



IMPACT PLANNING • EVALUATION • AUDIENCE RESEARCH



BBG-BASE PARTNERSHIP EVALUATION

Prepared for the
Brooklyn Botanic Garden
Brooklyn, NY

Photo credit: <https://www.bbg.org/learn/base>

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SUMMARY AND DISCUSSION

Since the school opened in 2003, BASE and BBG have partnered to support BASE students, teachers, and families in building connections to science, nature, and environmental stewardship. Evaluation results demonstrate that BBG is a valuable resource for students and families to engage with science and the environment, particularly important in an urban setting where connecting with nature can be a challenge. The partnership's benefits are far-reaching, from hands-on learning and internship opportunities for students, to visit passes for families, and professional development opportunities for teachers. While the BBG-BASE partnership is quite strong, we see opportunities for BBG and BASE to further strengthen its relationships with students, families, and teachers, thus deepening their engagement with science, nature, and environmental stewardship. The following discussion highlights successes and areas for growth for the partnership, organized by audience: students, families, and teachers.

**Key takeaways from the evaluation results are presented below.
Please read the body of the report for a comprehensive presentation of findings.**

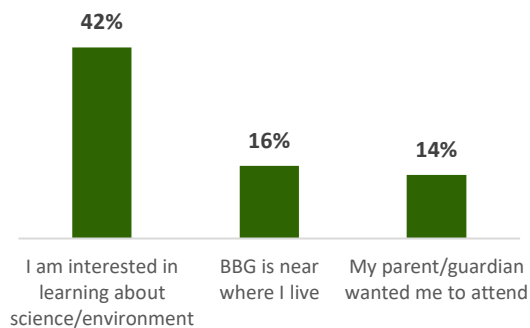
BASE STUDENTS

RELATIONSHIP TO BBG AND BBG-BASE PARTNERSHIP

BBG is a significant and influential resource for students who are interested in and want to engage with science and the environment. Many students come to BASE with a budding interest in science and the environment—questionnaire data indicate interest in science and the environment is the top motivation for attending BASE (42 percent of respondents). Moreover, the majority of students (66 percent) indicated they had visited BBG on their own outside of school at least once in the preceding 12 months. Considering their foundational interest in science and the environment and history of visits to BBG, it is perhaps not surprising, yet still quite positive, that many students are eager to engage in the many opportunities the BBG-BASE partnership offers. From visiting BBG and spending class time outdoors to participating in an internship or school club, one-half of students (50 percent) reported participating in at least one BBG-BASE activity related to nature or conservation. Considering high school students' busy schedules and varied interests, it is encouraging that one-half of students are prioritizing participation in a nature- or conservation-related activity through the BBG-BASE partnership.

It is interesting to note that students who reported visiting BBG outside of school at least once in the preceding 12 months were more likely to report participating in a BBG-BASE activity (58 percent) compared to students who had not visited BBG in the preceding 12 months (36 percent). While we cannot say that a history of visiting BBG *caused* higher participation in a BBG-BASE activity, the relationship between visiting BBG and participation in BBG activities is a positive one. It may be that students interested in science and the environment are more likely to engage in activities related to that interest, such as visiting BBG on their own or participating in activities related to nature and conservation at their schools. For these students, BBG is an important (and free) local resource for exercising and expanding these interests.

TOP 3 MOTIVATIONS FOR ATTENDING BASE



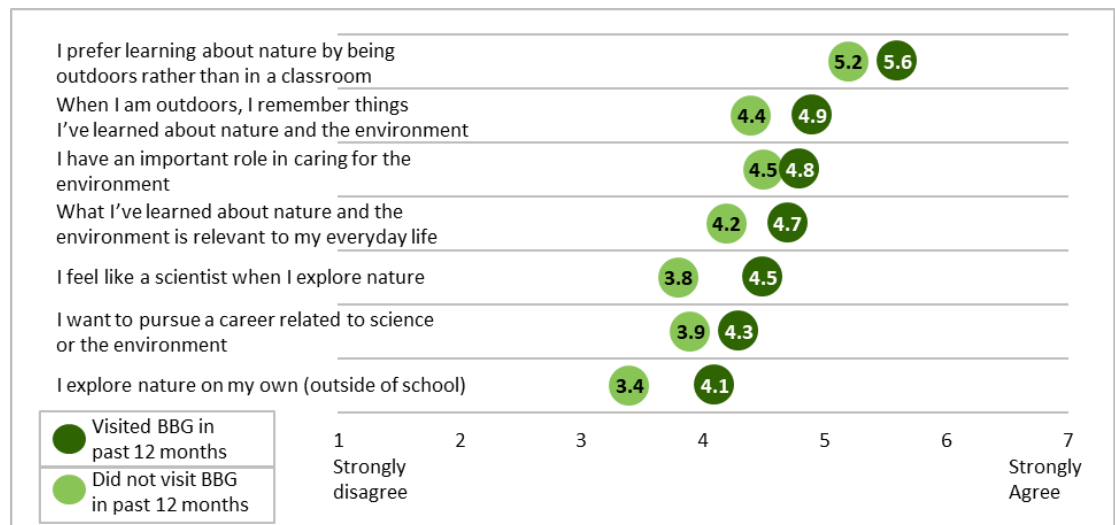
PARTICIPATION IN BBG-BASE ACTIVITIES



RELATIONSHIP TO SCIENCE, NATURE, AND ENVIRONMENTAL STEWARDSHIP

Students who visit BBG outside school have a stronger relationship with science, nature, and the environment, and there is room for BBG-BASE to cultivate and strengthen that relationship for all BASE students. Students who reported visiting BBG in the preceding 12 months rated all seven statements about their relationship to science, nature, and the environment higher than those who did not visit BBG in the preceding 12 months (see graphic below), and the difference is statistically significant. These students are taking advantage of BBG as a place to explore nature, which could be strengthening their sense of a personal connection to science, nature, and the environment. Nevertheless, when looking across the total sample of students asked about their personal relationship with science, nature, and the environment, students' ratings fell around the mid-point of 4 (mean ratings from 3.8-5.4) on a scale from 1 (strongly disagree) to 7 (strongly agree). Similarly, when asked about their perceptions of science, the environment and STEM careers, students gave mildly positive ratings across all statements—mean ratings hovered around 5 on a scale from 1 (negative perception) to 7 (positive perception). These almost-neutral ratings are surprising, considering students' interest in science and the environment as a motivation to attend BASE and their visit history with BBG (discussed above). Students living in an urban environment like Brooklyn may find it difficult to connect to the environment and nature on personal level because they have limited opportunities to do so.

VISITATION TO BBG CORRELATES WITH A STRONGER RELATIONSHIP WITH SCIENCE, NATURE, AND THE ENVIRONMENT



UNDERSTANDING OF ECOSYSTEMS AND SCIENTIFIC INQUIRY

Students demonstrate a stronger understanding of ecosystems after completing the Field Studies course, but the BBG-BASE partnership can continue to build students' understanding on ecosystems and scientific inquiry. Data indicate a statistically significant difference in freshman students' understanding of ecosystems before and after completing the Field Studies course (mean score of 1.7 versus 2.2 respectively, on a scale from 1 [No Achievement] to 4 [Accomplished]). This growth is promising; however, there was no statistically significant difference in freshman students' understanding of scientific inquiry before and after completing the Field Studies course. There is room for continued improvement to help students articulate how the parts of an ecosystem are connected and the ways that scientists approach an issue or research question. Perhaps the Field Studies course could place more explicit emphasis on the *process* of scientific inquiry during labs and activities to help students better understand how and why scientists approach research questions in a particular way—for example, why it is important to back up a claim or hypothesis with evidence.

While students' modest rubric scores for understanding ecosystems and scientific inquiry may be discouraging, we want to recognize that the questionnaire format may have influenced the complexity and thoughtfulness of students' responses. Unlike interviews, questionnaires do not provide an opportunity for the data collector to ask probing questions that prompt students to elaborate on and clarify their responses. It is possible that students would have scored higher on the rubric if their responses had been collected through an interview rather than a written questionnaire.

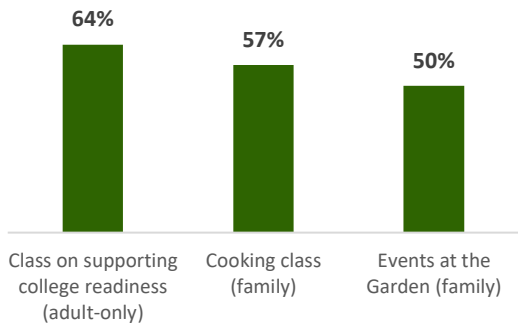
BASE FAMILIES

RELATIONSHIP TO BBG AND BBG-BASE PARTNERSHIP

BASE families have a positive perception of BBG and the BBG-BASE partnership, and BBG can build on this to deepen their relationship with BASE families. Most families have visited BBG, even before they had a student enrolled at BASE (77 percent). Moreover, most are aware of the family pass offered through the BBG-BASE partnership, and about one-half (48 percent) reported using the family pass in the preceding 12 months. Notably, their past experiences with BBG have left a positive impression. Families agree that BBG is “educational,” “enjoyable,” “comfortable,” “welcoming,” and “fun”—mean ratings for all statements were 6.1 or above on a scale from 1 (negative characteristic) to 7 (positive characteristic). Moreover, families report that BBG has had a positive effect on their BASE students' learning experiences, particularly increasing their students' awareness and appreciation of nature (25 percent), providing an opportunity to learn outside a classroom setting (18 percent), and enhancing their learning about science and the environment (13 percent).

While families have positive impressions of BBG, most have never been a BBG member (86 percent). This could be because the family pass offered through the BBG-BASE partnership precludes the need for a BBG membership. Still, there is clear enthusiasm among BASE families for participating in family and adult-only opportunities at BBG in the future. BASE families are particularly interested in classes focused on supporting college readiness for their child (64 percent), cooking classes (57 percent), and events at the Garden (50 percent). BASE families' interest in participating in family and adult-only activities at BBG is encouraging—it suggests an opportunity for BBG to deepen its already strong relationship with BASE families. By cultivating relationships with BASE families while they have a student at BASE, families may be more likely to continue their relationship with BBG after their student leaves BASE (e.g., through continued visitation or a BBG membership).

TOP 3 MOST APPEALING BBG-BASE FAMILY OPPORTUNITIES



HOW BBG-BASE PARTNERSHIP AFFECTS STUDENTS

“It is an excellent experience. My son feels near to the nature and he has the opportunity to learn hands on.”

“It’s a wonderful opportunity to expose my child to the beauty of plants, flowers and nature.”

“I think BBG makes my child more excited about school.”

RELATIONSHIP TO NATURE AND ENVIRONMENTAL STEWARDSHIP

BASE families value the BBG-BASE partnership as a way to bring their child closer to nature, and are open to cultivating their families’ relationship to nature. Similar to the results of the student questionnaires, family questionnaires confirm that students’ interest in science and the environment is a primary motivation for sending a student to BASE (55 percent), followed by parents/guardians’ own interest in science and the environment (14 percent). BASE families are also keenly aware of the student opportunities for engaging with nature and conservation offered through the BBG base partnership (e.g., 93 percent are aware of the Garden Crew). Thus, it is not surprising that families see a clear connection between the BBG-BASE partnership and their child’s relationship to nature—the top response for how BBG affects BASE students was increasing students’ awareness and appreciation of nature (25 percent).

Questionnaire results suggest BASE families are open to deepening their own relationship with nature and environmental stewardship (beyond just their BASE student). It is encouraging that about one-half of families already regularly spend time outdoors exploring nature with their family (47 percent do this at least once a month). And, one-third (33 percent) who spend little time outdoors with their family (two to three times a year or less) said they would like to spend more time outdoors. With encouragement from BBG and BASE, families have strong potential to connect more closely with nature and the environment. A few promising outlets for this would be nature-focused activities BASE families expressed interest in through the questionnaire, such as events at the Garden (50 percent), a family hiking trip (42 percent) or a gardening class (41 percent).

BASE TEACHERS

PERCEPTIONS OF AND RELATIONSHIP TO BBG-BASE PARTNERSHIP

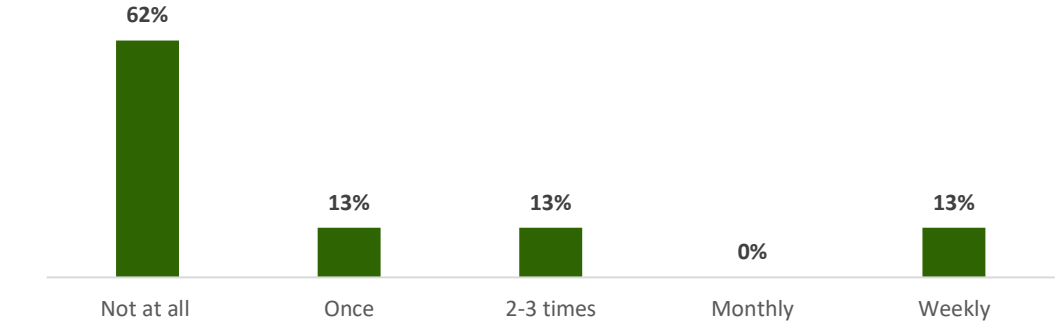
BASE teachers recognize the value of the BBG-BASE partnership to students, teachers, and the school as a whole. Data from the all-teacher questionnaire indicate teachers across all subjects see strong benefits of the BBG-BASE partnership. Notably, teachers are highly aware of the many aspects of the BBG-BASE partnership (from Field Studies to family passes to event support), and when asked to rate a series of statements about the benefits of the partnership to students and the school on a scale from 1 (No benefit) to 7 (High benefit), teachers gave a mean rating of 6.1 or higher to all statements. In particular, teachers rated the internship and job opportunities and exposure to BBG as a resource for nature and science highest (6.9 and 6.8 respectively). Interview data suggests science teachers share the perspective that internships and exposure to BBG are two major benefits of the partnership.

SUPPORTING TEACHERS THROUGH BBG-BASE PARTNERSHIP

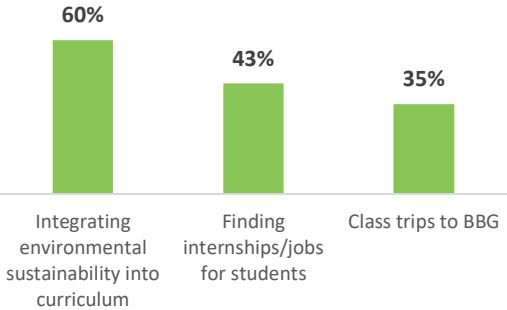
Teachers value the resources and professional development opportunities offered through BBG-BASE, but non-science teachers are not taking full advantage of the partnership. Teachers appreciate the support the BBG-BASE partnership provides teachers and are enthusiastic about the potential for support integrating environmental sustainability into their curriculum (60 percent) and helping find internships and other opportunities for their students (43 percent).

However, there is a gap between teachers’ awareness and recognition of the benefits of the BBG-BASE partnership and their use of partnership resources. For example, while all three science teachers visited BBG with their class at least once during the 2018-2019 school year, nearly two-thirds (62 percent) of teachers (across all subjects) did not visit BBG with their class. Relatedly, teachers rated building connections between science and the environment and other (non-science) subjects lowest among all benefits for students in the questionnaire, and science teacher interviews’ top suggestion for improving the partnership was to help non-science teachers take advantage of BBG resources. As BBG and BASE continue working to strengthen the partnership’s relationship with BASE teachers, non-science teachers in particular will need guidance (e.g., professional development and/or mentoring from BBG staff) and encouragement to fully understand how to embrace the resources BBG can offer to their classrooms.

BASE TEACHER VISITATION TO BBG WITH CLASS IN PRECEDING 12 MONTHS



TOP 3 MOST USEFUL RESOURCES FOR TEACHERS



AREAS FOR IMPROVEMENT

“All departments should be going [to BBG], and we should be offering more events there so everyone can participate in something other than Field Studies class.”

“[BBG] should talk to the non-science teachers about how to use the Garden to enrich our course curriculum beyond science.”

STUDY BACKGROUND

The Brooklyn Botanic Garden (BBG) and Brooklyn Academy of Science and the Environment (BASE) contracted RK&A to conduct an evaluation of the BBG-BASE partnership to provide a holistic understanding of the program’s progress and outcomes, taking into account the perspectives of teachers, students, and families. Through the partnership, BBG connects BASE students to science and environmental stewardship learning opportunities; provides resources and support for BASE teachers; and builds awareness of the Garden and its resources among BASE families. The evaluation is the culmination of three years of data collection with three key audiences: BASE students, families, and teachers. The goal of the summative evaluation is to explore audiences’ perceptions of and relationship to BBG and the BBG-BASE partnership and attitudes and understandings of how to engage in nature exploration, scientific inquiry, and environmental stewardship in a meaningful way.

Specific study objectives are summarized below by audience.

| BASE Students | BASE Families | BASE Teachers |
|--|---|---|
| <p>Explore students’:</p> <ul style="list-style-type: none"> ▪ Motivations for attending BASE ▪ Interest and participation in BBG-BASE activities ▪ Comfort in nature and identity as stewards of the environment ▪ Interest in science, the environment, and pursuing a career in STEM ▪ Familiarity with and understanding of ecosystems ▪ Familiarity with and understanding scientific inquiry ▪ Baseline demographic information | <p>Explore families’:</p> <ul style="list-style-type: none"> ▪ Motivations for sending a student to BASE ▪ Perceptions of BBG ▪ Perceptions of BBG-BASE partnership and how it affects students ▪ Interest in exploring nature with their families ▪ Interest in participating in BBG-BASE environmental stewardship opportunities ▪ Baseline demographic information | <p>Explore teachers’:</p> <ul style="list-style-type: none"> ▪ Awareness of and participation in BBG-BASE environmental stewardship opportunities ▪ Comfort with incorporating hands-on inquiry-based learning into teaching practices ▪ Perceptions of how the BBG-BASE partnership affects students, teachers, and BASE ▪ Strengths and areas of improvement for BBG support of BASE teachers ▪ Baseline demographic information |

METHODOLOGY

STUDENT QUESTIONNAIRES

RK&A developed a questionnaire instrument to be administered by BASE teachers to students in spring 2017, fall 2017, spring 2018, fall 2018, and spring 2019. Fall questionnaires were administered to freshmen enrolled in the Field Studies course at the start of the semester. Spring questionnaires were administered to students across all grade levels (freshman, sophomore, junior, and senior) at the end of the semester. Most questions were multiple-choice or rating scales, and a few were open-ended short answer questions. Fall and spring questionnaires were identical, aside from changes in verb tense for questions about future (fall semester) or past (spring semester) events/activities (See Appendix A for instrument).

FAMILY QUESTIONNAIRES

RK&A developed a questionnaire instrument to be administered online (via SurveyMonkey) and on paper (school events/meetings) to parents/guardians with a student at BASE in spring 2017, spring 2018, and spring 2019. Most questions were multiple-choice or rating scales, and one was an open-ended short answer question (See Appendix A for instrument).

TEACHER QUESTIONNAIRES

RK&A developed a questionnaire instrument to be administered to all BASE teachers in spring 2019. Most questions were multiple-choice or rating scales, and one was an open-ended short answer question (See Appendix A for instrument).

TEACHER/PRINCIPAL INTERVIEWS

In-depth interviews are open-ended and encourage interviewees to express their opinions and experiences in their own words. They also allow the data collector to probe for clarity and further details in interviewees' responses. RK&A developed an interview instrument and conducted telephone interviews with BASE science teachers and the BASE principal in spring 2017, spring 2018, and spring 2019. Each year before the interviews, BBG staff notified teachers about the evaluation and purpose of the interview. Then, RK&A staff contacted teachers and the principal to schedule a telephone interview at the convenience of the interviewee. During each interview, the interviewer typed notes of the interviewees responses as close to verbatim as possible to facilitate analysis.

ANALYSIS AND REPORTING

QUESTIONNAIRES

RK&A delivered raw questionnaire data to BBG in interim reports in spring 2017 and spring 2018. This final report presents the full statistical analysis of data collected over the last three years. The researcher used a quantitative approach to analysis for questionnaires, with a narrative explanation and summary tables for each question. Quantitative data are analyzed statistically using SPSS 20 for Windows. Quantitative analyses conducted include:

- ◆ Frequency distributions (e.g., percent of respondents that are members).
- ◆ Summary statistics (e.g., mean ratings).
- ◆ Inferential statistics to examine the relationship among variables. The types of analyses include:
 - Cross-tabulations show the frequency of response options by group. We conducted chi-square tests to examine whether the associations between variables are statistically significant.
 - Analysis of variance (ANOVA) was performed and the F-statistic was used to test the significance of the difference between groups on continuous measures.

Consistent test variables for **student questionnaires** were: Gender (male vs. female); Visit history (0 vs. 1+ visits to BBG); and Grade (freshman vs. all other). Open-ended questions about ecosystems and scientific investigation in the student questionnaires were rubric-scored and reported along an emergent continuum, and included an additional variable for statistical analysis: Pre-Field Studies (fall semester, freshmen only) vs. Post-Field Studies (spring semester, freshmen only). Consistent test variables for **family questionnaires** included: Gender of BASE student (male vs. female); and Grade of BASE student (freshman vs. all other). The **teacher questionnaire** sample was too small to conduct statistical analysis. In the findings section, we only report notable statistically significant results, which are those that we believe most inform BBG and BASE's work.

INTERVIEWS

Interview data are qualitative, meaning that results are descriptive. In analyzing the data, the evaluator studied the interview notes for meaningful patterns and grouped similar responses as patterns and trends emerged. Findings are reported in narrative; themes in the data are presented from most- to least-frequently occurring, and analysis highlights any trends that emerged over the three years of interviews. Quotations from interview notes (edited for clarity) illustrate participants' thoughts and ideas as fully as possible.

STUDENT QUESTIONNAIRE

BASE teachers administered a paper questionnaire to students in science classes during the spring 2017, fall 2017, spring 2018, fall 2018, and spring 2019 semesters. Fall questionnaires were administered to freshmen enrolled in the Field Studies course at the start of the semester. Spring questionnaires were administered to students across all grade levels (freshman, sophomore, junior, and senior) at the end of the semester. From spring 2017 through spring 2019, teachers collected a total of 844 questionnaires. The results of these questionnaires are presented below. For some results, totals may exceed 100 percent due to rounding or respondents selecting more than one answer for a question.

DATA COLLECTION CONTEXT

The number of respondents slightly declined from spring 2017 to spring 2019, but was relatively consistent overall (see Respondents by Semester – All Grades). A greater number of questionnaires were collected during the spring semesters when the questionnaire was distributed to all grades (versus freshmen only in the fall semesters). Freshman participation was relatively consistent over the five semesters of data collection, with between 16 and 23 percent of total freshmen responses collected in any semester of data collection (see Respondents by Semester – Freshmen Only).

DATA COLLECTION CONTEXT

| Respondents by Semester - All Grades | <i>n</i> | % of Total Respondents |
|---|-----------------|-------------------------------|
| Spring 2017 (all grades) | 285 | 34 |
| Fall 2017 (freshmen only) | 63 | 7 |
| Spring 2018 (all grades) | 249 | 30 |
| Fall 2018 (freshmen only) | 56 | 7 |
| Spring 2019 (all grades) | 191 | 23 |
| <i>Total</i> | <i>844</i> | <i>101</i> |

| Respondents by Semester – Freshmen Only | <i>n</i> | % of Freshman Respondents |
|--|-----------------|----------------------------------|
| Spring 2017 | 69 | 23 |
| Fall 2017 | 63 | 21 |
| Spring 2018 | 68 | 22 |
| Fall 2018 | 56 | 18 |
| Spring 2019 | 50 | 16 |
| <i>Total</i> | <i>306</i> | <i>100</i> |

RESPONDENT CHARACTERISTICS

Respondents range in age from 10 to 20 years old, with a mean age of 16.¹ Over one-half (59 percent) are male and less than one-half (41 percent) are female. The largest proportion of responses come from freshmen students and the lowest from senior students.²

RESPONDENT CHARACTERISTICS

| Age | % of Respondents (n=777) |
|---------------|-------------------------------------|
| 13 or younger | 4 |
| 14 | 19 |
| 15 | 23 |
| 16 | 22 |
| 17 | 21 |
| 18 | 10 |
| Over 18 | 2 |

Age range: 10-20 yrs Mean: 16 yrs Median: 16 yrs

| Gender | % of Respondents (n=775) |
|---------------|-------------------------------------|
| Male | 59 |
| Female | 41 |
| Other | <1 |

| Grade level | % of Respondents (n=781) |
|--------------------|-------------------------------------|
| Freshman | 39 |
| Sophomore | 25 |
| Junior | 20 |
| Senior | 16 |

¹ One respondent each reported being age 10, 11, and 12.

² It is not surprising that freshmen compose the highest proportion of responses considering fall questionnaires were administered to freshmen only.

BBG VISITATION

About two-thirds (66 percent) said they visited BBG on their own at least one time in the past 12 months (outside of school), and one third (35 percent) did not visit BBG on their own. One-fifth (21 percent) visited BBG on their own once a month or more in the past 12 months.

BBG VISITATION

| How often did you visit BBG on your own (outside of school) in the past 12 months? | % of Respondents (<i>n</i> =766) |
|--|--------------------------------------|
| Not at all | 35 |
| 1 time | 17 |
| 2-3 times | 28 |
| Once a month | 8 |
| One a week or more | 13 |

MOTIVATION FOR ATTENDING BASE

Respondents were presented with a list of motivations and asked what motivated them to attend BASE, or to write in their motivation in the “Other” response option. The most common motivation to attend BASE was respondents’ interest in learning more about science and/or the environment (42 percent). Several were motivated to attend BASE because it was close to home (16 percent), their parent/guardian wanted them to attend (14 percent), or they have a friend or family member who attends BASE (13 percent).

MOTIVATION FOR ATTENDING BASE

| Which of the following motivated you to attend BASE? | % of Respondents (n=825) |
|---|---------------------------------|
| I am interested in learning more about science and/or the environment | 42 |
| It is near where I live | 16 |
| My parent(s)/guardian(s) wanted me to attend | 14 |
| I have a friend/family member who attends BASE | 13 |
| Other: Someone else chose for me/only school that accepted me/transferred | 6 |
| Other: Miscellaneous ³ | 6 |
| To take advantage of BASE’s partnership with BBG | 5 |
| Other: Transferred | 1 |

STATISTICALLY SIGNIFICANT DIFFERENCES

Two statistically significant relationships arose from consistent test variables.

YEAR (SPRING DATA ONLY)

From 2017 to 2019, students were increasingly likely to report the BBG-BASE partnership as motivation for attending BASE.

GRADE

Freshman respondents were more likely than respondents from other grades to report the BBG-BASE partnership as motivation for attending BASE.

See Appendix B, Table A for more details.

³ Other responses varied widely, including: Accidentally picked this school; Interested in acting class; moved to Brooklyn; I think I can excel here; It was recommended to me; Lyfe program; Otaku club.

PERCEPTIONS OF SCIENCE, ENVIRONMENT, AND STEM CAREERS

Respondents rated statements about science, a career in STEM, and learning about the environment moderately—between 4.7 and 5.2 on a scale from 1 (negative) to 7 (positive).

PERCEPTIONS OF SCIENCE, ENVIRONMENT, AND STEM CAREERS

| To me, SCIENCE is: | | <i>n</i> | Respondents' Mean Rating |
|---------------------------|-----------------|-----------------|---------------------------------|
| 1 = boring / | 7 = interesting | 714 | 5.2 |
| 1 = means nothing / | 7 = means a lot | 705 | 5.2 |
| 1 = mundane / | 7 = fascinating | 768 | 5.1 |
| 1 = unappealing / | 7 = appealing | 716 | 5.1 |
| 1 = unexciting / | 7 = exciting | 724 | 5.0 |

| To me, A CAREER IN STEM is: | | <i>n</i> | Respondents' Mean Rating |
|------------------------------------|-----------------|-----------------|---------------------------------|
| 1 = means nothing / | 7 = means a lot | 706 | 5.1 |
| 1 = boring / | 7 = interesting | 711 | 5.0 |
| 1 = mundane / | 7 = fascinating | 746 | 5.0 |
| 1 = unappealing / | 7 = appealing | 715 | 5.0 |
| 1 = unexciting / | 7 = exciting | 722 | 5.0 |

| To me, learning about the ENVIRONMENT is: | | <i>n</i> | Respondents' Mean Rating |
|--|-----------------|-----------------|---------------------------------|
| 1 = means nothing / | 7 = means a lot | 695 | 5.0 |
| 1 = unappealing / | 7 = appealing | 710 | 4.9 |
| 1 = boring / | 7 = interesting | 709 | 4.8 |
| 1 = mundane / | 7 = fascinating | 741 | 4.8 |
| 1 = unexciting / | 7 = exciting | 722 | 4.7 |

STATISTICALLY SIGNIFICANT DIFFERENCES

Several statistically significant differences arose among the consistent test variables.

YEAR (SPRING DATA ONLY)

Students were more likely to perceive the environment to be something that “means a lot” (vs. means nothing) in 2018 and 2019 than in 2017.

GRADE

Freshmen respondents were more likely than respondents from other grades to perceive science as “interesting” (vs. boring) and “means a lot” (vs. means nothing), and learning about the environment as “exciting” (vs. unexciting), “fascinating”: (vs. mundane), and “interesting” (vs. boring).

BBG VISITATION

Respondents who visited BBG at least once in the last 12 months (outside of school) were more likely than those who did not visit BBG to perceive a career in STEM as “fascinating” (vs. mundane), and learning about the environment as “exciting” (vs. unexciting) and “fascinating” (vs. mundane).

PRE/POST FIELD STUDIES

Freshmen who had not yet taken Field Studies were more likely than those who had completed Field Studies to perceive science as “interesting” (vs. boring).

See Appendix B, Table B for more details.

RELATIONSHIP TO SCIENCE AND THE ENVIRONMENT

Respondents were asked to rate a series of statements about their relationship to science and the environment on a scale from 1 (Strongly disagree) to 7 (Strongly agree). Respondents rated the statement “I prefer learning about nature by being outdoors rather than in a classroom” highest (mean rating = 5.4). They rated the statement “I explore nature on my own (outside of school)” lowest (mean rating = 3.8).

RELATIONSHIP TO SCIENCE AND THE ENVIRONMENT

Please rate each statement on a scale from 1 to 7, where 1 is “Strongly disagree” and 7 is “Strongly agree.”

| | <i>n</i> | Respondents’ Mean Rating |
|---|----------|--------------------------|
| I prefer learning about nature by being outdoors rather than in a classroom | 796 | 5.4 |
| When I am outdoors, I remember things I’ve learned about nature and the environment | 803 | 4.7 |
| I have an important role in caring for the environment | 801 | 4.6 |
| What I’ve learned about nature and the environment is relevant to my everyday life | 783 | 4.5 |
| I feel like a scientist when I explore nature | 800 | 4.2 |
| I want to pursue a career related to science or the environment | 795 | 4.1 |
| I explore nature on my own (outside of school) | 791 | 3.8 |

STATISTICALLY SIGNIFICANT DIFFERENCES

Several statistically significant differences arose among the consistent test variables.

GRADE

Freshmen were more likely than respondents from other grades to agree with the statement “I feel like a scientist when I explore nature.”

VISITATION TO BBG

Respondents who visited BBG at least once in the past 12 months (outside of school) were more likely than those who did not visit BBG to agree with the following statements:

- ◆ I prefer learning about nature by being outdoors rather than in a classroom
- ◆ When I am outdoors, I remember things I’ve learned about nature and the environment
- ◆ I have an important role in caring for the environment
- ◆ What I’ve learned about nature and the environment is relevant to my everyday life
- ◆ I feel like a scientist when I explore nature
- ◆ I want to pursue a career related to science or the environment
- ◆ I explore nature on my own (outside of school)

See Appendix B, Table C for more details.

INTEREST AND PARTICIPATION IN BBG-BASE ACTIVITIES

Respondents said they were most looking forward to visiting BBG (22 percent), going on a field trip (besides a trip to BBG) (20 percent), spending class time outdoors (19 percent) or participating in a club or activity (19 percent).

INTEREST IN BBG-BASE ACTIVITIES

| What experience offered through BASE and Brooklyn Botanic Garden are you/were you looking forward to most this year? Select one. | % of Respondents (n=720) |
|--|--------------------------|
| Visiting BBG | 22 |
| Going on a field trip (besides a trip to BBG) | 20 |
| Spending class time outdoors (i.e., learning outside the classroom) | 19 |
| Participating in a club or activity (e.g., Garden Crew, Hiking Club, etc.) | 19 |
| Learning a new science skill (e.g., how to collect data) | 12 |
| Other ⁴ | 5 |
| Nothing | 3 |

STATISTICALLY SIGNIFICANT DIFFERENCES

Several statistically significant relationships arose from consistent test variables.

YEAR

From 2017 to 2019, students were increasingly likely to report most looking forward to participating in a club or activity (e.g., Garden Crew, Hiking Club, etc.)

GRADE

Freshmen respondents were more likely than respondents from other grades to report most looking forward to spending time outdoors.

BBG VISITATION

Respondents who visited BBG at least once in the past 12 months (outside of school) were more likely than those who did not visit BBG to report most looking forward to participating in a club or activity. Respondents who did not visit BBG at least once in the past 12 months (outside of school) were more likely than those who visited BBG to report most looking forward to going on a field trip (besides a trip to BBG).

See Appendix B, Table D for more details.

⁴ “Other” responses include: job opportunities; sports; internships; technology; chemistry class; graduating; not applicable.

Respondents reported highest participation in Garden Crew (32 percent), followed by participating in an internship or job (27 percent). Several participated in a personal project (17 percent), Hiking Club (12 percent) or Recycling Team (10 percent).

Respondents were asked an open-ended question about which internships or jobs they applied to and which they were accepted to. Only data collected during spring semesters (all grades) are presented below to reduce likelihood of duplicated responses from freshmen surveyed in the fall. The highest number of respondents reported applying to and being accepted to an internship at Prospect Park, followed by the City Parks Foundation. The table below presents internships and jobs with at least two applicants. All others are listed in the footnote below.⁵

PARTICIPATION IN BBG-BASE ACTIVITIES

| Which activities did you participate in this year related to nature or conservation? | n | % of Respondents |
|---|----------|-------------------------|
| <i>None of the activities below</i> | - | 50 |
| <i>At least one activity below</i> | - | 50 |
| Garden Crew | 757 | 32 |
| Internship/job | 741 | 27 |
| Personal project | 726 | 17 |
| Hiking Club | 734 | 12 |
| Recycling Team | 727 | 10 |

| Which internships/jobs did you apply to/ were you accepted to? | Number applied | Number accepted |
|---|-----------------------|------------------------|
| Prospect Park ⁶ | 43 | 35 |
| City Parks Foundation | 14 | 10 |
| Art program/BBG art fellowship ⁷ | 14 | 1 |
| Garden Apprentice Program (GAP) | 9 | 8 |
| LEAF internship | 9 | 7 |
| Learning Garden | 4 | 5 |
| SYEP | 4 | 4 |
| BBG | 4 | 1 |
| Bcamp | 2 | 2 |
| Wildlife Conservation Corps | 2 | 2 |
| HATCH | 2 | 0 |

⁵ Aquarium, Central Park Conservancy, Silver Center, Steve's Corp Apprenticeship, Woodlands youth crew, Young Urban Forester, Youth Crew, All stars project, Manhattan Museum, Sadie Nash, Saltz.

⁶ Includes: Prospect Park, Prospect Park Alliance, Audubon Center, Boat House, Lefferts House, PPYA, and PYR.

⁷ Includes: Art, art program, BBG art, Botanic Art fellowship.

STATISTICALLY SIGNIFICANT DIFFERENCES

A few statistically significant relationships arose from consistent test variables.

YEAR

From 2017 to 2019, students were increasingly likely to report participating in at least one BBG-BASE activity.

GENDER

Female respondents were more likely than male respondents to report participating in at least one BBG-BASE activity. More specifically, females were also more likely than males to report participating in an internship/job.

GRADE

Freshmen respondents were less likely than respondents from other grades to report participating in Recycling Team.

BBG VISITATION

Respondents who visited BBG at least once in the past 12 months (outside of school) were more likely than those who did not visit BBG to participate in at least one BBG-BASE activity.

Respondents who visited BBG at least once in the past 12 months (outside of school) were also more likely than those who did not visit BBG to participate in Garden Crew, an internship/job, personal project, Hiking Club, or Recycling Team.

See Appendix B, Table E for more details.

INTEREST IN BBG PROGRAMS (OUTSIDE SCHOOL)

Respondents were presented with a list of options and asked what type of BBG program they would be interested in participating in outside of school. Interest was highest for internship guidance (30 percent) and lowest for family events at the Garden (7 percent).

INTEREST IN BBG PROGRAMS (OUTSIDE OF SCHOOL)

| What type of program offered through Brooklyn Botanic Garden would you be interested in participating in (outside of school)? Select one. | % of Respondents (n=571) |
|--|-------------------------------------|
| Internship guidance | 30 |
| College guidance | 25 |
| Tours of the Garden | 17 |
| Social events at the Garden | 17 |
| Family events at the Garden | 7 |

STATISTICALLY SIGNIFICANT DIFFERENCES

Two statistically significant differences arose from the consistent test variables. Freshmen respondents were more likely than respondents from other grades to be interested in participating in tours of the Garden, and less likely to be interested in college guidance programs.

See Appendix B, Table F for more details.

UNDERSTANDING OF ECOSYSTEMS

To measure students' understanding of ecosystems, respondents were asked to imagine they were in a forest and walked up to a pond. Then, they were asked to describe in an open-ended written response at least three parts of the pond ecosystem and how they related to one another. Since the goal for this question is to gauge the impact of the Field Studies program on students, the sample used for analysis of this question is limited to freshmen respondents only to assess change in their understanding of ecosystems before and after taking the Field Studies course. Respondents who left the answer blank or indicated they did not take Field Studies (44 responses) were removed from the sample. The total sample includes 100 pre-Field Studies and 97 post-Field Studies responses, for a total of 197 responses.

The chart on the following page presents the results of rubric-scoring students' responses on a scale from 1 (No achievement) to 4 (High achievement). The chart provides a description of each rubric level and an example of a student response that was typical of that rubric level. The mean rubric score from pre-Field Studies responses was 1.7. The mean rubric score from post-Field Studies responses was 2.2.

STATISTICALLY SIGNIFICANT DIFFERENCES

Two statistically significant differences arose in analysis.

PRE/POST-FIELD STUDIES

Respondents scored higher on the understanding ecosystems rubric in the post-Field Studies questionnaire, showing improvement from the pre-Field Studies questionnaire. This suggests students have a better understanding of ecosystems after completing the Field Studies course.

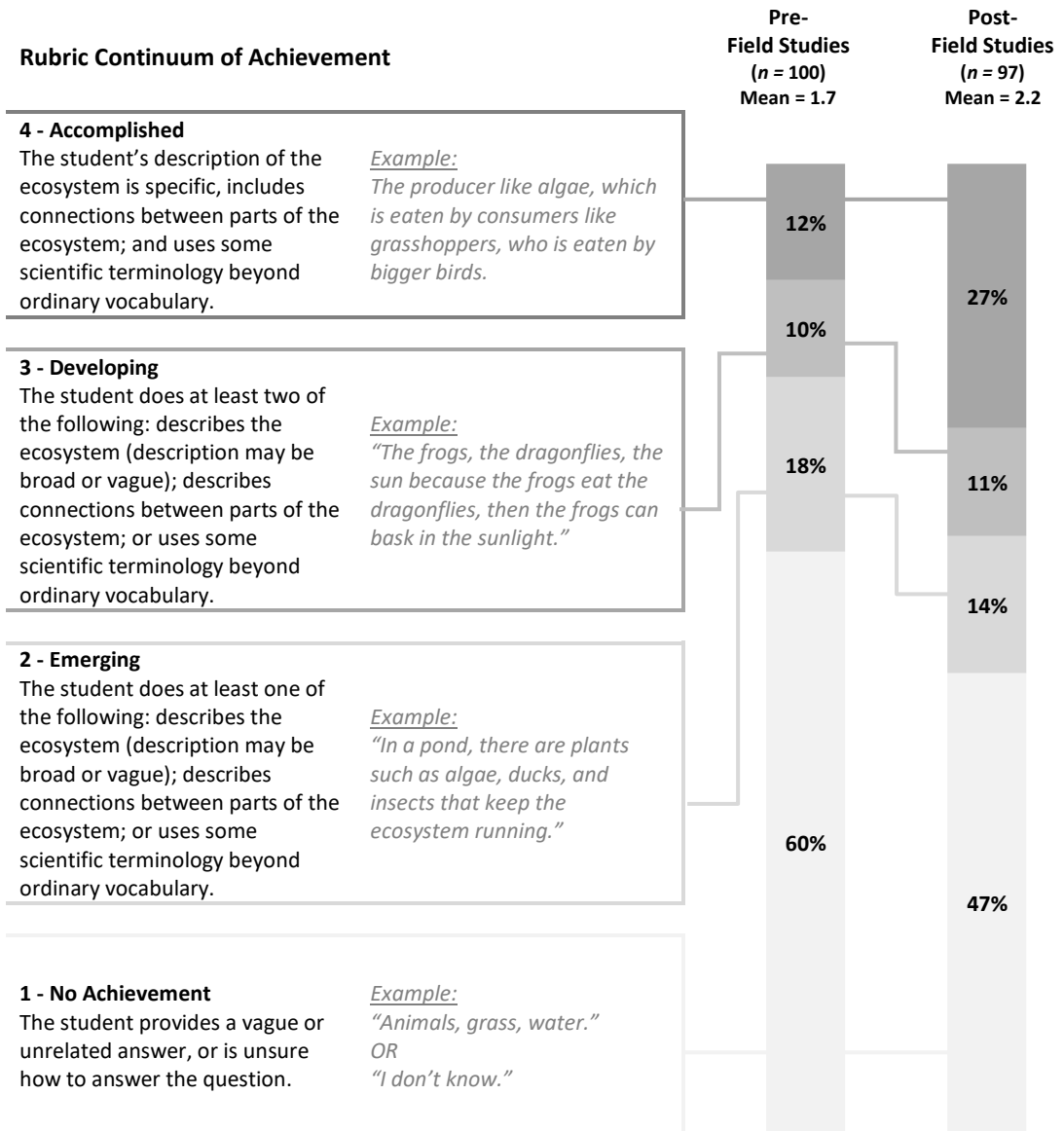
VISITATION TO BBG

Respondents who visited BBG at least once in the past 12 months (outside of school) were more likely than those who did not visit BBG to score higher on the understanding ecosystems rubric.

See Appendix B, Table G for more details.

UNDERSTANDING OF ECOSYSTEMS RUBRIC AND SCORES

Rubric Continuum of Achievement



UNDERSTANDING OF SCIENTIFIC INQUIRY

To measure students understanding of scientific inquiry, respondents were asked to describe in an open-ended written response the steps they might take to investigate what was causing the fish in a pond to die. Similar to the previous question about understanding ecosystems, the sample used for analysis of this question is limited to freshmen respondents only to assess change in their understanding of scientific inquiry before and after taking the Field Studies course. Respondents who left the answer blank or indicated they did not take Field Studies (29 responses) were removed from the sample. The total sample includes 101 pre-Field Studies and 108 post-Field Studies responses, for a total of 209 responses.

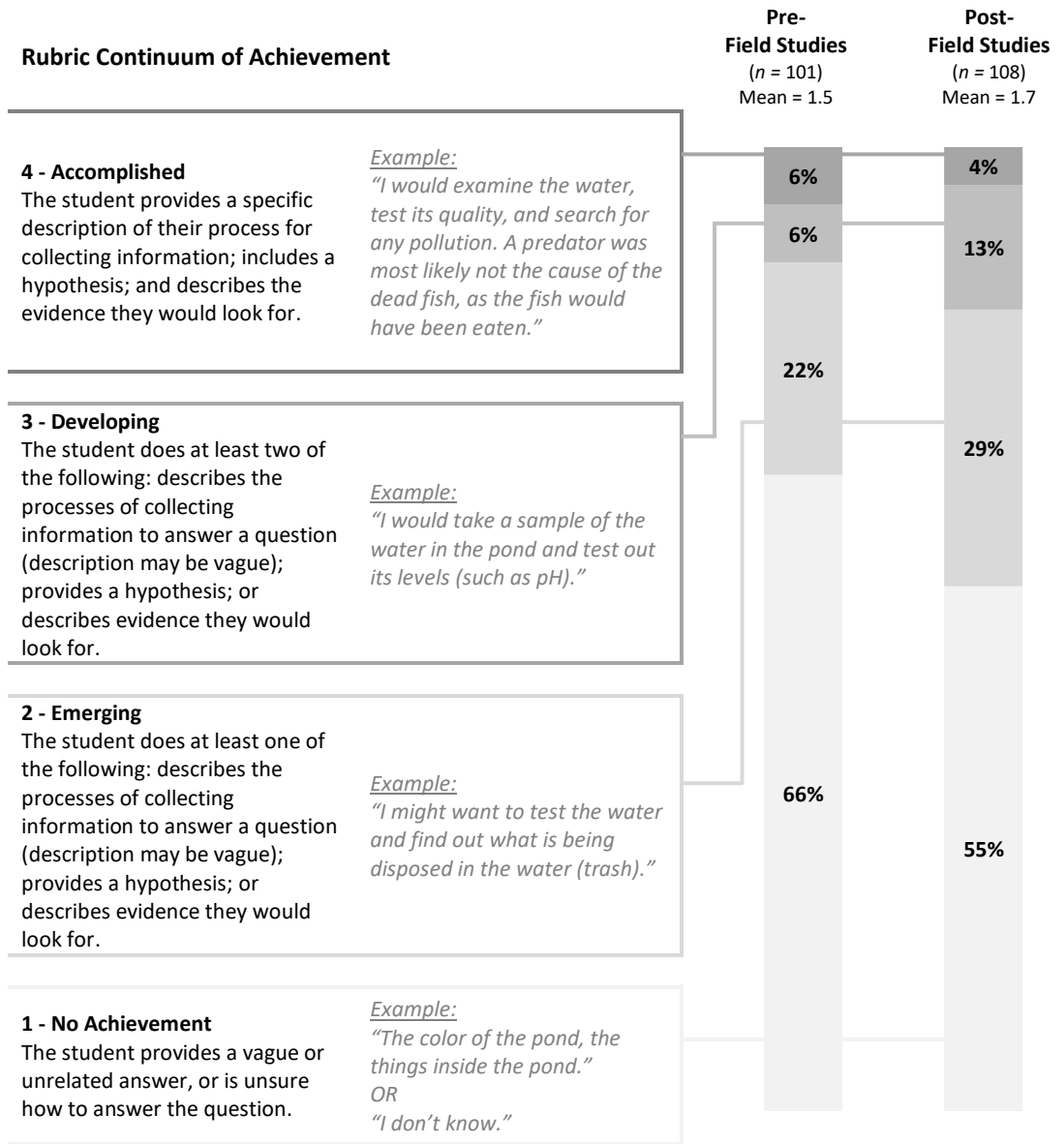
The chart on the following page presents the results of rubric-scoring students' responses on a scale from 1 (No achievement) to 4 (High achievement). The chart provides a description of each rubric level and an example of a student response that was typical of that rubric level. The mean rubric score from pre-Field Studies responses was 1.5. The mean rubric score from post-Field Studies responses was 1.5.

STATISTICALLY SIGNIFICANT DIFFERENCES

No statistically significant differences arose in analysis among consistent test variables.

UNDERSTANDING OF SCIENTIFIC INQUIRY RUBRIC AND SCORES

Rubric Continuum of Achievement



FAMILY QUESTIONNAIRE

In spring of 2017, 2018, and 2019, BASE parents and guardians completed a questionnaire about the BBG-BASE partnership. Questionnaires were administered through varied method over the three years. Paper surveys were sent home with students to be completed by a parent/guardian (2017), distributed at Parent Association meetings (2017, 2018, 2019), and/or sent out via text message to be completed through the online SurveyMonkey platform (2018, 2019). RK&A received a total of 102 questionnaire responses.⁸ The results are presented below. Totals may exceed 100 percent due to rounding or respondents selecting more than one answer for a question.

DATA COLLECTION CONTEXT

The number of respondents slightly declined from 2017 to 2019, but was relatively consistent overall. Most questionnaires were completed on paper, and one-fifth were completed online.

DATA COLLECTION CONTEXT

| Year | % of Respondents (n=102) |
|-------------|-------------------------------------|
| 2017 | 37 |
| 2018 | 34 |
| 2019 | 28 |

| Survey format | % of Respondents (n=102) |
|----------------------|-------------------------------------|
| Paper | 79 |
| Online | 21 |

⁸ Note that individual's responses were not tracked from year to year, so some respondents may have completed a survey for multiple years.

RESPONDENT CHARACTERISTICS

Nearly two-thirds of respondents (62 percent) had a male student enrolled at BASE, and over one-third (40 percent) had a female student enrolled at BASE.⁹ Respondents represent students across all grades at BASE, with the highest proportion of responses from parents/guardians of sophomores and lowest proportion of responses from parents/guardians of seniors. About one-half of respondents spend time outdoors exploring nature with their family at least once a month (47 percent).

RESPONDENT CHARACTERISTICS

| Gender of BASE students | % of Respondents (n=78) |
|--------------------------------|------------------------------------|
| Male | 62 |
| Female | 40 |

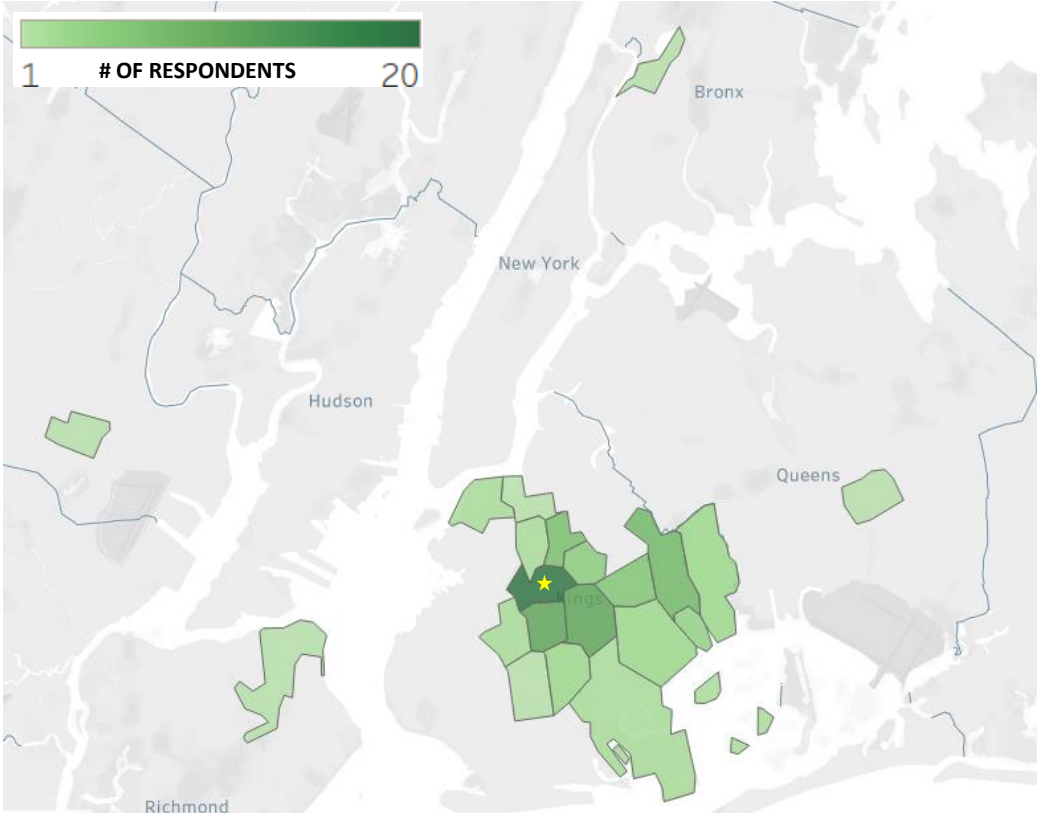
| Grade level of BASE students | % of Respondents (n=80) |
|-------------------------------------|------------------------------------|
| Freshman | 26 |
| Sophomore | 30 |
| Junior | 28 |
| Senior | 19 |

| Time spent outdoors exploring nature (e.g., at a park, garden, backyard, etc.) with your family. | % of Respondents (n=95) |
|---|------------------------------------|
| Once a week or more | 24 |
| Once a month | 23 |
| Two to three times a year or less, but we would like to spend more time outdoors | 33 |
| Two to three times a year or less, which is sufficient for our family | 20 |

⁹ Note that four respondents had more than one child at BASE.

The highest proportion of respondents live in the same zip code where BASE is located (11225). The table below presents the percentage of respondents in each zip code. Zip codes with three or fewer respondents are omitted from the table but represented in the heat map below.¹⁰

HEAT MAP OF RESPONDENT ZIP CODES



The star identifies BASE’s zip code.

¹⁰ Three or fewer respondents reported the following zip codes: 07108, 10301, 10468, 11201, 11205, 11208, 11210, 11218, 11230, 11234, 11236, 11238, 11433.

BBG VISITATION AND MEMBERSHIP

Most respondents have visited BBG before (89 percent), and of those, most had visited BBG before their child enrolled at BASE (77 percent). Most have never been a BBG member (86 percent), and a few are current BBG members (6 percent).

BBG VISITATION AND MEMBERSHIP

| Have you visited BBG before? | % of Respondents (n=98) |
|-------------------------------------|------------------------------------|
| Yes | 89 |
| No | 11 |

| [If visited BBG before] Had you visited BBG before your child(ren) enrolled at BASE? | % of Respondents (n=90) |
|---|------------------------------------|
| Yes, visited BBG before my child enrolled at BASE | 77 |
| No, visited for the first time after my child enrolled at BASE | 23 |

| Were you ever a member of BBG? | % of Respondents (n=99) |
|---------------------------------------|------------------------------------|
| No, I have never been a member | 86 |
| Yes, but I am not currently a member | 8 |
| Yes, I am currently a member | 6 |

STATISTICALLY SIGNIFICANT DIFFERENCES

Respondents with a freshman at BASE were more likely than those with students in another grade to indicate they had visited BBG before their child enrolled at BASE.

See Appendix C, Table A for more details.

AWARENESS AND USE OF FAMILY PASS

Most respondents said they were aware of the family pass (82 percent), and of these, about one-half used the family pass at least once in the past year (48 percent).

AWARENESS AND USE OF FAMILY PASS

| Are you aware BBG provides a family pass to BASE students? | % of Respondents (n=98) |
|---|------------------------------------|
| Yes, I am aware of the family pass | 82 |
| No, I was not aware of the family pass | 18 |

| [If aware of family pass] How often have you used your family pass this year? | % of Respondents (n=81) |
|--|------------------------------------|
| Not at all | 52 |
| One time | 28 |
| Two or more times | 20 |

STATISTICALLY SIGNIFICANT DIFFERENCES

No statistically significant differences arose in analysis among consistent test variables.

PERCEPTIONS OF BBG

Overall, respondents have positive perceptions of BBG (mean rating = 6.1 or above on a scale from 1 to 7). Respondents most strongly perceive BBG as “educational” and least strongly perceive BBG as “fun” (although, again, all statements received an overall positive rating).

| PERCEPTIONS OF BBG | | | Respondents' Mean Rating |
|-----------------------|-----------------|--------|-----------------------------|
| BBG is: | | | |
| 1 = non-educational / | 7 = educational | (n=87) | 6.6 |
| 1 = unenjoyable / | 7 = enjoyable | (n=89) | 6.4 |
| 1 = uncomfortable / | 7 = comfortable | (n=87) | 6.3 |
| 1 = unwelcoming / | 7 = welcoming | (n=92) | 6.3 |
| 1 = boring / | 7 = fun | (n=89) | 6.1 |

STATISTICALLY SIGNIFICANT DIFFERENCES

No statistically significant differences arose in analysis among consistent test variables.

MOTIVATION TO SEND CHILD TO BASE

Respondents indicated that the most common motivation for sending students to BASE is that their child is interested in science and/or the environment (55 percent). Several respondents were motivated by their own interest in science and /or the environment (rather than their child's interest) (14 percent) or said they chose BASE because it is the closest school to their home (11 percent).

MOTIVATION TO SEND CHILD TO BASE

| Which of the following motivated you to send your child(ren) to BASE? (Select one) | % of Respondents (n=89) |
|---|--------------------------------|
| My child is interested in science and/or the environment | 55 |
| I am interested in science and/or the environment | 14 |
| BASE is the closest school to where I live | 11 |
| I have a friend/family member who has a child at BASE/recommended BASE | 9 |
| Other ¹¹ | 8 |
| To take advantage of BASE's partnership with BBG | 3 |

STATISTICALLY SIGNIFICANT DIFFERENCES

No statistically significant differences arose in analysis among consistent test variables.

¹¹ Other responses include: Early college opportunities; Recommended by Welcome Center; He was placed at BASE by the welcome center; It was my child's choice; Of the schools available for enrollment, BASE was the selected choice of high school; it was the only good school that accepted him; Placement option at the time.

AWARENESS OF STUDENT OPPORTUNITIES THROUGH BBG-BASE

Of the student opportunities offered through the BBG-BASE partnership, respondents are most aware of the Garden Crew, Field Studies, and internships and apprenticeships—unsurprisingly, these opportunities also have the highest participation among respondents’ children. Nearly one-half of respondents said they were not aware of the Recycling Team (49 percent) or the Hiking Club (47 percent).

AWARENESS OF STUDENT OPPORTUNITIES

| Indicate your awareness of the following student opportunities offered through BBG-BASE. | | Aware, and child participates | Aware, but child does not participate | Unaware |
|--|--------|-------------------------------|---------------------------------------|---------|
| Garden Crew at BBG | (n=90) | 51 | 42 | 7 |
| Field Studies | (n=88) | 49 | 36 | 15 |
| Internship/apprenticeship | (n=91) | 40 | 46 | 14 |
| Hiking Club | (n=79) | 14 | 39 | 47 |
| Recycle Team | (n=76) | 13 | 38 | 49 |

STATISTICALLY SIGNIFICANT DIFFERENCES

No statistically significant differences arose in analysis among consistent test variables.

BBG'S EFFECT ON STUDENTS' BASE EXPERIENCE

Respondents were asked an open-ended question about how BBG affects their child's experience at BASE. Nearly one-third of respondents did not write a response (29 percent) and over two-thirds responded (71 percent).

Of those who responded, one-quarter (25 percent) said BBG has increased their child's awareness and/or appreciation of nature (e.g., "She is more aware of her surroundings, keeping the environment clean and safe."). Several provided general responses about BBG positively affecting their child's BASE experience (18 percent). Several said BBG provides opportunities for their child to learn outside a classroom setting (13 percent) or enhances their child's learning about science and the environment (13 percent). Remaining responses are summarized in the table below.

BBG'S EFFECT ON BASE EXPERIENCE

| How do you think BBG affects your child's experience at BASE? | % of Respondents (n=72) |
|---|-------------------------|
| Increases awareness/appreciation of nature | 25 |
| Generally positive effect | 18 |
| Opportunity to learn outside the classroom | 13 |
| Enhances learning about science and the environment | 13 |
| Other ¹² | 10 |
| Not applicable ¹³ | 6 |
| No effect | 4 |
| Uncertain | 4 |
| Internship/apprenticeship opportunities | 3 |
| Builds teamwork/social skills | 3 |
| Access to BBG benefits BASE families | 3 |

STATISTICALLY SIGNIFICANT DIFFERENCES

No statistically significant differences arose in analysis among consistent test variables.

¹² Other responses include: BBG helps build my child's leadership skills; I think it gives him a lot of opportunities for school activities; I wish she would engage more; Made him more aware of the garden; My family are from Grenada so I'm happy he is in a school that provides gardening; She's motivated to go to work; That was his reason for coming to BASE.

¹³ These respondents wrote in "N/A" or said their child was not at BASE for freshman year, so they missed involvement with BBG.

INTEREST IN FAMILY OPPORTUNITIES

Respondents indicated that the family opportunities of highest interest are a cooking class (57 percent) and events at the Garden (50 percent). Respondents are least interested in a park clean-up day (17 percent).

INTEREST IN FAMILY OPPORTUNITIES

| Indicate which family opportunities you would be interested in participating in if they were offered through BBG-BASE. | % of Respondents (n=98) |
|--|-------------------------|
| Cooking class | 57 |
| Events at the Garden | 50 |
| Family hiking trip | 42 |
| Gardening class | 41 |
| Park clean-up day | 17 |
| Other ¹⁴ | 2 |

STATISTICALLY SIGNIFICANT DIFFERENCES

No statistically significant differences arose in analysis among consistent test variables.

¹⁴ Other responses include “Vegan cooking” and “Arts and crafts.”

INTEREST IN ADULT-ONLY OPPORTUNITIES

Respondents were most interested in a BBG-BASE class focused on supporting college readiness for their child (64 percent). One-half (49 percent) were interested in a cooking class, and one-third were interested in a gardening class (38 percent) or a class on supporting science learning (32 percent).

INTEREST IN ADULT-ONLY OPPORTUNITIES

| Indicate which adult-only opportunities you would be interested in participating in if they were offered through BBG-BASE. | % of Respondents (n=100) |
|---|---------------------------------|
| Class on supporting college readiness | 64 |
| Cooking class | 49 |
| Gardening class | 38 |
| Class on supporting science learning | 32 |
| Art class | 25 |

STATISTICALLY SIGNIFICANT DIFFERENCES

No statistically significant differences arose in analysis among consistent test variables.

TEACHER QUESTIONNAIRE

In June 2019, 25 BASE teachers completed a paper survey about the BBG-BASE partnership. The results are presented below. Totals may exceed 100 percent due to rounding or respondents selecting more than one answer for a question.

RESPONDENT CHARACTERISTICS

Respondents teach a wide range of subjects, with the highest responses from social studies (20 percent), math (16 percent), science (16 percent), and language arts (16 percent) teachers. One-fifth (20 percent) did not identify the subject area they teach. Nearly two-thirds did not visit BBG with their class during the 2018-2019 school year (62 percent), and one-third visited at least once with their class. Many (80 percent) visited BBG at least once for a personal visit during the 2018-2019 school year.

RESPONDENT CHARACTERISTICS

| Subject Taught (n=25) | % of Respondents |
|------------------------------|-------------------------|
| Did not specify | 20 |
| Social Studies | 20 |
| Math | 16 |
| Science | 16 |
| Language Arts | 16 |
| Physical Education | 8 |
| Art | 4 |
| Paraeducator | 4 |

| Visitation to BBG in 2018-2019 (n=24) | With class % of Respondents | Personal visit % of Respondents |
|--|--|--|
| Not at all | 62 | 21 |
| Once | 13 | 17 |
| 2-3 times | 13 | 50 |
| Weekly | 13 | 0 |
| Monthly | 0 | 13 |

AWARENESS OF BBG-BASE PARTNERSHIP

Respondents were presented with a list of various aspects related to the BBG-BASE partnership and asked to identify which they were aware of. Respondents were most aware of the Field Studies course (92 percent) and least aware of the HATCH Botanical Art Fellowship (48 percent).

AWARENESS OF BBG-BASE PARTNERSHIP

| Aspects of partnership (n=25) | % of Respondents |
|---|------------------|
| Field Studies | 92 |
| BASE Garden Crew | 88 |
| Class trips to BBG | 88 |
| Internships, jobs and volunteer opportunities for students | 88 |
| Club support for Green Team, Hiking Club, Recycling Club | 88 |
| Family passes to BBG for all BASE families and BBG memberships for all BASE staff | 84 |
| Science- and environmentally-themed field trips | 76 |
| Event support (e.g., Summer Bridge, New Student Orientation, Harvest Lunch) | 76 |
| Identifying outside partnerships and opportunities (i.e. Publicolor, LIU) | 68 |
| HATCH Botanical Art Fellowship | 48 |

BBG-BASE PARTNERSHIP BENEFITS FOR STUDENTS

Respondents were asked to rate a list of potential benefits of the BBG-BASE partnership for students on a scale from 1 (No benefit) to 7 (High benefit). Respondents rated all student benefits high (mean rating of 6.2 or above). They rated internship and job opportunities for students highest (mean rating = 6.9) and building connections between science/environment and other (non-science) subjects lowest (mean rating = 6.2).

BBG-BASE PARTNERSHIP BENEFITS FOR STUDENTS

| Benefits (n=25) | Mean rating |
|---|--------------------|
| Provides internship/job opportunities to students | 6.9 |
| Exposes students to BBG as a resource for nature and science | 6.8 |
| Brings students learning outside the classroom through Field Studies course | 6.8 |
| Builds students' confidence in their abilities through hands-on experiences | 6.7* |
| Fosters students' interest in environmental stewardship | 6.6 |
| Fosters students' appreciation for the natural world | 6.5 |
| Helps students build connections between science and the environment and other (non-science subjects) | 6.2* |

*One respondent each indicated "not sure" for these statements.

BBG-BASE PARTNERSHIP BENEFITS FOR SCHOOL

Respondents were asked to rate a list of potential benefits of the BBG-BASE partnership for the school on a scale from 1 (No benefit) to 7 (High benefit). Respondents rated all school benefits high (mean rating of 6.1 or above). They rated providing clubs and supporting club highest (mean rating = 6.7) and supporting family engagement with BASE and BBG lowest (mean rating = 6.1).

BBG-BASE PARTNERSHIP BENEFITS FOR SCHOOL

| Benefits (n=25) | Mean rating |
|---|--------------------|
| Provides clubs (e.g., Garden Crew) and supports school clubs (e.g., Green Team, Hiking Club) | 6.7 |
| Makes the school more attractive to students and families during recruitment efforts | 6.6 |
| Provides support for schoolwide events (e.g., Harvest Lunch, New Student Orientation, Senior Breakfast) | 6.6 |
| Connects school with new partnership opportunities (e.g., Publicolor, LIU) | 6.4 |
| Strengthens BASE's focus on environmental stewardship | 6.3 |
| Supports family engagement with BASE and BBG | 6.1* |

*Two respondents indicated “not sure” for this statement.

BBG-BASE PARTNERSHIP BENEFITS FOR TEACHERS

Respondents were asked which BBG membership benefits they used in the last year. Over one-half (52 percent) said they used the free admission for two adults. A few (16 percent) attended “members only” events. The remaining benefits were used by few, if any, respondents.

AWARENESS OF BBG-BASE PARTNERSHIP

| Aspects of partnership (n=25) | % of Respondents |
|---|-------------------------|
| Free admission for 2 adults for 12 months | 52 |
| Admission to “members only” events | 16 |
| Free admission for children 17 and under | 8 |
| Discounts on family classes | 4 |
| Discounts on continuing education classes | 0 |

BBG-BASE TEACHING RESOURCES

Respondents were presented with a list of potential teaching resources available through the BBG-BASE partnership and asked to select the resource that would be most useful or write in a response. A few selected more than one response. Respondents indicated that the most useful teaching resource would be help finding internships, jobs, and other opportunities for students (43 percent).

MOST USEFUL BBG-BASE TEACHING RESOURCE

| Resource (n=23) | % of Respondents |
|---|------------------|
| Finding internships, jobs, and other opportunities for students | 43 |
| Curriculum planning to integrate environmental theme or trip to BBG | 39 |
| Class trips to BBG | 35 |
| Professional development | 30 |

BBG-BASE PROFESSIONAL DEVELOPMENT RESOURCES

Respondents were presented with a list of potential professional development resources available through the BBG-BASE partnership and asked to select the resource that would be most useful or write in a response.¹⁵ Respondents indicated that the most useful professional development resource would be help integrating environmental sustainability into their curriculum (43 percent).

MOST USEFUL BBG-BASE PROFESSIONAL DEVELOPMENT RESOURCE

| Resource (n=20) | % of Respondents |
|---|------------------|
| Integrating environmental sustainability into your curriculum | 60 |
| Developing a lesson to teach at BBG | 30 |
| Managing students/materials in an outdoor setting | 10 |
| Not interested BBG-BASE professional development | 5 |

¹⁵ One wrote in “Outdoor classroom.” Two responses were eliminated because they indicated contradictory responses (i.e., selected “not interested in professional development” and at least one other option).

TEACHER & PRINCIPAL INTERVIEWS

RK&A conducted telephone interviews with BASE science teachers and the principal in the spring of 2017 (four teachers), 2018 (four teachers), and 2019 (three teachers). Interviews explored their thoughts about and experiences with the BBG-BASE partnership, how the partnership affects students, and how BBG could better support BASE through the partnership. A summary of the findings from these interviews is presented below. For each section, the findings are presented from most- to least-frequently occurring.

INQUIRY-BASED LEARNING

All science teachers reported using inquiry-based learning in their classrooms. They described inquiry-based learning as providing students with hands-on activities, allowing students space to explore a concept independently or with peers, and acting as a facilitator using questions to drive inquiry forward. Some teachers' responses emphasized the hands-on nature of their approach, while others focused on allowing students to drive the direction of their project, or on how questioning guides a lesson. Examples of inquiry-based learning projects included: dropping hydrogen peroxide on a piece of liver and using questions to help students make observations about the processes at work and back up their claims with evidence; testing soil compaction in different locations to understand how, if at all, compaction affects the environment; or observing an insect or organism and coming up with their own theories about what types of things drive that organisms' behaviors.

Teachers cited a few barriers to inquiry-based learning, including: students' discomfort with the open-ended nature of projects (e.g., teachers being "hands-off" during a lesson) because they are worried about being "wrong;" students having to learn how to "think outside the box" rather than being presented with the right answer; and the time it takes to complete a project-based lesson (e.g., time lost handing out and collecting materials).

VISITATION TO BBG

PERSONAL VISITS

Teachers' visitation to BBG for a personal visit appears to have remained somewhat steady from 2017 to 2019. In 2017, two science teachers visited at least once, and two did not visit. In 2018, all science teachers reported visiting BBG at least once. In 2019, two said they visited at least once, and one had not visited but planned to visit over the summer. The principal reported visiting BBG at least once a month from 2017 to 2019.

WITH CLASS

Teachers' visitation to BBG with their classes appears to have increased slightly from 2017 to 2019. In 2017, two science teachers visited BBG with their class at least once, and two did not visit BBG with their class. In 2018, three science teachers visited BBG with their class at least once, and one did not. In 2019, all three science teachers interviewed visited BBG with their class at least once.

FOCUS OF CLASS VISITS TO BBG

Science class visits to BBG vary widely by the subject taught and lesson plan goals. Some trends emerged on how teachers use BBG for visits with their classes. There were not notable differences in how teachers used BBG between 2017 and 2019.

- ◆ **Experiments/activities:** Teachers most often described bringing their classes to BBG to conduct experiments or activities. Some of the experiments and activities described included counting organisms in a defined space to measure biodiversity; testing the pH of the water to measure water quality; testing the relative humidity of each of the three climate areas; and identifying tree species in the forest area.
- ◆ **Lessons/discussions:** Sometimes teachers use BBG as a setting for class discussions, for example visiting different pavilions at the Garden to talk about plant adaptations to different types of environments and how it relates to evolution or using the boulders in the rock garden to discuss how glaciers move materials over long distances.
- ◆ **Environmental stewardship:** In couple of cases, teachers described using visits to the Garden to spark discussions about sustainability, humans' relationship with the environment, and opportunities for civic action. For example, one teacher described taking students through BBG looking for examples of alternative energy sources and ways to increase sustainability at the Garden, and for a "civic action" project about the benefits of trees for urban communities.

BBG-BASE TEACHER SUPPORT

SUPPORT TO INCREASE CLASS VISITS

Teacher responses consistently highlighted areas for BBG to support more class visits from 2017 to 2019:

- ♦ **Curriculum:** Teachers said connecting the BBG visit to the curriculum and State Regents testing would be crucial to encouraging more field trips. They suggested that having a BBG educator help BASE teachers plan visits and lessons and provide support during the visits would help.
- ♦ **Visit logistics:** Planning the activities, managing students, and working with BBG to schedule visit times can all be barriers to class visits. Some teachers also point out it is difficult to complete a visit to BBG within their class period, so students would have to miss time in another class to visit BBG.
- ♦ **Designing new courses:** Two teachers in 2019 said there is potential to add more science courses focused on “project-based learning” that could utilize the Garden more. One said they are already working with BBG to design a new course and another suggested adding a Field Studies-type course for sophomores or juniors.

OTHER WAYS TO SUPPORT TEACHERS

Science teachers and the principal are generally aware of many opportunities for teachers and students offered through the BBG-BASE partnership, but their participation in these activities varies. In the 2019 interviews, teachers noted participating in professional development opportunities (e.g., a workshop on environmental sustainability), a hydroponics project made possible through funds from BBG, the Field Studies course, and involvement in the Hiking Club and Garden Crew. Teachers did not mention barriers to participation in BBG-BASE activities except for personal conflicts with the professional development dates scheduled.

Teachers were presented with a list of five ways in which BBG-BASE could further support teachers: professional development; science, nature or environmentally-themed field trips; lab supplies; class trips to BBG; and curriculum planning to integrate an environmental theme or for a trip to BBG. Teachers were interested in all five options, but priorities for teachers have changed from 2017 to 2019. In 2017, teachers said lab supplies and field trips were the highest priority of the five options. In 2018, there was no clear priority for BBG-BASE support (all teachers chose a different option as highest priority). In 2019, all three science teachers said curriculum planning support from BBG-BASE was their top priority.

HOW BBG-BASE AFFECTS STUDENTS

Teachers and the principal were consistent in their perspectives from 2017 to 2019 about the benefits of the BBG-BASE partnership for students.

- ◆ **Exposure to Garden:** Teachers value the “exposure” to the Garden because students may not otherwise visit a place like BBG. One teacher observed that students living in Brooklyn don’t necessarily take advantage of the resources available in the city (for many reasons, such as lack of knowledge, admission money, subway fare), but the BBG-BASE partnership provides exposure to “all the Garden has to offer.” The partnership also provides funding for other activities, like hiking trips and Steve’s Camp, that they might not be able to participate in otherwise.
- ◆ **Internships/jobs:** Teachers and the principal also highly value the internships and job opportunities available through the BBG-BASE partnership. They talked about the value of the role of the BASE partnership liaison in communicating these opportunities to students. One noted that internship experiences might be the most important impact on students in the long term.
- ◆ **Engagement in learning:** Teachers also noted the partnership helps students get more engaged and invested in learning because they have opportunities to apply what they are learning in class to the “real world” around them. They said this can lead to increased confidence, a stronger connection to nature, and making connections to their local community.
- ◆ **Inquiry-based learning:** One said the Field Studies course in particular is important for helping students develop skills and understand scientific processes (e.g., develop a hypothesis, conduct research, test hypothesis) through inquiry-based learning.

PARTNERSHIP STRENGTHS

In addition to the positive effects of the partnership on students mentioned above, teachers noted the following strengths of the BBG-BASE partnership:

- ♦ **Supportive partnership manager:** Teachers and the principal highly value the liaison working between the school and the Garden for communicating opportunities for students, supporting teachers, and helping out with events. In particular, they note the liaison's importance in raising awareness of internships and job opportunities and helping teachers plan class visits. Teachers noted that "If a teacher asked for support, [the liaison] would give it" and another said "they are always here, always present."
- ♦ **Activities and programs:** Beyond classroom support and internship opportunities, teachers and the principal noted that all of the activities and programs available through BBG, such as the Hiking Club and Garden Club, were added strengths of the partnership.

AREAS FOR IMPROVEMENT

Across all three years of interviews, teachers and the principal cited two main areas for improvement of the partnership:

- ♦ **Expanding to other (non-science) classes:** Teachers and the principal would like to see non-science teachers and upperclassmen taking advantage of the resources the Garden has to offer to enrich classroom learning. A few mentioned creating a partner course to Field Studies for upperclassmen. Others noted that a few non-science courses (e.g., Theater and English) have visited the Garden, but many more could be using it.
- ♦ **Maintaining funding:** Teachers and the principal noted that funding limitations restrict BASE's ability to fully utilize BBG's resources. They said there is only funding for a BBG teacher to help with Field Studies for half of the year, although it is a yearlong course. They also said more funding would help support teachers in developing curriculum that connects to the Garden and planning visits.

APPENDICES

Redacted.