian American, 31-35, professional]

“I learned a lot of things I would have never learned in school. You learn different things than you learn in school. You might learn about how gas travels through different clothes, how it travels through glass rather differently than through other types of material. You get a better understanding of things.” [Female “Mixed”, 20-25, college student, fundraiser, library office aide]

The NYHS teaching style

“There was something about being taught by people who were accessible. Most of the time they were close to our age, usually our peers. And I learned a lot from the way they taught. They started out with broad concepts and then got into the specifics, and were always aware of the context within which they were teaching, and included real world

things. What happens with that sort of teaching is that there is always something you can hold onto as a student and you could pick and choose the sort of information that you could handle.” [Female Caucasian, 26-30, teacher]

One of the reasons that the Program afforded participants deeper knowledge was the participants’ understanding that in order to teach one needed a deeper understanding of the subject. This well-known concept was articulated by the participant who stated, “If you go through the museum as a visitor, you use exhibits, but don’t think about them, or think about the meaning. I had to learn the inside, the deeper meaning, because I worked with them.”

How Knowledge Is Useful In the Daily Lives of Past Participants

The respondents believe that the Program helped them acquire knowledge and skills that are useful in the current life (92%). Participants felt that the knowledge they gained at the NYHS was generally useful, even for their school work:

“Often in school the science teacher will ask something but preface her statement with: “Well, I doubt any of you will know this but...” And I typically know it! I am always noticing interesting occurrences. And my experience with NYHS has helped me with concepts, studying for tests, etc.” [Female Caucasian, under 20, high school student]

But the usefulness extended beyond the classroom, into a better understanding of everyday life occurrences, and even parenting:

“I even draw on my NYHS experiences as a parent. I remember the Richard Scarry exhibit, and am looking forward to teaching my 10 month old daughter about science.” [Female Caucasian, 31-35, teacher]

“When I working there, I don’t know if they still have it, we used to have little kids come in and there was a section were they could build toys from simple things into working toys. Now that I have kids, it helps me teach them.” [Female Caucasian, 26-30, college student, babysitter]

Science Career Ladder alumni like to talk about science with other people (91%). In that, they are very different from the control group. 45% of alumni (in contrast to 6% of the control group) highly agreed with a statement that identified them as people who like to talk about science with others. One of the reasons for why former Program participants may be inclined to talk about science frequently with friends and relatives (see below) may lie in the fact that those conversations combine the new skill of explaining issues in understandable language with a strongly developed interest in science.

“Daily science: it’s a lot easier to explain phenomena to friends/families in ways they can understand. I learned as an explainer to break it down so that people can understand it, a 5-year old as well as an older man; you need to address them differently.” [Female Pacific Islander, under 20, college student]

“I find myself today explaining things to people just out of the blue. And I am always

asking what and why questions.” [Female Caucasian, under 20, high school student]

“I highly agree that what I learned in the program is applicable to my daily life. Things I’ve learned from the exhibits and the people. It’s surprising how much that comes back in daily life: the sky, for instance, questions about the sky.” [Female Pacific Islander, under 20, college student]

II. Perception of Science and Scientists

An Appreciation for Science

The respondents were almost unanimous in their high regard for science. All of the respondents felt that they liked science (99%; n=106); in fact, 56% of Program alumni even state that they “highly agree” with the statement “I like science,” while just 11% of the control group supported that statement. Elsewhere in the survey, 95% disagreed with the statement that science is boring; more so, 66% highly disagreed with this statement, in contrast to the control group, where just 18% highly disagreed.

A majority of respondents (66%; n=68) felt that the Program definitely assisted them in developing an appreciation for science. This appreciation for science may manifest itself in several different ways. The Program did not only allow participants to teach science, it allowed them to experience science in a hands-on fashion; both elements certainly contributed to the high level of science appreciation of former participants:

“There were so many positive aspects of the program. Once a week we had this training program. I liked that we had to do research, and it made me truly appreciate the exhibits on a more in-depth level.” [Female Caucasian, under 20, high school student]

“Ultimately NYHS taught me how to do science in different ways. In high school you learn science by the textbook. I learned a lot of things but among them was definitely how to teach other people about science without using a textbook.” [Female Asian American, 20-25, college student]

“I learned a lot of science working with demos and explaining science concepts to others, it really made science more alive.” [Female Caucasian, 31-35, teacher]

Science Is Everything and Everywhere

Thirty-one percent of respondents felt that the Science Career Ladder Program helped them perceive themselves as a scientist. Two-thirds of the respondents (67%; n=70) agreed with the statement that they are a scientist at heart. Only 20% of individuals in the control group supported the same statement. In addition, the Program allowed explainers to see science as a ubiquitous part of their everyday lives. Participant comments suggested that their appreciation for the science they encounter in everyday life increased due to their experience in the Program, in part because the NYHS taught science as a phenomenon rather than as a set of formulas and equations:

“Science is what we live in, what’s around us, the environment...Even people, in a

way...what's all around.” [Female Caucasian, 26-30, college student, babysitter]

“To me, science really means every part of your life, your body, the weather...science is everything, including the technology you use in your daily life.” [Female Caucasian, 31-35, teacher]

Though participants came to view science as “everything and everywhere,” they did not necessarily embrace a naïve notion of science. As one participant commented, “Science is constant learning.” The new view of science adopted by Career Ladder explainers was in many ways a view that enabled participants to utilize scientific principles practically:

“When I think of the Hall and all the science I learned there, I realize I am beyond how I used to think about science. I’m more of a practical science person, I’m not interested in formulas and detailed, but how things work in a practical sense.” [Female Asian American, 31-35, professional]

The NYHS Career Ladder Program also conveyed a sense that science is not a dry and boring endeavor, but that it can instead be fun and rewarding, as demonstrated by the responses below.

“For me, science is fun. I was an “English” person not a science person before I joined the program at the Hall. I was not as interested in science, but my experience at the Hall changed that. I focused some of my courses in college in science-astronomy, a geology course, and biology. I also did courses in archaeology.” [Female Caucasian, 26-30, nursery school teacher]

“Kids think science is boring and I try to make it not boring. Science in general does seem kind of boring—when you read about it it’s dull. Science here, at the NYHS is fun, doing what I’m reading about makes it fun.” [Female Latina, 20-25, college student]

Perceptions of Scientists

Another outcome of the Program was a shift in participant’s perceptions of scientists. Over 80% (n=86) of the survey respondents felt that they gained an appreciation for the ethnic and cultural diversity of scientists while at the NYHS. In fact, participants might have entered the Program with rather traditional perspectives on science and diversity: “To tell you the truth I didn’t see that much diversity in science until I entered the Explainers Program.” [Female Caucasian, 31-35, teacher]

A change in peoples’ perceptions of scientists was achieved by involving the Explainers in an ethnically and culturally diverse group that included both females and males:

“We worked with a very culturally diverse population, and I like to see that. We were able to get away from the image of scientists as white men with labcoats. I now work with a very diverse population of students, and I try and get them to see that they ARE scientists. For example, when I have them make predictions about what they are about to see when they look through a microscope. The explainer group happened to be a very culturally diverse group, and that was great.” [Female Caucasian, 31-35, teacher]

“The stereotypical picture of an older man in a white lab coat is not what I found at the Hall; there are Hispanics, Blacks, Asians, science is not just White people.” [Female Pacific Islander, under 20, college student]

“I was a bit surprised to see people from all different backgrounds interested in science. All of the different ethnicities and religions were fascinating. To see that is unfortunately rare. The stereotype is white male geeks in lab coats.” [Female Caucasian, under 20, high school student]

“The types of people that I worked with there were of all kinds. Different ethnicities and different religions and personalities, all teaching and working with me.” [Female Caucasian, 26-30, teacher]

“In NYHS I met a lot of people of a lot of different cultures interested in science. I was really young and I didn’t have that much exposure to science outside of school. I learned about people interested in science in a different way. There were lots of educators who were people of color who were also scientists. Right now I am part of a student group on campus promoting minority awareness in certain areas—there is always a need to push for that a bit more.” [Female Asian American, 20-25, college student]

“You really don’t know about scientists because all you hear about is in school, all the scientists are men. But everybody is a scientist, for me, well I’m a scientist, all the children because their experimenting as well. You see women scientists, which I’d never seen before.” [Female Latina, 20-25, college student]

Linking Science and Math

Some participants acknowledged their awareness of a link between science and math in the Program, although that notion was not generally shared by most former participants. Twenty-six percent (n=27) of participants indicated that their experiences in the Program increased their math skills. The following comments describe the broader view of math obtained by some participants:

The Program helped with math outside school

“I see connections between math and science. Usually I think of my experience in the Program as helping me with math concepts that I encounter out of school. I can’t think of an example right now.” [Female Caucasian, under 20, high school student]

Math in the museum

“Yes: Math is all over the museum. A former friend at the Hall is a math major; we have peer training there, and each of us explains an exhibit, 1 hour a week. When he explained an exhibit, he pulls out the math in it, so you get a math lesson and the science. I learned a lot that I didn’t know before.” [Female Pacific Islander, under 20, college student]

“Math is my favorite subject, so working there helped show me how math and science rely on each other. It made the math clearer in science; you could see where they were related.” [Female Caucasian, 20-25, paramedic]

Math and science are connected

“Yes, the NYHS helped me develop math skills. I think math is everywhere. And math and science are closely related. You really can’t do one without the other.” [Female Caucasian, 31-35, teacher]

“I didn’t want to do anything with math and science before I started the Program. I got my degree in Humanities. But I learned it isn’t just one thing or another. Going to public school in New York, everyone was a math person or science person, or an English person. Working at the NYHS showed me that it didn’t have to be one or the other. That you can bring in examples from books, from theorems, that there is cross-over between the fields. It broadened my view.” [Female Latina, 20-25, special assistant to a US congressman]

In-depth interviews with other participants revealed, however, that although participants may have indicated that the Career Ladder Program increased their math skills when they filled out the survey, they did not truly feel that the Program affected their perspective towards math. In the survey itself, 22% (n=23) of respondents stated they disliked math (control group: 36%). The following comments illustrate that not all Explainers identified with the mathematical aspects of the Program:

“Math was not part of it, I can’t think how math was incorporated. The math part wasn’t what they wanted the visitors to see. There was physics, but I really can’t think of anything with math.” [Female Caucasian, 31-35, teacher]

“You really don’t use math so I don’t use it much here. The way I use math, when I help groups with how many are in the group, how many groups are there, helping the teacher know how much they have to pay. Besides that, I don’t really use math.” [Female Latina, 20-25, college student]

“No, not math. Not much to do with math.” [Female Asian American, 20-25, college student, SAT teacher]

III. Impact on Career Planning, including Interest in Teaching and Science

To gauge the influence of the Program on participants’ career planning, the survey inquired into the relationship between Program alumni’s career choices and their participation in the Science Career Ladder Program. Over one-third (36%; n=38) of respondents felt that the Program was exceedingly helpful in assisting them in their academic career and in making vocational decisions. Another 30% indicated the Program assisted them “a fair bit” in their academic and career choices. These results were validated in similar questions elsewhere in the survey, indicating a high degree of reliability. Three-quarters (73%) of respondents believed that the Program was helpful in preparing them for their current job or course of study.

Survey data suggest that the fields that respondents pursued in their education skew towards both

science and education. Of those that had already graduated from college, 41% (n=29) had majored in a science field, 14% (n=10) in education, and an additional 9% (n=6) in science education. Of the alumni who graduated from college twice as many chose a field in science and/or education than a field in liberal arts, business or accounting.

Researchers asked respondents with bachelor's degrees, as well as respondents currently pursuing a bachelor's degree to indicate their undergraduate major. Fifty-two percent of those respondents had graduated or will graduate with a bachelor's in science or technology, 15% in education, and 33% in other fields. Compared to the total population of college graduates, the Career Ladder sample was highly skewed towards science and education degrees. In 1996-1997, 32% of bachelor's degrees in New York State were conferred in subject areas related to science and technology, and a little less than 8% in education.⁴ When researchers asked current students what they would like to be or do in 10 years, 14 of the 32 replies referred to a career related to science or medicine, and 11 answers indicated a strong interest in teaching.

Institute researchers asked respondents who were currently employed to indicate their present occupation. Sixty-eight alumni responded to this question, and of those, nearly half were involved with teaching in one way or another. Eight of the respondents were currently working at the NYHS. Even after excluding the Explainers who went on to obtain careers at the NYHS, 42% of those who provided their current occupation (n=25) taught in some capacity, and 10 of them self-identified as a science teacher. In addition, fourteen alumni were currently employed in the science, medicine or technology sector as researchers, physicians or technicians. Twenty-one respondents were employed in some other capacity.

Deciding To Pursue Science Based On Experiences in the Program

In some cases, the Career Ladder Program directly impacted participants in their decision to pursue science as a career, by introducing participants to, and familiarizing them with science or teaching. Participants in this category made the following comments during interviews with researchers:

Science as an option

“I want to pursue marine biology I think—either that or environmental law. At NYHS, I watched people function at various levels in science careers. I found that interesting, to see what life in science could be...It was really the only contacts I had to that world. Otherwise I had my teachers and nobody else. Really, there were very few people in science related fields that I could talk to.” [Female Caucasian, under 20, high school student]

⁴ Source: Office of Higher Education, Research and Information Systems, *College and University Degrees Conferred, New York State 1996-97*. Albany, NY: The University of the State of New York, The New York State Education Department (undated).

Not afraid of science/self-confidence

“I was not afraid to work in science related job after I left the Hall. I went to Natural History organization. All of my jobs have been related to science. My current job is science. It allowed me to not be afraid to work, the Hall continued to keep me in the science fields. When I read science articles now, I know what they are talking about. If it wasn't for the Hall, I wouldn't have had any interest in science at all.” [Female Asian American, 31-35, professional]

“I am who I am, with the Hall of Science; I wouldn't have the Masters degrees. I wouldn't have all this. My career choice is directly related, won't work in science institution without the Hall. When I go to interviews for science organizations, I'm able to walk in and show how much I know, and show I have the ability to learn what I don't currently know.” [Female Asian American, 31-35, professional]

Changing career plans due to a Program experience

“I was a senior in high school when I joined the Hall. I had applied to St. Johns to study pharmacy. I changed from pharmacy to elementary education because of my experience at the Hall. I liked working with kids: their eyes light up and you see they understand and that's really beautiful. It's a great feeling when you sense that you got through to them. It's a great feeling. So now I want to become an elementary school teacher. I want to do something fulfilling; I don't much worry about the money, that's what the husband is for. It needs to be fulfilling; I don't want to dread going to work every morning, I want to enjoy doing it.

“I actually wrote an essay to go into college about this. It was an experience I had at the Hall's playground, where I played with this kid, and they tugged my apron and told me before they left that they had a lot of fun. That was sweet. And then the mom came back to me and told me that I was great at this, and didn't I think about becoming a teacher, because she was impressed on how her daughter and I interacted. That happened right at the time when I thought about changing my major.” [Female Pacific Islander, under 20, college student]

Providing a Foundation for a Career

It is possible that many of the SCL Program participants arrived at the NYHS with a pre-existing interest in pursuing a science or teaching related career. However, alumni revealed that the Explainer Program provided a solid foundation for their career that would have been difficult to obtain elsewhere. Specifically, participants were provided with opportunities to gain self-confidence, knowledge, speaking skills, and skills for working with children. The following comments demonstrate the valuable role the Science Career Ladder Program played in providing a foundation for future career choices:

“I don't think I wouldn't be as passionate as I am in my career without the Explainer Program. I wouldn't know as much as I know about the world. Why the lamp looks purple, why the dust appears brown, how depth perception works. I'd have no foundation.” [Female Latina, 20-25, special assistant to a US congressman]

Developing an Appreciation for Teaching

Another of the Program's main impacts was helping participants develop an appreciation for teaching, regardless of what career field they chose to pursue in the future. Participants articulated a new awareness for the difficulty and the possibilities of teaching. They began to think of teaching as not simply lecturing, but fostering a love of learning. The comments below reflect some of the participants' insights into teaching:

"I got sympathy for teachers. I learned how complicated teaching is. First I thought, oh yah, they just share with you what is in the book. But giving explanations are not just that. You really have to understand in order to be able to answer people's questions. There is no way to fool people. You really have to know what you are talking about. I definitely have more respect for teachers now." [Female Caucasian, under 20, high school student]

"I realized teaching could be more than just sitting in front of a classroom and listening to someone talk. I appreciate good teachers more." [Female Asian American, 20-25, college student]

"It changed the way I thought about teaching. I figured you just sat up there in front and lectured. I came to the states when I was nine and I'm from the old school. In the old school you just sit down and memorize tables. If you develop a love in the kids for learning, you don't have to make them memorize tables because they will do it on their own. If you give them the energy and the curiosity—that is more important to give them—that level of curiosity to keep going." [Female Latina, 36-40, stay-at-home mom]

Participants' new appreciation of teaching often allowed them to see themselves as teachers, whether they eventually pursued that career or not. Their thoughts are reflected in the following comments:

"I never thought of myself as a teacher before, since I had that experience it made me see I could do this, that I had the ability." [Female Asian American, 20-25, college student, SAT teacher]

"Last year I took nine families with four people a piece to the science center. I would have never thought of teaching as a career before; I would think of going to Montana and discovering a dinosaur. Now I can see myself go to Montana to be a teacher." [Female Latina, 36-40, stay-at-home mom]

One of the most rewarding aspects of teaching for former Program participants was the perception of having a true impact on students' lives. Science Career Ladder Program participants felt strongly about being able to touch children's lives:

"Probably my favorite memory is when I did the kids club. It was a hands-on experience, with kids, you saw them every week, and you got to know them. I felt I really had an impact on them." [Female Asian American, 20-25, college student, SAT teacher]

"My favorite memory is when I was running the kid's club and there was a girl who

didn't speak at all- not to anybody. Her mom was putting her into programs to help her open up some. She didn't speak at all 4 weeks. By the fifth week she was smiling some. By the end of the session, she talked to me; I felt I had helped her open up some.”
[Female Latina, 20-25, college student]

“I loved to hear kids say “wow, I didn't ever think of that before.” That's what did I glad I got the experience to do it. I think the explainers are a huge part of the NYHS.”
[Female Latina, 20-25, special assistant to a US congressman]

“I get a certain pleasure out of having kids gather around. And in the Program I got better at it. There was this hands-on exhibit with metal plates, where you make the connection in order to play music. I remember once I showed this little kid. First I tried the complicated explanation and he didn't get it. So I took his hand and put one hand on the plate and the music started playing and I said “See.. you are acting as a wire.” His eyes lit up and he called all of his friends over and started explaining to them the concept that I taught him! He said: “I'm like a wire, music is traveling through me in the form of electricity.” I imparted information and he actually learned something that day.” [Female Caucasian, under 20, high school student]

Building Teaching Skills

Respondents generally felt that the Program helped them improve their teaching skills. Specifically, sixty-nine percent of the respondents felt that the Program helped them develop teaching skills and 64% felt the Program developed in them a sense of appreciation for teaching. Seventy-three percent of the respondents (n=76) agreed with the statement that they are “a teacher at heart,” compared with 59% (n=63) who felt that they were “artists at heart.” In addition, respondents overwhelmingly (95%; n=101) enjoyed the teaching aspect of their work at the NYHS.

Aside from instilling in participants an appreciation for teaching, the Program – on a very practical level – taught participants the art (and science) of teaching. Since the Program ensured that participants found themselves repeatedly in similar teaching situations, they could practice their teaching skills, and adjust quickly depending on feedback from museum visitors. The following comments provide some insight into the unique role the Science Career Ladder Program played in developing teaching skills:

“Being in school it just wasn't the same as when I got to the hall. I'm teaching one thing, and learning something else and find out about something else. It was interactive. And now, that's how I teach. Let's start from the beginning and go from there.” [Female Asian American, 31-35, professional]

“When I was in LaGuardia (school), I was asked to be a tutor in a bio-chemistry class. I helped students prep for exams, helped them understand things because I knew more and I could explain it.” [Female “Mixed”, 20-25, college student, fundraiser, library office aide]

“One of our trainers, Frank, told us that before you approach somebody, ask things like what do you observe, what is it that you see. Don't just ask why or how, but give them some information first, that's the pedagogy; you pull them in this way because it's based

on their own observation.” [Female Pacific Islander, under 20, college student]

“The Career Ladder Program was my first experience being in the classroom. I was in education but I was not at the point in my studies where we were doing any teaching. I knew how much science I knew but the Program was great because it was structured and repetitive. They provided you with scripts, so you were definitely prepared to go out there and teach, but over time you were able to develop your own flair. And having the repetition was critical. You always got to try a lesson again and perfect it. That’s really something great.” [Female Caucasian, 31-35, teacher]

Teachers in the Science Career Ladder Program

Nineteen (18%) of the survey respondents identified themselves as K-12 teachers, teaching altogether 21 subjects. Fifty-seven percent (n=12) of the K-12 teachers reported teaching science or math. Almost half of the K-12 teachers reported teaching less than four years (n=10), four reported between four and six years of teaching experience, and seven teachers had a teaching career that lasted for seven years or more. Eight teachers reported teaching in the New York Public School system, four nearby, and another eight elsewhere.

Some teachers provided valuable insights in how the Program may have influenced their decision to enter the teaching profession:

Inspiration/motivation

“I am a teacher now, and one of the greatest things about the Program was that we were able to practice talking in front of children; well, in front of anyone, really. When we did demos there were a lot of people listening. I decided I surely wanted a career with children. When you explain things and see their faces light up, that is such a good feeling.” [Female Caucasian, 31-35, teacher]

Confidence

“I really wanted primary school education, but this position became available, and I had the experience. It always was in the back of my mind to go into teaching, but the Program gave me the confidence.” [Female Caucasian, 31-35, teacher]

“Being at NYHS gave me confidence and knowledge so that I could apply to be an instructor of adult education. It showed me I can contribute a great deal to a classroom. The Career Ladder Program was geared towards public education, but I ended up in adult education.” [Female Caucasian, 31-35, teacher]

Nine respondents indicated that they had previously taught as a K-12 teacher, but are no longer teaching. This increases the number of former Program participants with teaching experience to 28% of the respondents (n=30). Three of the former teachers had only taught for less than a year, four respondents taught for four years, and two taught for five years before leaving the teaching profession.

Researchers asked former K-12 teachers why they chose to leave the teaching profession. Four individuals left the teaching profession due to a negative experience with teaching or the school system; two left because of low pay and benefits; one had a child, one advanced in their career, and another actually stayed in teaching, but at the college level.

Of the twelve individuals who are teachers but do not currently teach in the NYPS system, six had done so in the past, but left the system. Three of the respondents stated that they left the teaching profession to earn more money elsewhere (one now teaches on Long Island), one left “because I saw it as a “sinking ship” poorly run in New York City. I work in Nassau County now” and another teacher had moved to Pennsylvania.

Thirty respondents reported professional teaching experiences other than K-12 teaching. These experiences included Pre-K, tutoring of various kinds, college teaching, adult education, after school programs, assistant teaching, industrial training, and even martial arts instruction. Only four mentioned the NYHS as their sole teaching experience.

Since people might not currently pursue their dreams, we asked respondents who were not currently involved with science or teaching whether they thought about a career either in science, teaching, or teaching science. Forty-eight respondents answered the question that related to science. Almost half (48%; n=23) answered that they might change careers in the future and pursue science, and 23% (n=11) even fully intended to pursue this in the future. Fifty-three respondents answered the question that related to teaching. Again, 43% (n=23) stated that they might change careers in the future to pursue teaching, and 21% (n=11) fully intended to do so. Forty-six respondents answered the questions that referred to changing careers to teach science. Eleven percent (n=5) fully intended to teach science in the future, 31% (n=14) might choose to teach science, but 28% (n=13) also stated that they were not interested in teaching science. Overall, the answers reflected a group of individuals who were very interested in science *or* teaching, although not equally interested in teaching science.

Re-Affirming the Choice to Go Into Teaching

For some participants, the decision to become a teacher was made before becoming a part of the Career Ladder program. In fact, some chose the Program because they wanted to pursue teaching in the future:

“I had a degree in English before and couldn’t get a job so I decided I wanted to go into teaching...and that is how I ended up at the NYHS. I always loved children so I naturally thought of being a teacher. The experience did help me become a teacher but I was learning towards that already.” [Female Caucasian, 31-35, teacher]

The Program benefited some of the future teachers directly, by providing them with a qualification for their future career:

“I came into the Program knowing that I was going to be a teacher. I’ve always had a good rapport with children, and always wanted to be around children. If it weren’t for NYHS, I wouldn’t have a job. They needed teachers and it qualified me as a science teacher.” [Female Caucasian, 26-30, teacher]

The Program Helped Current Teachers

The impact of the program remained with teachers well into their careers. Participants continued to use skills, lessons, and topics they learned during their time at the NYHS to teach. This wide-ranging impact is demonstrated by the following responses:

“I got lots of ideas of how to model things. I modeled a lot of my teaching lessons after the exhibit concepts at the NYHS.” [Female Caucasian, 26-30, teacher]

“Yes, it gave me a lot of skills. I try and teach and pass on information in the same way that it was passed on to me. One of the greatest things I learned is to do your homework, so that you are well informed, and then to be excited about what you know and what you are talking about. If that happens, others will be excited too and want to learn.” [Female Caucasian, 26-30, teacher]

“I teach 4th, 5th and 6th graders science. And almost everything I do is in NYHS. For example, I was at the NYHS when the Magic School Bus was there. I think on that a lot. I also think about the displays at the NYHS and how we were able to get various points across.” [Female Caucasian, 31-35, teacher]

IV. Influence On Leisure Time Choices

Participants in the Explainer Program remained highly interested in the field of science. Sixty-four percent (n=68) of the participants felt that science was frequently a part of their everyday life (control group: 20%). In fact, science was the only area in which the alumni sample and the control group significantly differed from one another. In contrast, 48% felt that music was part of their everyday life (control group: 63%, n.s.), 47% felt that current events were part of their everyday life (control group: 38%, both likely high due to September 11th), 21% included politics in their daily life, 18% felt that art was frequently a part of their everyday life, and 16% felt that way about history.

Participants demonstrated their continuing interest in science in a variety of ways, with over a third of the respondents stating that they regularly read science-related books, look for science related articles in newspapers, magazines, and journals, and talk to family or friends about science-related issues. Over one third (35%; n=37) currently subscribe to science-related magazines. The majority (61%) of these are generalist science magazines, such as Natural History, Scientific American and National Geographic. Another 21% of the magazines were academic or medical journals. Examples of these journals include the Journal of the American Medical Association, Current Oncology and the American Journal of Physics. Science teacher journals made up 18% of specifically mentioned journals and included such publications as NSTA Science Teacher, Science and Children, and The Physics Teacher.

Over 76% of the respondents (n=80) stated they visit science museum, planetaria, and zoos at least occasionally. Over three quarters of the respondents (76%; n=79) also stated that they had specifically visited the New York Hall of Science in the last three years. Respondents were less

likely to regularly attend public lectures on science (9%; n=9) or listen to radio shows about science (5%; n=5).

Science Career Ladder alumni compare favorably with a sample of highly educated American adults, 29% of which read at least one science magazine per month, half watch at least one science TV Program per month, and 75% visit science museums, aquaria, zoos, etc. once a year.⁵

Former Program participants' interest in science remains strong, but not to the exclusion of all other interests. Seventy-three percent of the respondents had visited an art museum within the last year, and 60% has attended a sports event, and 55% had been to the New York Hall of Science within the last year. These numbers compare favorably with the control group. While there was virtually no difference between the alumni sample and the control group in terms of attending sports events, only 41% (in contrast to 73%) of the control group had recently visited an art museum, and only 18% had been to the NYHS recently.

⁵ Science and Engineering Indicators, 1998.

CONCLUSIONS AND RECOMMENDATIONS

As stated in the introduction to this study, in light of the 19% response rate and possible strong sample bias, a conservative view of the data suggests that the results recorded in this report should be interpreted as indication of the Program's maximum impact on participants. However, since it is also unrealistic to assume that those alumni who did not respond to the survey did so primarily because they believed that the Program did not have any positive impact on them, Institute researchers concluded that the Science Career Ladder Program at the New York Hall of Science is a highly successful program that fosters participants' personal development in various major areas.

Institute researchers concluded that the Science Career Ladder Program at the New York Hall of Science is a highly successful program that fosters participants' personal development in various major areas. Specifically, the Science Career Ladder Program at the New York Hall of Science impacts its participants in the following different areas:

- Participants developed self-confidence, communication and teaching skills, and generally seemed to have been positively influenced in their personal development during a critical phase in their lives. In fact, personal growth is strongly facilitated by the Program, either by fostering existing predispositions, or by exposing Program participants to new challenges in a challenging and supportive environment.
- Participants were more willing than the average college graduate to consider a career in teaching (inasmuch as they did not consider it before they joined).
- Participants acquired an appreciation for science in all its diversity.
- Participants acquired an appreciation for teaching.
- Participants developed a lifelong appreciation for science and learning, and developed a personal connection to science and learning.
- Participants likely developed above-average science knowledge.
- Some evidence suggests that participants generally developed an interest in other cultural arenas outside science (art, for instance).

The impact of the Program on its participants is directly linked to the participants' real experiences during their tenure in the Program. That is, participants were impacted in those areas in which they actually worked, were trained in, gained experiences in, or which allowed them to develop or practice their skills. In addition, participants in the Program joined a peer group that supported an appreciation for learning, achievement, and excellence. An important element of success seem to have been that participants felt challenged and had a sense of assuming responsibilities, but also received immediate positive impact from their audience; in short, they were given an opportunity to succeed and feel satisfaction when they did so. The following quote from the open-ended final question of the survey illustrates this notion:

"I always appreciated the fact that the students were given respect and responsibility to explore the position and learn from it. Especially high school students were allowed to make schedule and given leadership roles whether it was during training, as floor captain or in some other way and this allowed the students to learn leadership skills and teaching skills and

allowed the supervisors to recognize the ability of the explainers.”

The Program seems to attract two different types of applicants:

(A) Those who are coming in with an already well-developed sense for science and teaching. These are high school or college students with a desire for learning who see the Program as a meaningful way to engage in an area of their interest while at the same time earning some money. We believe that we mostly sampled from this group, and hence show the optimal potential for this particular sub-sample of former participants. However, it should be noted that the Program might not have as much of an impact on this self selected, and well-advanced group than it could have on another group with a lesser interest in teaching and/or science.

(B) The second cohort of participants might have chosen the Program for a variety of reasons unrelated to science and teaching. While we did receive some feedback from putative members of this group, we cannot be sure how strong or numerous this sub-sample truly is. The Program has touched these students in very different ways, for instance, it made science and teaching accessible to these former participants. However, at this point we cannot assess quantitatively the precise impact the Program might have had on this group’s appreciation for science and teaching, career choices, self-confidence, etc.

Program Staff was interested in whether the Science Career Ladder Program contributed to participants’ math skills. We found little evidence for that. Some former participants reported an influence of the Program on their math skills, but those were based on factors that were not integral components of the Program. However, since the Program’s impacts on participants seems to be linked directly to their everyday experience in the Program, it would be easy to formally add a math (or any other) component to the Program. As with any stated goal for the Program, it may be useful to address those directly and to formally incorporate elements in support of those goals into the Program.

Recommendations on how to improve the Program on a very practical level were made by participants in their comments on the survey and are classified and documented in Appendix E (pages 57-60).

We believe (with the majority of respondents) that the Program more than fulfills its mission. Its design and its implementation seem to have model character, and we recommend that the Program continue on its path that combines inquiry-based science learning (for the participants) with teaching and interpretation while providing youth with an opportunity to engage in a new peer group. The Program could potentially be made even more valuable to participants if certain desired outcomes (math skills, for instance) were to be addressed directly in training and/or day-to-day tasks of the participants.

APPENDICES

Appendix A: Survey Protocol

Appendix B: Follow-up Telephone Interview Protocol

Appendix C: Control Group Survey

Appendix D: Selected Tables

Appendix E: Commentary from the Career Ladder Survey

Appendix A:
Survey Protocol



Your opinion matters!

How much are the following topics part of your everyday life?

Table with 6 columns: A lot, Somewhat, Little, Not at all, Don't know / no opinion. Rows include Art, Music, Politics, Science, History, Current events.

Here are some more spare-time activity questions. They are difficult to answer. Please give it a rough estimate. How often (if at all) do you...

Table with 6 columns: Regularly, Occasionally, Seldom, Never, Doesn't apply. Rows include reading science-related books, articles, lectures, radio shows, documentaries, museum visits, and family discussions.

When was the last time you visited the New York Hall of Science? _____

When was the last time you visited an art museum? _____

When was the last time you attended a sports event? _____

Do you currently subscribe to science-related magazines or journals? Yes No

If Yes, please list the magazines or journals for us:

What year did you join the NYHS Science Career Ladder/Explainer Program? _____

How did you start working at the NYHS? As an intern as a volunteer/ppa as a college student

In what capacity did you join the NYHS Science Career Ladder/Explainer Program?

Public Programs Assistant High School Explainer College Explainer

When you joined the NYHS Science Career Ladder/Explainer Program, where were you? (Check one)

Table with 2 columns: High School, College. Rows include 9th Grade, 10th Grade, 11th Grade, 12th Grade, Freshman, Sophomore, Junior, Senior.

What positions did you hold during your time at the New York Hall of Science? (Check all that apply)

- Explainer Program Explainer Senior Explainer Science Program Assistant
 Assistant Explainer Coordinator Science Instructor Assistant Librarian Librarian
 Any Supervisory or Managerial Positions (please specify): Other (please specify):

How long did you stay active in the Science Career Ladder/Explainer Program? (Check one)

- 0-1 year 1-2 years 3-4 years 5-6 years Over 6 years I am still active as:

Why did you want to be an Explainer at the NYHS? (check all that apply)

- To be with my friends/meet people It was a paying job Wasn't really my decision
 Something to do I love science Other:

How would you rate your experience at the NYHS (please circle one number)

I did not enjoy it at all 1 2 3 4 5 6 7 I enjoyed it a lot

How much do you draw upon what you've learned while in the Science Career Ladder Program? (Check one)

- Not at all A little A fair bit Very much

Please explain:

How helpful was the NYHS SCL program in assisting you with academic and career decisions? (Check one)

- Not at all A little A fair bit Very much

Please explain:

My participation in the SCL program helped me...

	Yes	Somewhat	A little	No	Don't know
...develop an appreciation for science	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...appreciate the ethnic diversity of scientists	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...think analytically	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...apply math where needed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...gain self-confidence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...see myself as a scientist	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...develop leadership skills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...make career choices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...develop an appreciation for teaching	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...develop teaching skills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...solve problems in general	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Where are you now? (please check all that apply)

- High School College/University (undergraduate) Working part-time
 Trade/vocational school Graduate school Between jobs
 Community College Working full-time Stay-at-home parent
 Other:

Did you take advanced placement courses in science or math while in high school? Yes No

Which ones?

What is your highest level of schooling completed?

- High School Diploma BS/BA in _____ Doctorate in _____
 Associate Degree in _____ Masters in _____ Professional Certificate in _____

For those who went to college **or** are currently pursuing a college degree: What is/was/will likely be your major and minors? **Major(s):** _____ **Minors** _____

For current students: What would you like to be or do 10 years from now? _____

For those who are currently employed: What is your current occupation? _____

If your current occupation or course of study does not include science or teaching: Have you thought about a career in...

	Yes, I fully intend to pursue this in the future	Yes, I may change careers in the future	No, I am happy in what I do	No. I might change careers, but would then do something different	No. I'm not interested in this
...science?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...teaching?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...teaching science?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Are you currently a teacher in K-12? Yes No

If Yes, please complete this Special Teacher Section:

What do you teach? _____

How long have you been teaching? _____

Do you teach in the New York Public School System? Yes No Nearby

If you don't teach in the NYPS system: Have you taught there before? Yes No

If you previously taught in the NYPS system: Why did you leave? _____

Have you worked as a K-12 teacher at some point in your career, but are no longer teaching? Yes No

If Yes, for how long did you teach K-12? _____

If Yes, why did you leave the teaching profession? _____

Have you had any kinds of teaching experiences other than K-12? Yes No

If Yes, please explain: _____

Please help us complete our alumni database by providing us with some of your personal information

Your name: _____ Are you: Female Male

Your age: under 20 20-25 26-30 31-35 36-40 over 40

Race/Ethnicity (please check all that apply)

Caucasian African American Latino Asian American

Native American Pacific Islander Other: _____

Phone Number: _____ (Home/ Work) E-mail: _____

Please rate how strongly you agree or disagree with the following statements

	Highly agree	Agree	Disagree	Highly disagree	Don't know, no opinion	Doesn't apply
Science is boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am a scientist at heart	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am an artist at heart	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am a teacher at heart	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I have the abilities to become a scientist (if I wanted to)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I would <u>not</u> want to be a scientist	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I like science	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I enjoyed teaching science at the NYHS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I like to talk about science stuff with people	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I did <u>not</u> like the teaching part of my work as Explainer at the NYHS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The Explainer program was helpful in preparing me for my current job/course of study	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If I were faced with the question again whether to participate in the Career Ladder Program, I would <u>not</u> do it again	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
While at the NYHS, I acquired know-how and skills that are useful in my life	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Participation in the Explainer Program did <u>not</u> help me to better tackle and solve problems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
While at the NYHS, I improved my skills in how to interact with people	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Participation in the Explainer Program did <u>not</u> provide me with better strategies for looking deeper into issues and for asking critical questions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
While at the NYHS, I gained an appreciation for the ethnic and cultural diversity of science and scientists	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I don't like math	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Learning primarily has to do with schools, classrooms, and teachers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Learning is ongoing and never stops to be part of my life	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Is there anything about the program that you'd like to share with us; anything that might help us improve? You can refer to things that worked well and to things that might need improvements.

Thank you so much for completing the survey!

We would like to talk to some former Program participants sometime in January or February. Could we contact you around that time to talk to you briefly on the phone? Yes No

If Yes, when would be a good time to call you: _____

Appendix B

Follow-up Telephone Interview Protocol

NYHS Telephone Interview PROTOCOL

“Good afternoon. My name is ... and I am calling you about the Explainer Program at the New York Hall of Science. We greatly appreciated you taking the time to fill out the Career Ladder survey we recently received from you and we’re hoping you are still willing to talk with us again on the telephone. We could speak now, or if that is not convenient, we are happy to schedule another time that would be more convenient for you.” To give you a little bit of an idea why we are calling people: The survey told us a lot about whether people felt in certain ways about the program, or whether they did or do certain things. But we are also interested in why and particularly, how the program might have influenced you in certain ways.” [If they ask: This should only take about 10 minutes of your time.”] [General note: These questions are only meant to guide the discussion, or serve as the framework for a truly structured interview. Feel free to let them roam in a thought and explain the impact in their own narrative if it seems that you receive comparable answers.]

Ask all interviewees

Let me start by asking you “what is the first thing that comes to your mind when you think about science?” [Respondent’s most general attitude, open-ended to prevent leading] What is science to you?

We were asking in the survey whether the program helped you appreciate the diversity of science and scientist. You indicated ... Can you tell me maybe what you meant by that?

What people gained

When asked how much you draw upon from what you’ve learned in the program, you answered [Fill in: *Not at all, A little, A fair bit, Very much*]. Can you expand on that or maybe give me an example for how you are still drawing from your experience at the NYHS?

Flexible: Specifically, you indicated that the Explainer program may have contributed to your ability to apply math in some way. Can you share with me how the Explainer Program may have contributed to your math skills, or your ability to use math today?

Flexible: Specifically, you indicated that the Explainer program may have contributed to your capacity to think analytically. Can you share with me how the Explainer Program may have helped you in that?

Flexible: When asked if your participation in the SCL program helped you gain self-confidence, you answered [Fill in: *Yes, Somewhat, A Little, No*]. How did that happen? Do you think you still benefit from this increase in self-confidence?

Flexible: We asked whether people acquired know-how and skills that are useful in their lives during their time at NYHS. You answered... Can you tell me how the program might have aided you in that regard? Or can you give me an example?

We asked whether participation in the program may have provided you with better strategies for looking deeper into issues and for asking critical questions. You answered... Again, can you tell me how the program might have aided you in that regard? Or can you give me an example?

Career (choices)

Was the Explainer program of help in preparing you for your current job or your current course of study? How? [Probe: *When we asked how helpful the Explainer program was in assisting with academic and career decisions, you responded [Fill in: Not at all, A little, A fair bit, Very much]. Can you expand on that? How did it help you?*]

Flexible: When asked if your participation in the SCL program helped you develop an appreciation for teaching, you answered [Fill in: *Yes, Somewhat, A Little, No*]. Can you expand on that or give an example?

Flexible: When asked if your participation in the SCL program helped you develop teaching skills, you answered [Fill in: *Yes, Somewhat, A Little, No*]. Can you expand on that or give an example?

Flexible: If they are interested in changing careers

What about changing careers interests you? Why do you want to go into [teaching, science, science teaching?]

What would you see as the most important benefit for you if you changed careers ? [*a career in science / a career in teaching / a career in teaching science*]

Ask teachers

What made you decide to become a teacher?

What about the explainer program may have helped you in your career choice?

Can you give an example of how the explainer program may have helped you in developing your teaching skills?

Last two question of all interviewees

[How much of what you have learned at the NYHS do you retain?]

Would you share with me the most memorable moment of your time at the NYHS? Can you tell me what the most terrible memory is that you have?

Lastly, is there anything that you'd like to share with me that would help me understand how the program has impacted you?

Appendix C:

Abbreviated Survey for Control Group



Survey: Your opinion matters!



How much are the following topics part of your everyday life?

	A lot	Somewhat	Little	Not at all	Don't know / no opinion
Art	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Music	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Politics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Science	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
History	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Current events	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Here are some more spare-time activity questions. They are difficult to answer. Please give it a rough estimate. How often (if at all) do you...

	Regularly	Occasionally	Seldom	Never	Doesn't apply
...read a science-related book?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...read science-related articles in newspapers, magazines, or journals?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...go to public lectures on science-related topics?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...listen to radio shows about science?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...watch documentaries or TV-shows on science?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...visit science museums, planetaria, zoos, etc.?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...talk to family or friends about science-related issues?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

When was the last time you visited/attended...	...the New York Hall of Science?	
	...an art museum?	
	...a sports event?	

Do you currently subscribe to science-related magazines or journals? Yes No

If Yes, please list the magazines or journals for us:

Please continue on the backside

Please rate how strongly you agree or disagree with the following statements

	Highly agree	Agree	Disagree	Highly disagree	Don't know, no opinion	Doesn't apply
Science is boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am a scientist at heart	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am an artist at heart	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am a teacher at heart	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I have the abilities to become a scientist (if I wanted to)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I would <i>not</i> want to be a scientist	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I like science	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I like to talk about science stuff with people	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I don't like math	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Learning primarily has to do with schools, classrooms, and teachers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Learning is ongoing and never stops to be part of my life	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please help us with some background information

Are you: Female Male?

Are you currently a teacher in K-12? Yes No

Your age: under 20 20-25 26-30 31-35 36-40 over 40

Race/Ethnicity (please check all that apply)

- Caucasian African American Latino Asian American
 Native American Pacific Islander Other: _____

Thank you so much for completing the survey!

Appendix D:
Selected Tables