Year Three Evaluation Report: 2018-2019

"GBE has provided my students opportunity to apply learning in a real life context. For students to know that their research is used by NASA scientists is motivating. Likewise, GBE provides an opportunity to learn and discover the reality of science experimentation as opposed to 'canned' labs that have a predetermined outcome. Also, for students and teachers alike, GBE provides an example of the interdisciplinary reality of 'real' science."

Growing Beyond Earth
Year Three Evaluation Report
2018-2019

August 2019

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I. Executive Summary

During the 2018-2019 school year, Fairchild Tropical Botanic Garden (Fairchild) implemented the third year of a four-year project entitled: Growing Beyond Earth (GBE). NASA is providing funding support for project implementation as well as an external project evaluation.

Growing Beyond Earth's dual purpose is to:

1) Increase middle and high school students' interest and skills in science by engaging them in authentic citizen science research conducted in classroom settings, and

2) Support NASA Kennedy Space Center Exploration and Technology Programs' plant research by conducting large-scale, student-led research designed to expand food options and increase plant diversity for spaceflight by evaluating multiple edible plants that meet NASA's criteria for size and edibility.

Analysis of this year's evaluation data yielded findings in four key outcome areas:

1) GBE engages students in an authentic research experience. GBE students have cemented their status as valuable research partners to NASA by serving as a "feeder program" into NASA's new plant testing research.

2) Students strengthen botany and science practices through their plant research including growing plants, collecting data, planning scientific investigations, constructing explanations, and reading and evaluating scientific information.

3) Students increase positive attitudes towards botany and science in a number of ways such as excitement about botany and science, interest in additional STEM experiences, and self-perception as a scientist. It appears that GBE is even engaging students who did not have prior interest in botany or science.

4) NASA benefits from GBE student research. The benefits of STEM programs designed for students are often unidirectional with the benefits accruing primarily to students, not to science partners. With GBE the benefits are clearly bidirectional—both students and NASA benefit.

Analysis of this year's evaluation data also yielded findings in four key areas of project implementation:

1) Fairchild demonstrated that GBE is both scalable and replicable at a national level. During this third year of the project, Fairchild undertook a significant expansion of the number of teachers and students engaged in this research—supporting participation of an additional 49 middle and high school teachers and their students in Puerto Rico and nine states (California, Colorado, Connecticut, Georgia, Michigan, Nebraska, New York, Ohio, and Washington).

2) GBE participation numbers grew as GBE continued to engage a diverse group of students and teachers. In total, throughout this past school year, an estimated 8,900 middle and high school students in 160 schools conducted research under the guidance of 184 trained teachers.

3) Fairchild augmented GBE's unique design with the enhancement of program components—further supporting outcomes for students and NASA. This past year, Fairchild expanded teacher training and support as well as increased student interactions with scientists. Data indicate that GBE is adaptable to a wide variety of instructional settings and can effectively engage a large number of students in authentic research.

4) Teachers and NASA partners continued to be engaged and very satisfied with GBE. Fairchild staff were able to provide the materials, training, and ongoing support that teachers within, and beyond, Miami-Dade County needed in order to successfully implement GBE.

One of the strongest themes emerging from analysis of the totality of evaluation data is the catalytic role that Growing Beyond Earth plays as a generator of student interest in both science and botany—a seemingly unique combination of project design components that elicit a high level of enthusiasm and engagement from students and teachers. Interview data point to three potential elements driving this engagement.

1) Students are engaged in authentic research—and they know it.

2) Plants can be engaging research subjects. Many students have never grown plants and they develop a sense of connection as they monitor the growth and condition of "their" plants.

3) GBE addresses several of adolescents' critical developmental needs such as having a sense of purpose, feeling valued, and having responsibility.

In closing, this year's evaluation results indicate that Growing Beyond Earth continues with its strong track record—from both an outcomes and implementation perspective. GBE continues to generate evidence of positive outcomes for students, NASA, and teachers. Overall, evaluation results are consistent with prior years' results.

II. Evaluation Activities

An external evaluator is collaborating with Fairchild staff to conduct a four-year evaluation of the Growing Beyond Earth project. The evaluation employs a utilization-focused, participatory approach and a mixed methods design. This year's evaluation continued to address both formative and summative evaluation questions. Data collection activities occurred between September 2018 and June 2019 and included observations, teacher surveys, phone interviews, and review of project documents. Additional details on the evaluation can be found in the Appendices.

The evaluation activities conducted this year focused on two tracks:

1) Assessment of Fairchild's national expansion effort which added new GBE school sites in multiple states and Puerto Rico. To support this expansion, web-based training was also developed and launched.
2) Continued assessment of GBE participation and outcomes as well as satisfaction levels, and recommendations for improvement—at the local and national levels.

III. Evaluation Findings

This report presents the key synthesized evaluation findings. Much more detailed results, including numerous charts, are located within the Appendices.

Findings: Project Outcomes

Outcomes Finding 1: Students Continue to Engage in an Authentic STEM Research Experience

Prior years' evaluation results have indicated that students participating in GBE are engaged in an authentic citizen science STEM research experience. As presented throughout this report, results from this year continue to confirm this finding.

NASA defines an authentic STEM experience as one which meets at least three of the following criteria. As explained below, GBE meets all five criteria.

1) *Features real-world STEM content*: GBE students are engaged in conducting authentic research—addressing NASA's research questions related to growing edible plants in space. NASA scientists use the results of GBE students' research to further NASA's research. As students know and have remarked:

   "This is for real, not just for a grade."

   "*This is for NASA … so it is super important. We have to get this right."*

2) *Conducted in a real-world STEM setting*: GBE studies are carried out in grow chambers designed by Fairchild that is analogous to the *Veggie* grow chamber used by NASA on the International Space Station (ISS). Under the guidance of trained teachers, students rigorously follow specific research protocols designed

by NASA and Fairchild. Additionally, students produce research posters disseminating their results and Miami-Dade students can also participate in a research symposium—replicating professional research practices.

3) *Directly participates in scientific practices:* Teachers report they participate in GBE because it is an excellent opportunity to provide their students with meaningful, hands-on scientific experiences. As further detailed in this report, students are strengthening fundamental science practices such as:
    1. Asking questions
    2. Developing and using models
    3. Planning and carrying out investigations (including problem-solving)
    4. Analyzing and interpreting data
    5. Using mathematics and computational thinking
    6. Constructing explanations
    7. Engaging in argument from evidence
    8. Obtaining, evaluating, and communicating information

4) *Involves scientists and engineers as role models or mentors*: Students interact in-person and virtually with NASA and Fairchild scientists. NASA scientists conduct webinars with GBE students and teachers, participate in GBE student research symposium, host student field trips to Kennedy Space Center (KSC), and interact regularly with students via Twitter.

    "*Interaction with NASA scientists was the most influential part of GBE. Students truly enjoyed the fact that they were generating data that NASA scientists would use. When students shared their data on Twitter, NASA scientists were responding directly to them and that made the experience more real for them.*"

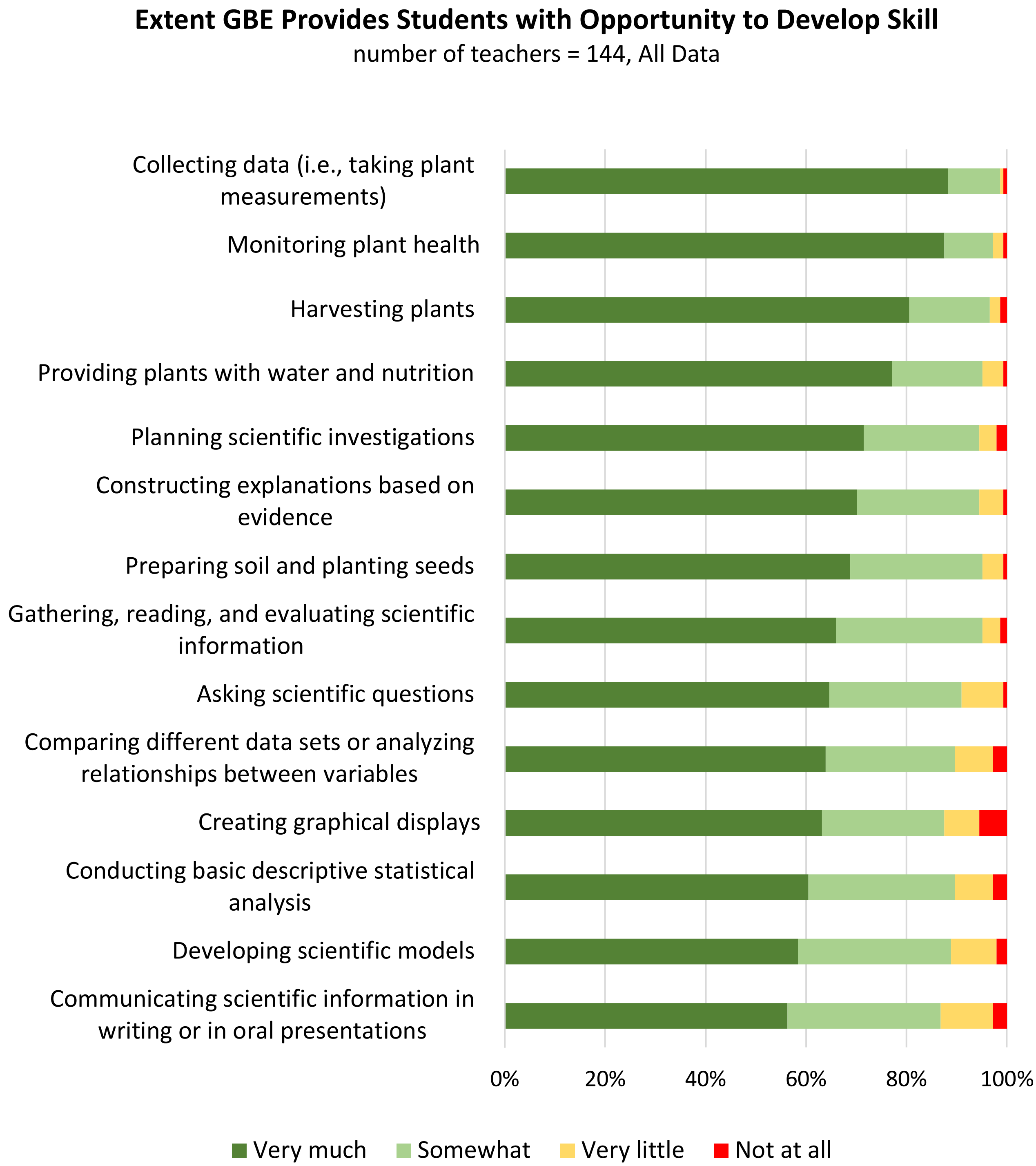
5) *Involves participants in collaborative project work*: A hallmark of GBE is the collaborative nature of the project's research and participation protocols. Typically, students work in groups and often divide roles and responsibilities.

    "My students became more interactive and started to see how collaboration really is necessary when undertaking such a complex science experiment. Many of them became more social and because they were comfortable with the growing process, they were encouraged and empowered to share this information with others."

Outcomes Finding 2: Students Strengthen Science and Botany Practices

"GBE makes science processes come alive."

This year's evaluation provided continued evidence of student STEM-related outcomes. Teachers reported that GBE presents students with the opportunity to develop a variety of fundamental science and botany practices as indicated in the chart on the following page. Topping the list of practices is collecting data and working with plants (i.e., providing water, monitoring health, and harvesting). Other practices high on the list include planning scientific investigations, constructing explanations, and reading/evaluating scientific information. Although evaluation data suggest that students are strengthening within these practice areas, a more rigorous evaluation design would be necessary to assess the extent of skills development.



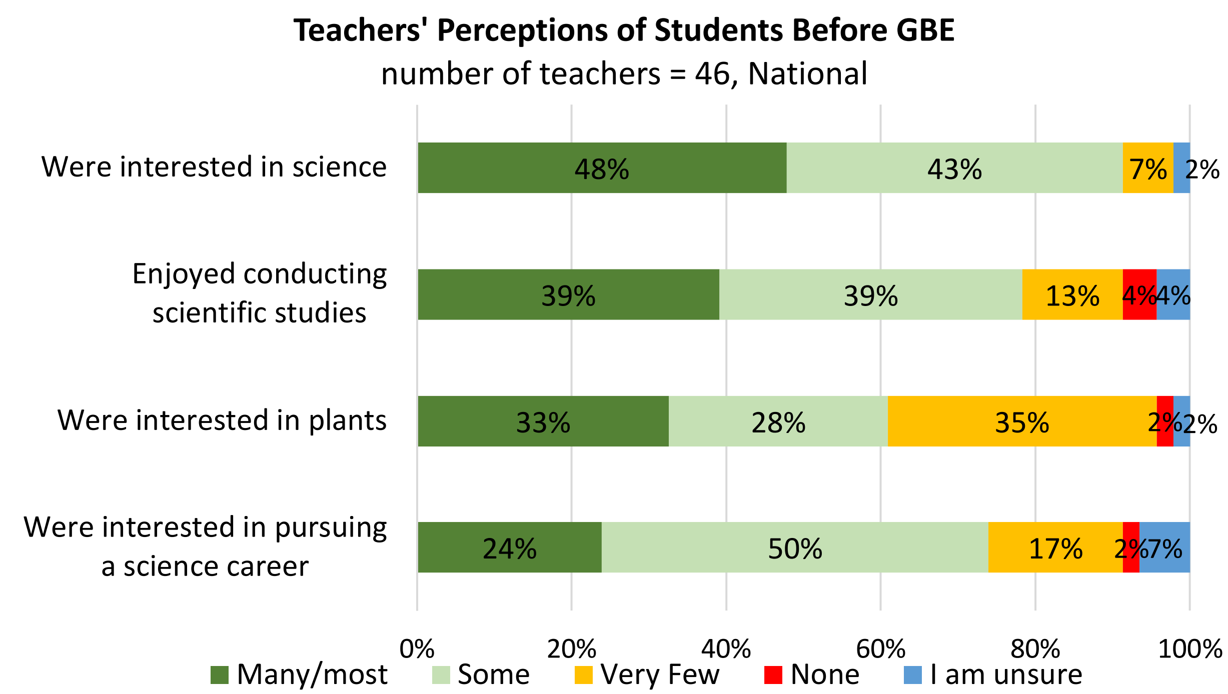
For the most part, national teachers and Miami-Dade teachers reported very similar results regarding development of science and botany practices. However, there was a noticeable difference in responses regarding communicating scientific information, 68% of teachers in Miami-Dade vs. 52% nationally responded *very much*. This is possibly explained by the research poster development, which was a requirement for only Miami-Dade high schools.

Outcomes Finding 3: Students Increase Positive Attitudes Towards Science and Botany

"GBE opens a door to student interest in science."

Pre-participation levels of interest in science and plants

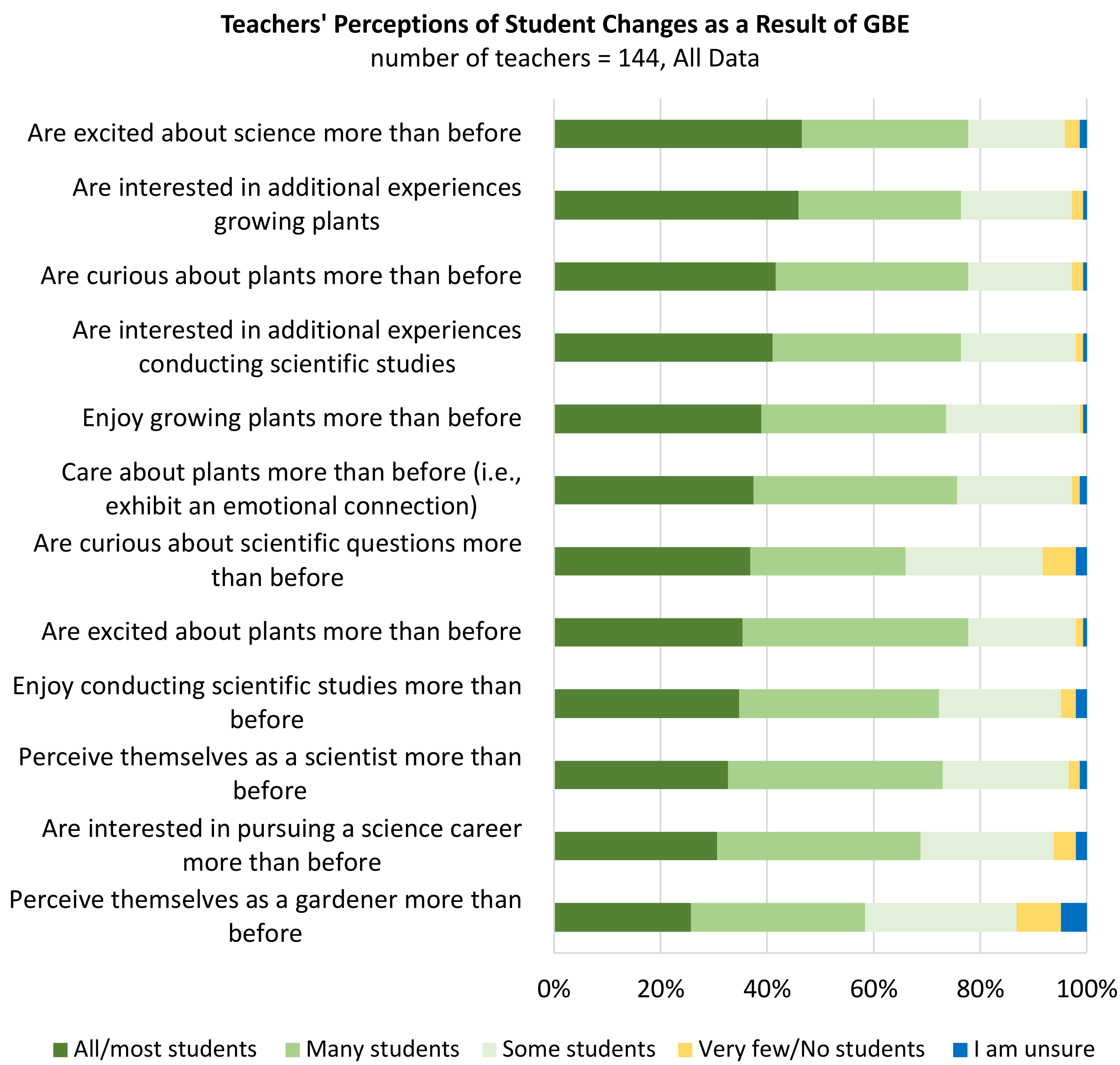
The following chart depicts national teachers' perceptions of their students' STEM-related attitudes prior to participating in GBE. It does *not* appear that GBE is engaging only students with high levels of pre-interest in science or botany. For example, only 48% of national teachers perceived that *many/most* of their students were interested in science prior to GBE. In comparing these responses to prior year responses from Miami-Dade teachers, overall, it appears that students at national sites might have had slightly more pre-interest in the GBE-related content than students at Miami-Dade sites.



Post-participation levels of interest in science and plants

The chart on the following page depicts teachers' perceptions of changes in student STEM-related attitudes as a result of GBE. These results provide evidence that GBE positively influences students' attitudes towards science and plants in a number of ways including excitement, interest, desire for additional experiences, and self-perception. These results are consistent with results obtained last year using the Common Instrument Suite (a validated assessment tool[1]) with a sample of GBE students.

In this year's survey results, more than 75% of teachers reported that *many or all/most* of their students are more: excited about science and plants, interested in additional opportunities to grow plants and conduct science studies, and curious about plants than before they participated in GBE.



[1] Common Instrument Suite (CIS) from The PEAR Institute at Harvard Medical School and McLean Hospital

Comparing the Miami-Dade teachers' responses to national teachers' responses, Miami-Dade teachers perceived their students to have a slightly higher increased perception of themselves as gardeners. This may be because there are more urban students in Miami-Dade, making this experience more novel. National teachers reported more of their students enjoying conducting scientific studies, which may be due to the more interdisciplinary approach to GBE of some national teachers.

In their own words, teachers recount their observations regarding student attitudes:

> *My students were very protective of the plants and even named them. For many of them it was the first time they ever grew a plant from a seed. They were happy when the plants were doing well and disappointed at times as well.*

> *Many students that don't normally eat vegetables really enjoyed eating our weekly harvests. Through this experience many students changed their eating habits and added leafy greens to their diet.*

> *Being exposed to these plants made them happier and was an experiment they looked forward to.*

> *I loved watching the students take ownership of the project and start to think like scientists.*

> *Students pay more attention to what they are doing and try to be more accurate because they know it is for NASA.*

> *The students gained a great deal of confidence in their ability to handle problems that arise during a project like this. Their skills with lab equipment also increased.*

<u>One of the strongest themes emerging from analysis of the totality of evaluation data is the catalytic role that GBE plays as a generator of student interest in both STEM and botany—and the role that students' authentic research experience plays in stimulating this level of interest and engagement.</u> Teachers recount that GBE is very accessible to all students (regardless of skill level) and that GBE engages students who might not otherwise be drawn to STEM activities. The protocols are simple to grasp and not intimidating as some other science activities can be. Students are also innately curious about the grow chamber and the rapid changes they observe in the plants.

Below are two examples of how GBE sparked interest in additional science experiences:

In one Miami-Dade 8th grade robotics class, students themselves initiated a GBE-related project that they called GB GBE or Going Beyond GBE. Many of these students participated in GBE during their 6th grade and now in their robotics class decided to research, design, and build Space Garden Stations.

In another Miami-Dade middle school, the teacher reported that he had lots of difficulty getting students involved in science activities. But as a result of participating in GBE some students indicated interest in doing more science activities so the teacher provided some additional opportunities including SECME (Southeastern Consortium of Minorities in Engineering), conducting a butterfly study, and using the GBE grow chamber to germinate seeds that were then transferred to a new student-developed garden—which they called GOE (Growing on Earth).

Outcomes Finding 4: NASA Benefits from Growing Beyond Earth Student Research

NASA staff continue to report meaningful benefits to NASA resulting from the data provided by GBE students. Fairchild staff have also begun to conduct to some statistical analysis of the student data, further increasing its usefulness to NASA. GBE students have cemented their status as valuable research partners in supporting NASA research by serving as a "feeder program" into NASA's new plant testing research. Students' GBE data enables NASA research to proceed faster by identifying plants that are good candidates for further testing.

Evidence of the benefits of GBE to NASA include:

- Adoption of the "cut and come again" harvesting technique that was first identified by GBE students
- Addition of the examining the "neighbor effect" to NASA's research agenda. This effect was first identified by GBE students.
- Expansion of NASA's relationship with Fairchild to now include a Makerspace project—The Innovation Studio—to generate new ideas for growing plants in space.

- NASA staff continue to present the GBE project at national and international conferences and to integrate GBE student research into their articles for peer-reviewed research journals.
- Testing of plant varieties on the ISS that were first identified by GBE students.
- NASA has invited Fairchild staff to participate in several NASA "brainstorming" sessions. Typically, NASA invites organizations that are leaders in the field to participate in these sessions—such as universities and national organizations.

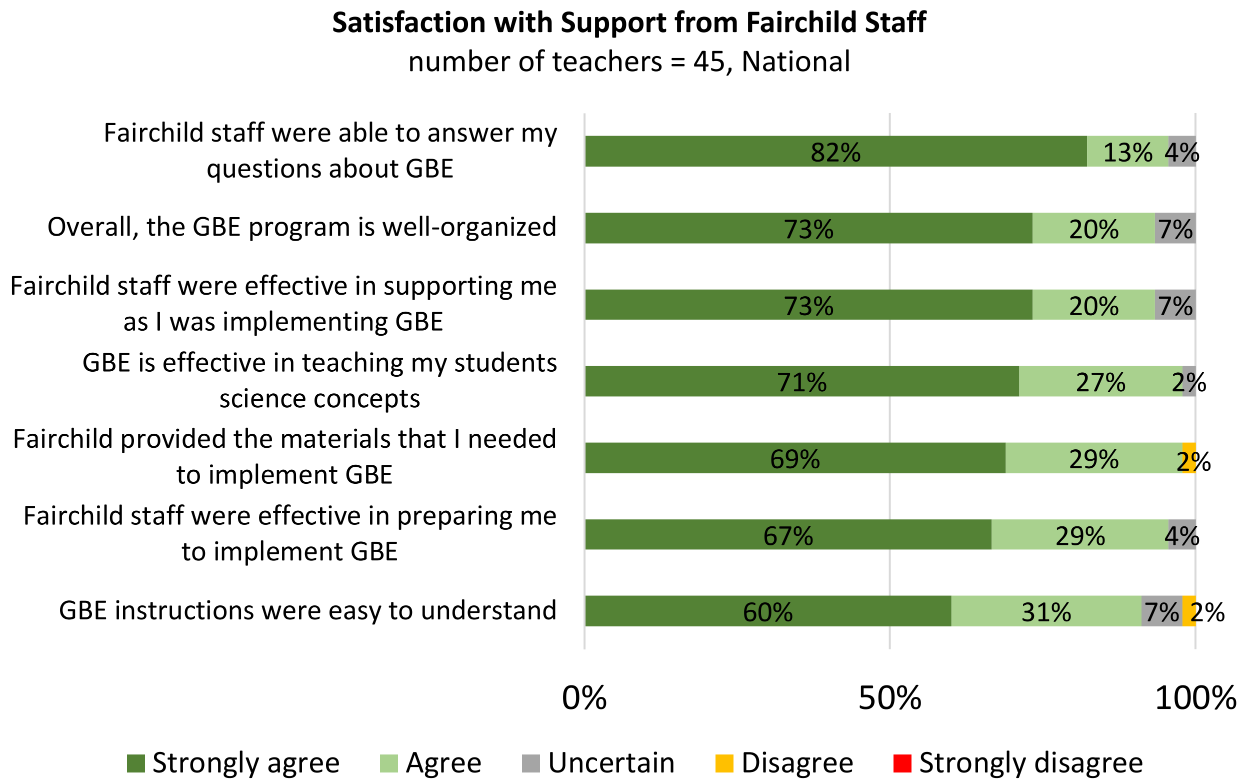
Findings: Project Implementation

Implementation Finding 1: Through a successful expansion to new national sites, Fairchild has demonstrated that GBE is both scalable and replicable at a national level.

During this past school year, Fairchild staff implemented a large scale national expansion—adding 43 new schools in Florida, Puerto Rico, and nine additional states (California, Colorado, Connecticut, Georgia, Michigan, Nebraska, New York, Ohio, and Washington). By all indications this expansion has been a success, providing initial evidence that GBE is both scalable and replicable.

Surveys and interviews with teachers at national expansion sites indicate that Fairchild staff were able to provide the materials, training, and on-going support that teachers beyond Miami-Dade County needed in order to successfully implement GBE in their classrooms. Fairchild staff report that the data received by these new national expansion sites was of similar quality to data received from Miami-Dade sites.

Additionally, according to interviews with NASA staff, from NASA's perspective the national expansion has been a success.



Teachers at the national expansion sites were asked a number of questions regarding their implementation of GBE in an effort to examine any differences in how teachers beyond Miami-Dade integrate GBE into their classrooms. <u>Overall, as in Miami-Dade there was wide variation in how teachers at the new sites integrated the GBE protocols into their instructional activities.</u>

Similar to Miami-Dade teachers, most teachers at national sites:

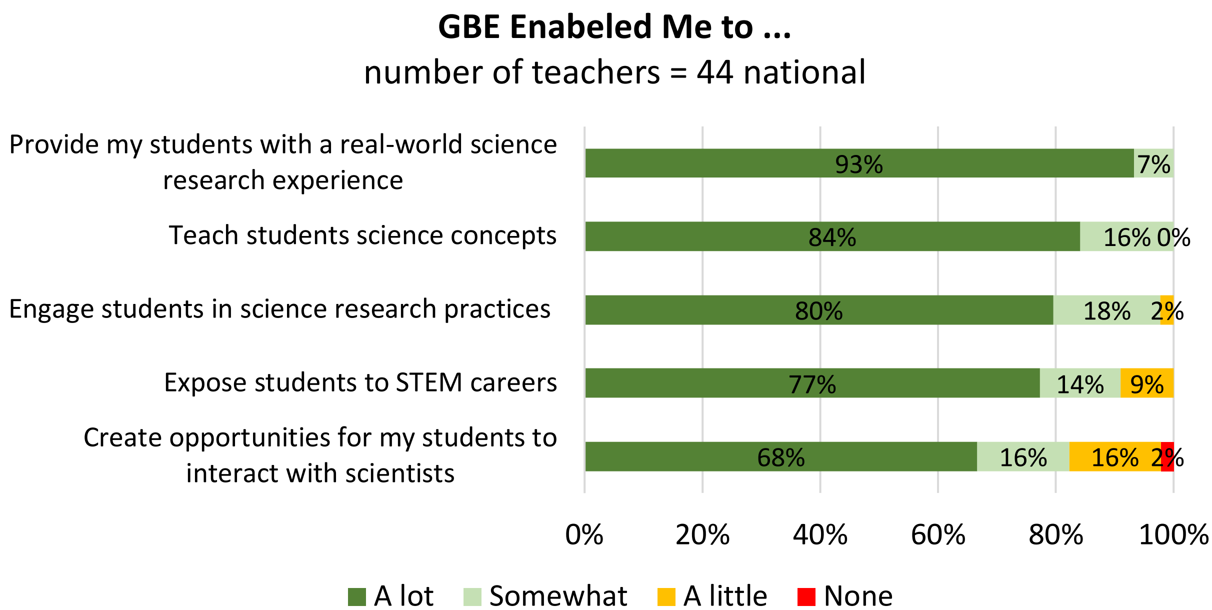
- Incorporated GBE into their classroom activities at least occasionally
- Had some students who spent more time on GBE activities than other students

Minor differences were reported in these areas:

- National teachers were slightly more likely to implement GBE outside of scheduled class time.
- National teachers were less likely to include GBE as a component of students' grades.
- National teachers were less likely to require students to participate in GBE.

Through GBE participation, national teachers were able to enhance their instructional practices. Consistent with prior years' results from Miami-Dade teachers, engaging students in real-world science research topped the list of instructional enhancements as reported by national teachers (below).

> *"I feel I learned more than my students! It was a fantastic experience and I have some ideas I am considering as preliminary lessons before we start GBE in the fall."*



Implementation Finding 2: Participation numbers grew as GBE continued to engage a diverse group of students and teachers in Miami-Dade County and beyond.

Fairchild undertook a significant expansion of the number of teachers and students engaged in this research. In total, throughout this past school year, an estimated 8,900 middle and high school students in 160 schools conducted research under the guidance of 184 trained teachers.

Teacher Participation and Characteristics

- 184 teachers participated in 2018-2019—the third year of GBE. The number of teachers has increased each year—from 135 last year and 110 in year one.

- A total of 160 schools participated—85 middle schools, 69 high schools, and 6 combined middle and high schools. The number of schools has increased from 117 last year and 97 in year one.
- This year, 57 schools from outside of Miami-Dade County participated. Last year 18 schools outside of Miami-Dade County participated.
- Teacher Academic Subject Areas: In 2018-2019, afterschool programming and Environmental Science courses were most frequently associated with GBE participation. In prior years, General and Biological Sciences courses were most frequently associated with GBE.
- Teacher Grade Levels: Middle school teachers continued to account for a slight majority of participating teachers (53% middle, 43% high, and 4% who teach both). However the percentage of high school teachers is increasing.
- School Type: The majority of participating schools continued to be public schools: 70% public, 18% private, and 12% charter.
- Teacher Background: 58% of participating teachers hold an advanced degree and 66% have been teaching 10 or more years.
- Teacher Demographics (estimates)[2]: More than 77% of participating teachers are female. Ethnic/racial background varied widely by region.
- 72% of this year's Miami-Dade GBE teachers participated in GBE in prior years.

Student Participation and Characteristics

- Based on teacher reporting, more than 8,900 students actively participated in GBE during the 2018-2019 school year. Of those an estimated 55% were middle school students and approximately 60% were from Miami-Dade County.
- An average of 48 students participated per teacher—with a minimum of 3 and a maximum of 200. This is a slight increase from prior years.
- Student demographics (estimates)[3]
  - Equal number of female and male students
  - Ethnic/racial background varied widely by region. With a high percentage of Hispanic students in Miami-Dade and a high percentage of White, non-Hispanic students at reporting national sites.

[2] Demographic data not collected for Puerto Rico and West Palm Beach teachers, as per participant request.
[3] Demographic data not collected for Puerto Rico and West Palm Beach students, as per participant request.

- 51% of participating schools have more than 80% of students eligible for free or reduced lunch (FRL). Most schools in Miami and Puerto Rico are between 80% and 100% FRL. The other schools nationwide are somewhat evenly distributed.

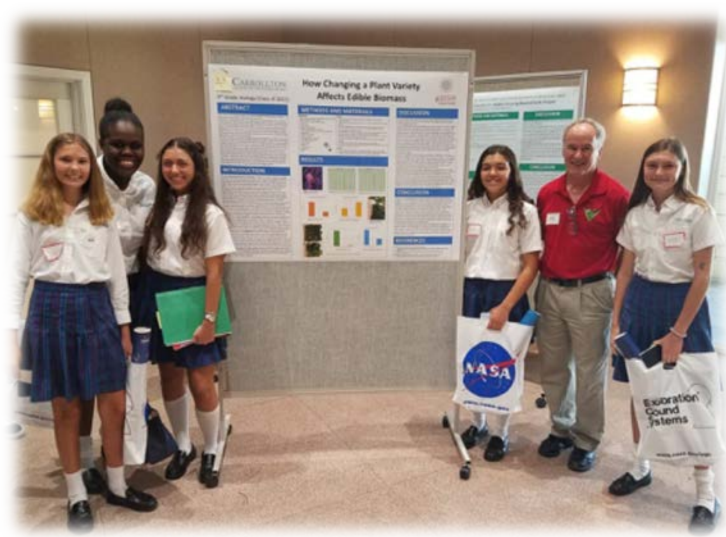
Implementation Finding 3: Growing Beyond Earth continued to expand and enhance its unique design.

During this third year of full scale implementation, Fairchild added several new components to GBE including:

- National expansion: Addition of new schools throughout the United States, seven of which also participated in the student symposium held at Fairchild.
- Enhanced teacher training: Addition of a face-face teacher training in Puerto Rico and web-based training for more distant national sites.
- Increased interaction with scientists: Via the monthly Chat with Scientists webinars students and teachers could directly ask questions of NASA scientists regarding plant research, trouble-shoot research problems, interact with other sites, etc. These appear to be very well-received although not all teachers who wanted to participate were able (see recommendations).

In addition to these new project components, evaluation data indicate that:

- GBE teachers are increasingly adding enhancements and extensions to their GBE activities such as statistical analyses, creation of school gardens, and using robotics kits to prototype space gardens, to name a few examples.
- Teachers are also integrating GBE with cooperative, interdisciplinary, and project-based learning approaches.
- There is consensus from teachers and NASA staff that the prior additions of a student-designed Trial 2, research poster development, and expanded student research symposia are the “icing on the cake” that greatly enhance students’ development of science practices. These additions further increase the authenticity of the students’ experience since they replicate real-world professional settings. Teachers report that since all posters are on the same research topic this enables students to meaningfully interact with each other on a shared topic. And finally, the multiple trial design aligns with scientific practices and stimulates students’ questions, curiosity, critical thinking.



Last year's evaluation identified two additional unique aspects of GBE:

1) The adaptability of GBE to a wide variety of instructional settings.
2) The ability to engage a large number of students in authentic research.

Building on prior years' evaluation data, a third unique aspect of GBE can be added: a seemingly unique combination of project design components that elicit a high level of enthusiasm and engagement from students and teachers.

> *"GBE is so powerful. I have never seen students so attached and excited."*

Analysis of interview data point to three potential elements driving this engagement.

1) Students are engaged in authentic research. They are citizen scientists doing real research with real lab equipment, interacting with scientists, and producing data that is feeding into research that the students and teachers feel is important.

2) Plants can be engaging research subjects. One NASA scientist has observed that visitors to Kennedy Space Center report that the Plant Research Unit is often the favorite part of a visit—"there is something about growing plants in space that captivates people." Additionally, with optimized light conditions, GBE plants tend to grow very quickly providing constant change for students to observe. Students often become attached to "their plants"—sometimes naming them and worrying over their condition. While school gardens are popular, GBE may be more engaging because the grow chamber is attention grabbing, plants grow quickly, and NASA uses the data.

3) GBE addresses several of adolescents' critical developmental needs[4] as was discussed briefly in last year's evaluation report. These can be a strong driver of behavior. Developmental needs most relevant to GBE include:

[4] The Search Institute has developed a Developmental Assets Framework that identifies 40 positive supports and strengths (grouped into eight categories) that young people need to succeed.

- Empowerment ("Young people need to feel valued and valuable"[4])

  "This is huge for middle schoolers … to actually be contributing to something important."

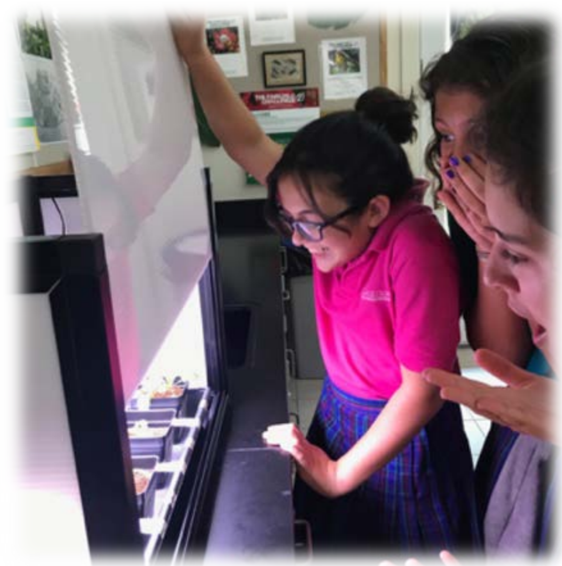
  "GBE empowers our youth to be a part of something significant and helps encourage them to do their best."

  "It meant the world to my students when one of the NASA scientists tagged and responded to the students' tweet"

- Positive Values ("Young people need to develop strong guiding values or principles to help them make healthy life choices"[4] such as caring and responsibility)

  "Growing plants elicits a sense of responsibility and accountability."

  "My students were very excited to participate in such vitally relevant research and were extra conscientious about everything they did to get their part done correctly."



- Positive Identity ("Young people need to believe in their own self-worth and to feel that they have control over the things that happen to them"[4] such as having a sense of purpose)

  "My students took pride in being selected to support NASA research."

Implementation Finding 4: Teacher satisfaction levels with GBE remain high.

Overall, the majority of teachers (84%) were *very satisfied* with GBE, with most of the remaining teachers reporting that they were *somewhat satisfied*. Each year teacher satisfaction levels with GBE have grown—beginning with 63% reporting being *very satisfied* in year one.

Additionally, as in prior years' evaluation reports, a strong majority of teachers reported that they are *very likely* to participate in GBE next year (86%) and would recommend GBE to a colleague (92%). Both of these are additional indicators of satisfaction levels.

Among participating Miami-Dade teachers, 84% reported that they are *very likely* to submit an entry to next year's Fairchild Challenge, with most of the remaining teachers reporting they were *somewhat likely* to submit.

During interviews NASA staff consistently reported that GBE is exceeding their expectations and that Fairchild is a good partner and responsive to NASA's needs.

Recommendations and Conclusion

Recommendations

A number of recommendations for refining the project design and implementation emerged from this year's evaluation and are listed below for consideration by Fairchild staff. Given that Fairchild staff are soliciting feedback from teachers on an ongoing basis, some these recommendations are already being implemented.

Recommendations provided by teachers, NASA, students and the evaluator represent opportunities for continual quality improvement and enhancement. Several themes emerged from the analysis of recommendations and are presented below. More details regarding many of these recommendations can be found in the Appendices.

a. Provide additional written and video guidance for research protocols, trouble-shooting, participation requirements, and timeline. Teachers at the national expansion sites were more likely to make this recommendation. Respondents indicated that Fairchild staff were helpful in assisting where needed.
b. A few teachers from Puerto Rico requested language translations of protocols.
c. Increase accessibility of the Chat with Scientists webinars. Due to time zone and school schedule differences some teachers reported they were not able to participate. Consider recording the webinars and offering them at different times.
d. Address technology challenges experienced with Chat with Scientists including technological glitches and teachers who could not use the technology.
e. Some teachers requested changes in deadlines and timelines to accommodate their particular class, school, or district schedule. With sites throughout the US, these requests may be difficult to accommodate.
f. There is a learning curve to doing GBE. Teachers new to GBE should start small – one class or small group of students
g. Provide additional plants and/or growing chambers so that more students per participating teacher can be actively engaged in all aspects of the research protocol and project activities. The reduction in the number of plants makes it more challenging to engage students with hands-on experiences if a teacher is working with many students (low plant/student ratio).
h. Provide additional materials kits for additional teachers per school.
i. Facilitate ways in which teachers and students at national expansion sites can collaborate with others since they cannot participate in GBE events held at Fairchild. For example, a number of teachers expressed interest in having contact information for other teachers in their area/state as well as conducting regional symposia or poster sessions (face-face or virtual).

j. Increase teachers' ability to incorporate additional data analysis and statistical analysis into GBE activities. A number of teachers expressed interest in having other schools' data sets for comparison as well as for guidance on incorporating more sophisticated statistical analysis. Teachers felt they either did not have ideas on what additional analyses they might conduct and/or that they did not have sufficient background in statistics.
k. Improve quality of tweets providing examples of good and "bad" tweets.
l. Doublecheck materials kits particularly for teachers outside of Miami-Dade County. A small number of teachers noted that their kit arrived with missing or damaged parts.
m. Explore ways to facilitate additional support for schools (e.g., volunteers) that are working in particularly challenging environments.
n. Project sustainability: Consider implementing a fee-based model if necessary. Schools could obtain mini-grants from various funding sources to pay to participate in GBE.

Given the demands on Fairchild staff consider engaging veteran GBE teachers in assisting Fairchild staff to implement some of these recommendations (e.g., creating additional "how-to" and troubleshooting videos, arranging regional symposia, etc.).

Conclusion

In closing, the year's evaluation provides evidence that this third year of implementation and expansion went smoothly and that desired project outcomes are being achieved. As demonstrated by the evaluation findings presented in this report, Growing Beyond Earth appears to be well run, participants are engaged and satisfied, and the project is generating evidence of positive outcomes for both students and NASA. Wide variations in implementation at the classroom level and limitations of the evaluation design preclude more detailed assessment or quantification of student outcomes. A more rigorous evaluation design entailing establishment of comparison groups would enable further assessment of student-level outcomes.