

## Environmental Education in Botanic Gardens: Exploring Brooklyn Botanic Garden's Project Green Reach

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**ABSTRACT:** Brooklyn Botanic Garden's Project Green Reach (PGR) is a children's program that has offered garden-based youth education since 1990. PGR focuses on Grade K–8 students and teachers from local Title I schools who work in teams on garden and science projects. In this exploratory study, the authors used field observations, document analysis, and past participant interviews to investigate PGR's program, model informal science education, and document the influence of the program on urban youth. In all, 7 themes emerged: (a) participants' challenging home and school environments, (b) changes in academic and interdisciplinary skills, (c) changes in science and gardening skills, (d) increased environmental awareness, (e) social and personal growth, (f) a positive life experience, and (g) the cultural significance of the program.

**KEYWORDS:** botanic gardens, informal education, positive life experience, urban environmental education, youth gardening

**W**ith an increasing number of children's gardens and youth gardening programs being offered at schools, nature centers, public gardens, and other related institutions throughout the world, more children now have opportunities to be engaged in informal learning experiences about the environment, nature, and science (Finch, 1995). Researchers have found that non-White students from financially unstable backgrounds who are not regularly exposed to open green spaces and rural areas positively benefit from hands-on gardening activities (Bradley, Waliczek, & Zajicek, 1997; Catsambis, 1995; Tanner, 1980; Waliczek & Zajicek, 1999). Such students benefit not only educationally but also psychologically and socially from opportunities to contribute to the aesthetics of their surroundings, mentor peers, work together in groups, develop

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respect for others and property, and feel a sense of belong to a community (Finch; Pentz & Straus, 1998). However, despite these benefits of gardening activities, many youths are unable to participate in such programs. Some barriers to participation include the expense of the programs, lack of family support, poor health, poor personal skills, and other social and personal problems (Hobbs, 1999).

Most students first learn about plants and the environment through school-related activities. According to Skelly and Zajicek (1998), "This is important because many researchers believe that schools are the instruments to teach environmental education" (p. 582). However, many teachers feel uncomfortable or inadequately skilled in teaching environmental concepts to their students (DeMarco, Relf, & McDaniel, 1999). Public gardens and other environmental education programs can provide support for teachers both in and out of the classroom, and these institutions have a responsibility to serve their communities in such a manner (DeMarco et al., 1999; Hobbs, 1999; Waliczek & Zajicek, 1999).

In 1914, Brooklyn Botanic Garden (BBG) established a teaching garden for youth in New York City. The main goal was to provide practical skills and life lessons through hands-on gardening experiences. It was the first program of its kind in the world at a public garden. Ninety years later, the BBG Children's Garden and its Children's Gardening Program (CGP) serve as prototypes that many other programs around the world have emulated (Stone, 1984).

One component of BBG's youth education program is Project Green Reach (PGR). BBG and Brooklyn's Title I schools have partnered through PGR since 1990 to provide unique hands-on outdoor activities for urban students and teachers (Parker & Wodzinski, 2000; Sutter, 1990). Title I schools are those with a high percentage of children who live in impoverished areas and who are on free or reduced lunch programs. These schools are considered to be at risk of failing to meet the performance standards of state and federal agencies. PGR is a specially funded academic-year program for Title I students in Grades K–8 as well as a summer program for selected older students who have participated during the previous year. The program, also referred to as Junior Botanist Summer Adventures, is specifically designed to eliminate barriers such as funding and transportation, which typically prevent targeted students from participating.

PGR uses hands-on, inquiry-based learning to promote science education and environmental awareness among students who come from challenging home and school environments. Science educators have long recommended inquiry as an approach to instruction. According to the Directorate for Education and Human Resources, Division of Elementary, Secondary, and Informal Education, National Science Foundation (2000), "Inquiry is an approach to learning that involves a process of exploring the natural or material world, and that leads to asking questions, making discoveries, and rigorously testing those discoveries in the search for new understanding" (p. 2). By directly experiencing objects (e.g., garden plants) and phenomena (e.g., growth) through an inquiry approach, children's engagement in learning is enhanced, and they are prompted to ask questions and discuss their experiences with others. This is characteristic of learning from a constructivist perspective (Bentley, Ebert, & Ebert, 2007).

### **Problem Statement**

Over the years, mounting anecdotal evidence has indicated that PGR graduates show improved confidence and academic skills, but there remains a question as to the program's long-term influence on the students (PGR coordinator, personal communication, August 6, 2003). Many previous research studies on youth gardening have focused on the effects of school gardening activities (DeMarco et al., 1999; Phibbs & Relf, 2005; Skelly & Zajicek, 1998; Waliczek & Zajicek, 1999). Other studies have documented the health benefits of gardening, including improved nutrition (Lineberger & Zajicek, 2000; Poston, Shoemaker, & Dzewaltowski, 2005). Still others have exam-

ined the outcomes of hands-on environmental education activities. However, much of the work has been based on anecdotal evidence rather than empirical research, and few researchers have examined the long-term effects of hands-on gardening-related activities, from youth to adulthood, and the role of public gardens in providing plant-based education (Phibbs & Relf).

We undertook the present exploratory study for several reasons: to investigate the long-term influence of a hands-on gardening program on urban youth; to document the PGR program as a model for informal science and plant-based education; and to add to the qualitative research literature and general understanding of the phenomenon of children's gardening, in particular, and of public horticulture, in general. We selected the children's gardening program at BBG for the present study because it has served as a model for children's programs at public gardens around the world. Also, the program demonstrates how special populations, such as inner city youth, can be served through informal education in their own communities.

## Method

We selected a qualitative approach "to allow for the collection of detailed descriptive data" (Hamilton & DeMarrais, 2001, p. 212). The study involved nonparticipatory observing in the field, collecting and analyzing program documents and records, and interviewing alumni and current and former staff members.

We conducted the study within a social constructivist educational framework. The data we collected were representative of a small group of people who individually had their own understandings of the PGR program and their personal experiences in it.

From a constructivist perspective, the "researcher and subject co-create understandings" (Hatch, 2002, p. 13) about a phenomenon or experience: "What is to be known is an entirely human construction as we travel through life making meaning of our experiences" (Blandford, 2002, pp. 16–17). Thus, researchers and study participants cocreated a general understanding of the PGR program on the basis of individuals' experiences. In the case study research tradition, the goal is to examine and describe a phenomenon within a bounded system (Hatch). As described by Stake (2000), the case itself is not as important as the case in and of itself in contributing an instrumental insight and understanding about the phenomenon in the larger context (Welch, 2002–2003). Therefore, specific generalizations, or applied theories, about the case outside of that system cannot be derived from a case study, although assumptions can be supported. The bounded system in the present study was BBG; the case was the PGR Summer Program, how inner city youth experienced gardening activities, and what influences, if any, this had on the development of their belief systems, motivations for environmental action, and general views toward the environment into adulthood. The motivations for selecting the tradition of the case study involved a naturalistic, interpretive approach to inquiry.

An important element in a case study is the added benefit of triangulation of methods. According to Flick (1998),

The use of multiple methods, or triangulation, reflects an attempt to secure an in-depth understanding of the phenomenon in question. Objective reality can never be captured. We can know a thing only through its representations. Triangulation is not a tool or a strategy of validation, but an alternative to validation. (p. 230)

The use of three data collection methods (i.e., document review, interview, and observation) is referred to as *triangulation*. Through various methods of data collecting in triangulation, researchers

help improve the study's credibility by reducing the potential biases of any one form of data collection method (Glesne, 1999). This also helps to justify the use of qualitative research as a good candidate for obtaining detailed information about and rich descriptions of the PGR program. One critical element of the PGR case study offers a vivid description of the program's organization enriched through the use of data that are collected using interviews, document collection and review, and observations with descriptive notes and personal reflective notes. A case study uses triangulation to provide dimension to the story. In the present study, our use of observational and interview data with document analysis was not for the direct purpose of collecting data for this study, but rather for enhancing our understanding of what the actual alumni participants might be talking about. Thus, triangulation was not the basis of the data but a means of enhancing our understanding of it.

The two aspects of PGR include academic year and summer programs. The school-year component serves children in Grades K–8, and sessions are conducted in the schools and at BBG. The Junior Botanist Summer Adventures, the focus of the present study, takes place at BBG over a 6-week period and involves a selected group of fourth-through eighth-grade student who have graduated from the academic year program.

Observation allows the researcher to see things that are taken for granted by participants and would be less likely to come to the surface in interviews or other data collection techniques. It also allows the researcher to get closer to social phenomena and add his or her own experience in the setting to the analysis of what is happening (Hatch, 2002–2003). When used in combination with other data collection methods, such as interviews and document analysis, observation can contribute to a richer understanding of participants' realities. Field observations at BBG for this study were conducted over the course of 3 days during the 4th week of the 6-week PGR program. Two 6.5-hr observation periods took place on the 1st and 3rd days. In addition, the first author interviewed PGR staff about the program and collected program documents and records for further review. We selected the 4th week of the 6-week program to allow participants the opportunity to develop relationships with other participants and instructors, familiarize themselves with the program and related activities, gain experience, and demonstrate some notable behavioral reaction to the program. The first author recorded on-site observations of the activities and interactions of participants and instructors in a journal and took further notes on the day's events, activities, and personal reflections at the end of each day. For these nonparticipatory observations, the first author had minimal interaction with participants or instructors during program activities.

### **Document Collection and Analysis**

The collection of unobtrusive data, such as artifacts, photographs, paper documents, personal communications, and records has been an important research method. According to Hatch (2002), "Unobtrusive data are nonreactive. They can tell their own story independent of the interpretations of participants, and they can be gathered without disturbing the natural flow of human activity" (p. 119). This type of data is useful in weaving together an understanding of the participants' experiences by providing "alternative insights" without interfering in the course of participants' activities because the presence of a researcher may have an effect (Hatch; Hodder, 2000).

The first author collected and analyzed past documents, records, and photographs, including notes of planning meetings, annual reports, articles and publications about the program, photographs, classroom activity sheets, student work, and various objects and documents relating to the history and activities of PGR. The researcher catalogued each document or object for record, assessed them for authenticity, and photocopied a selection of documents for further review.

## Interviews

In qualitative research, interviews can be used in combination with observation and document analysis to reconstruct events and experiences that were not observed, providing a benefit through the triangulation of method. Interview data help “reveal the meanings and significance of artifacts collected in the field” (Hatch, 2002, p. 91) and help researchers reach a deeper understanding of the participants’ experiences through a descriptive account (Hatch; Lincoln & Guba, 1985).

The PGR coordinator and summer program interns were interviewed informally during the observation period to gather additional information about the program’s history, organization, and perceived significance to the youth, community, and to BBG. Also, during the observation period, we acquired an informal contact list of PGR summer program alumni because no official alumni records database was available. This list was compiled from bus lists, address labels, and other pieces of paper that included alumni names, their parents’ names, addresses, phone numbers, and, in some cases, their schools and teachers.

We examined the long-term effects of the program on the targeted population of alumni who were selected as fourth- through eighth-grade students to participate in the PGR Summer Program at BBG over its 15-year history. Therefore, the formal interview participants were 4 alumni and 1 former staff member of the PGR Summer Program. We interviewed those people who were contacted following a determination that they were qualified to participate in the study and consented to do so.

We preferred to interview former participants who, at the time of the study, were older than 18 years of age and who either were involved with or attended the summer program in the early 1990s, as opposed to more recent staff or graduates. We assumed that the more experienced staff person and older interviewees would be better able to speak about the long-term effects of this program.

However, because of the transient nature of alumni of this particular program and BBG’s inconsistent records of alumni, it was challenging to locate and contact potential interviewees. In addition, an average of 12–15 students had participated each year since 1990, further limiting the number of potential interviewees. For these reasons, instead of making a purposeful and balanced selection of participants representing different genders, age groups, participation years, and other similar characteristics, we attempted to make contact with every graduate from program years 1990–1996 (except for 1995 during which no contact information was available). Thus, the formal interviewees included 4 alumni and 1 former staff member.<sup>1</sup> Descriptive characteristics of the 5 interview participants are presented in Table 1. Although a purposeful selection of interview participants was not possible, we determined that the information gathered from the 5 individuals set a sufficient example to begin to represent alumni participants’ experiences. This is the first study of the PGR Summer Program, exploring the meaning of PGR for its alumni participants.

We developed an interview guide as a tool to guide the researcher in coaxing participants in recalling their experiences of the summer program (see Appendixes A and B). We also constructed the guide by following the on-site observations and consulting earlier research about the BBG CGP (Blandford, 2002; Tims, 2003). The first author conducted the interviews that were semistructured. The researcher asked open-ended questions to provide a more flexible, natural flow of conversation. Interviewees were given prompts to encourage them to elaborate on their own. Each telephone interview was audiotaped for transcription and lasted approximately 1 hr. We assigned pseudonyms to interviewees to help them maintain anonymity.

## Data Analysis and Results

Data for this case study included detailed descriptions of the program’s organization from program documents, interview data, observations with descriptive notes, and personal reflective

**TABLE 1. Characteristics of Participants in Study of Project Green Reach (PGR)**

Name	Gender	Current age	Cultural background	Year of participation	Age at year of participation	Education
Sasha <sup>a</sup>	Female	24	South American	1990	9	Currently attending college
Deborah	Female	24	African American	1990	9	Bachelor's degree
Richard <sup>a</sup>	Male	22	Caribbean American	1991	9	Bachelor's degree
Mary <sup>b</sup>	Female	22	Haitian American	1993	10	Bachelor's degree
Sally	Female	—	Former PGR instructor	1989–2000	—	Bachelor's degree

<sup>a</sup>First-generation child within family unit; parents nonnative to United States.

<sup>b</sup>Born in another country.

notes. We began data analysis soon after data collection, and we reviewed notes on all documents, records, photographs and copies of materials made during the observational period, as well as the researcher's notes and reflections made during observations. We read through the transcribed interviews and researcher notes to identify possible themes from the data. Upon reevaluating the observation notes, documents, and written personal reflections, we reread the interview transcripts, during which we color-coded topics and themes that frequently appeared in the data to help sort through the data (Hamilton & DeMarrais, 2001). We carefully compared these results with the observations and document analysis. From this triangulation, seven themes or commonalities emerged relating to the experiences of participants in PGR: (a) the challenging home and school environments of participants, (b) development of academic and interdisciplinary skills, (c) increasing understanding of science and development of gardening skills, (d) increasing environmental awareness increased, (e) social and personal growth, (f) sense of positive life experience, and (g) cultural significance of the program.

## Discussion

### Theme 1: Challenging Home and School Environments

PGR Summer Program participants come from challenging home and school environments. In their interviews, alumni described growing up in housing projects or having several friends who lived in the projects. Participants described living in neighborhoods or going to public schools in which there was drug use and violence. Deborah said that several of her classmates cut classes and did not go to school on a regular basis. When asked to describe the community in which she grew up, Participant Mary said the following:

It was a poor neighborhood. It was very homogenous, African Americans, mostly Caribbean Americans. There was a lot of noise. . . . I remember a lot of noise. I was very protected because I came from school to home, and my parents didn't let me walk around the neighborhood much. . . . There was a lot of drug use, and there was a lot of...little dime bags [bags in which drugs are sold on the street] around and things like that. . . . I thought the dime bags were . . . cute. [They were] something different for my dolls.

Mary and Deborah lived in multifamily homes; Mary lived in a two-bedroom apartment with her parents, two brothers, and cousins before moving into a three-bedroom apartment in a housing project. Richard, who also participated as a youth, grew up in a single-parent home with his mother and sister; he indicated that when he was a child, he did not spend much time with his father.

Often the children who participate in PGR do not have the financial ability to participate in gardening programs. Richard described wanting to participate in a community garden project directly across the street from where he lived. He felt skilled enough to work in the garden because of his PGR experience, but his family could not afford for him to participate.

Documents, such as a handwritten note from a PGR instructor, described concerns about particular children who participated in the program. In one case, an instructor had noticed a "thing on her head," which was found to be a sore that had developed from an unhygienic accumulation of dandruff. The child reported having "severe, debilitating neck pain" as a result of aggressive wrestling with her brothers when the parents left them at home. In addition, she reported having to sleep on comforters on the floor because her brothers broke their bunk bed by jumping on it. Notes described children's reports of not having had anything to eat for breakfast, as well as troubled financial and health issues at different children's homes.

During the on-site observations, most of the children appeared active and friendly, but there was one girl, a foster child, who kept to herself and was very quiet. Sometimes she followed her partner around the garden, but she mostly stayed alone, working intently on her projects. She clung to two female interns at times and appeared to smile most when interacting with them.

An applicant's home situation is a significant factor in selecting participants for the program. The PGR program pamphlet describes how selected participants "must be from financially disadvantaged homes." In addition, participants must also attend a Title I school. BBG provides free transportation to and from the Garden, which ensures that children who live at a distance are able to participate.

Although it is clear that this special population was selected, in part, because of their economic situation, the identification of this theme is relevant in describing the entire experience of the participants in PGR as it relates to their school and home life. Understanding their school and home life provides insight into how much more potentially meaningful participation in PGR may have been for each individual participant. This theme also helps to more vividly describe and document the population that PGR serves.

These examples illustrate how BBG reaches out to inner city children, a typically underserved population in its community. There have been no documented cases found in the review of the literature about a public garden having a hands-on, plant-based educational program directly focused on serving inner city youth. Much of the research and anecdotal evidence on plant-based programs for a special population such as inner city youth has examined outdoor programs for juvenile delinquents or school-based programs for inner city students (Finch, 1995; Rahm, 2002; Rahm & Grimes, 2005; Snell, 2003).

## **Theme 2: Academic and Interdisciplinary Skills**

Participants developed science and reasoning skills through participating in plant-based education, and they developed skills related to writing, public speaking, geography, art, and cooking. During on-site observations, we viewed the Plant Investigator Poetry Café, an exhibition of student work in acrostic poetry and haiku, and we noted pickles and jams that participants had made from harvested fruits and vegetables.

PGR activity sheets and student work on family trees encouraged students to celebrate their family heritage and history and learn the geography of their family's country of origin. Participants collaborated with their parents to write about their family homeland, the plants that grow there, and a family recipe. Student work included songs, art, and journal entries. Photographs showed children writing in journals and working on arts and crafts projects with plant materials.

Each participant described working in the greenhouse as a favorite memory. Deborah recounted memorizing plants through a quiz game:

I know they had an area with nothing but glass around it. . . . They would take us in there, and they would ask us basically what type of plant...and describe it to us. . . . Sometimes they would ask us before we leave . . . "Do you remember what this was?" . . . Like a little game, and I think the person who remembered, . . . they gave us a little prize . . . so it was fun because we were trying to get the prizes. We were trying to remember "What was this? Do you all remember?" . . . So we were trying to help each other out. . . . I thought that was fun because we get something free. I said, "Okay, I try to remember as much as I can," but I can't remember everything. . . . We felt kind of bad because a person would get the stuff, and . . . we didn't get [any]thing. One day we didn't get anything, and we felt bad because we couldn't remember [any]thing. So . . . we had to be very attentive when they talked, you know be aware. I said, "Could we write something down so we could remember?" I know we couldn't write anything because they wanted us to use our

heads and really remember a lot of things. . . . We just had to try to remember . . . because there was so many things there, and for us to remember, [it made] my head [hurt].

Deborah also recounted her experience of journal writing and public speaking in PGR and how she drew upon her experiences when she was in college:

Actually, it had to help me . . . because after I took . . . speech in college, . . . I didn't realize by me speaking from these journals that it was actually going to help me along in college. . . . I mean it was nerve racking, because you're standing there and you're speaking in front of [a group of people]. And it's just nerve racking. And . . . we had to speak loud. We had to pronounce and see who was paying attention because you can tell who was not paying attention, who was making googly faces at you, trying to make you laugh. Some people would try anything to try to get us to laugh. . . . [The instructors] knew who it was, and they'd tell them to stop, . . . and we tried to be serious about it. But sometimes we all had to laugh about it because it was just too funny. But [this activity] kicked in the nerves for most people because some people [were really] nervous, and they could not speak in front of us. So we tried to find a way to help them out to get them . . . relaxed. . . . And then when I got into college, it was like "Whoa, I got speech." . . . I'd be in a bigger crowd, and the classes were big, older people, bigger people, my professor, and we were getting graded. You see here [at PGR] we [weren't] getting graded.

Richard recalled visiting BBG with his mother to attend various cultural events, including an African music festival. He credited BBG with bringing a love for music into his life and said, "The Garden actually bridged one part of what I wanted to do, one part of my life to another." In PGR, he remembered making musical instruments out of cups and seeds:

It forced us to look outside the box when we were thinking about plants. We didn't just grow them and bring home vegetables and . . . things of that nature. We drew pictures. We spoke about our experiences while we were there. We made instruments.

The use of gardening activities for interdisciplinary learning is not new. Other studies have shown that through gardening activities, children can enhance learning in areas such as art, math, geography, history, writing, and nutrition (DeMarco et al., 1999; Lewis, 2005; Skelly & Zajicek, 1998).

### **Theme 3: Increased Understanding of Science Concepts and Gardening Skills**

PGR participants have several opportunities to evolve into young gardeners and science investigators. An instructor's lesson plans and activity worksheets revealed science and gardening concepts to be covered for a particular lesson. They included garden tools, garden etiquette, plant parts, photosynthesis, and various other botany and garden-related ideas. A handwritten note from a participant's mother expressed gratitude to the staff for her son's involvement and acknowledged the science and gardening skills he had learned:

[My son] really enjoy taking part in the program. He learn and understand (sic) a lots about vegetable, plant, leaves, stem, seeds, fruit, and flower. He came home and share the knowledge with the rest of the family about his day. He gain lots of experience at the garden. He recognize and value the work, it take in harvest an garden. . . . It is a summer we will always remenable [remember].

Instructors make use of several garden areas and facilities, including various research lab facilities and greenhouses. Participants were observed working in the Children's Garden and doing a scavenger

hunt for plants and nature-related objects throughout the garden. The plant investigators went to research facilities across the street from the garden where they dressed in white lab coats, worked on science investigations, and made observations using scientific processes. The children were divided into two groups. One group tested the sensitivity reaction of sensitive plants as they dropped various objects of different weights onto the plants. The second group tested how marigolds reacted to different solutions when watered. Each test used a control. Children took measurements and recorded data. They completed lab reports and presentations by the end of the summer program.

Interviewed participants stated that although they did not garden currently, they felt competent to garden, and they all indicated that they planned to garden in the future. Participants typically demonstrated an aptitude for science prior to their participation in PGR. One criterion for selection to participate in the summer program is “a high interest in science.” PGR cultivates this interest even further. After participating in PGR, Richard, Sasha, and Deborah described participating in several science-related activities in high school. Sasha participated in a local utility program, and Richard and Deborah took lab courses and mentored peers in science classes. Although the other alumni participants did not pursue careers in science, Richard earned a biology degree and aims to have a career in pediatric medicine.

These examples support anecdotal evidence from PGR instructors that children develop science and gardening concepts and skills as a result of participating in PGR, which is consistent with previous research linking learning about science and nature and developing gardening skills to school-based gardening programs (Rahm, 2002; Skelly & Zajicek, 1998; Waliczek, Logan, & Zajicek, 2003). These are also consistent with Blandford (2002) and Tims (2003), who found that children who participated in a public garden’s gardening program learned about science and nature while working with plants and developed gardening skills through “learning by doing” (Blandford, p. 30).

#### **Theme 4: Environmental Awareness and Appreciation**

Direct experience in the garden at BBG contributed to participants’ environmental awareness and appreciation. After describing New York City as “nothing but a concrete jungle,” Richard responded in the following way when asked about the program’s meaning for him:

I enjoyed the program. It did help me grow I believe . . . probably more so with my consciousness and with the things I think about and my appreciation for nature because I do enjoy seeing beautiful plants. . . . I do respect nature. A lot of people just see trees and plants and could care less about what they see. . . . But I do ultimately have a respect for nature. . . . And so . . . it’s changed my consciousness. It has made my consciousness in growing as a person, and I think as a child you need to be exposed to different things. I think you need—I know you need to have different sorts of experiences in your life. And that’s one of those experiences I wouldn’t give back for anything. And I wish that my nephew and niece had the opportunity to do the same exact thing. But they’re not living in New York so . . . I don’t know what kind of programs they have where they live, if any types of programs of that nature are available that are free. . . . It was a wonderful experience for me. And it was very meaningful. And I think back about that experience, . . . I think about it whenever I’m passing by the gardens.

In Mary’s interview, her most memorable experience was the variety of bright colors she saw when visiting BBG on a daily basis. Mary was born in Haiti and lived there for a few years before immigrating with her family. The bright, natural colors at BBG reminded her of her native country and brought positive feelings. She said,

One of the things I remember is the heat of the sun on my back and [being] bent over in my garden. I remember that. . . . That was really great. I remember the colors. [I am] still very affected by the colors. I'm in a better mood when there's a lot of colors around. Not that I knew it back then, but I just knew that I loved [it]. . . . Even on cloudy days, it felt warmer being in the gardens and being outside because [of] a lot of the colors. . . . I'm in a better mood when there are colors around, when there are lots of greens and reds and blues. I remember feeling very healthy. . . . I knew that breathing the air wasn't all that great but breathing the air in Brooklyn Botanical Gardens was a pretty side of Brooklyn, not where I live. . . . I remember forgetting that I was in Brooklyn, and when I stepped out of the garden, I was reminded again. . . . That felt great. . . . Once you're there, you just forget that you're not in some deep forest somewhere because there are a lot of tall buildings. So you can't really see outside. . . . All you see around you are flowers, plants, grass, trees, orchids so you forget. Once I was in the gardens, I was in the garden, and there was nothing else like the outside world with the cars and the building and things like that [because] I couldn't see them. So they weren't there. . . . I don't like gray. . . . New York is...gray, red, and black . . . I remember coming out [of the garden] and . . . seeing the cars, seeing the buildings, seeing a bunch of people. . . . I'd rather not live in such a crowded area.

A 2000 foundation report related that one participant “dreams of becoming a marine biologist . . . [and] relished the opportunity to participate in the Junior Botanist program. At only 12 years old, he had incredible knowledge about the environment and environmental issues, and was constantly asking questions.”

When observing them, we found participants to be aware of their outdoor environment. Children were engaged in pulling weeds, fertilizing their plants, looking at insects, and playing in the soil. They appeared to enjoy harvesting cucumbers from their plots and picking and tasting grapes from a nearby grapevine.

Each of the alumni remembered observing the wildlife at BBG, including the fish and frogs in the Japanese Garden and the flies in the Children's Garden. Richard recalled learning about the use of algae in the ice-cream-making process during a field trip to the BBG Japanese Garden pond. Sasha and Deborah recalled playing and swimming in the water during a beach field trip. Mary described her terrifying experience seeing a snake in the Gardens, but she said she loved playing with ladybugs. These findings are consistent with research showing that gardening experiences at school increased children's positive attitudes toward the environment (Skelly & Zajicek, 1998; Waliczek & Zajicek, 1999).

### **Theme 5: Social Development and Growth**

Social skill development was a significant aspect of learning in PGR. A worksheet described the summer program's first day staff skits on the “3 Rs: Respect, Responsibility, and Reliability.” These skits were followed by a group discussion on the meaning of the terms and how each relates to behavior in the garden and daily life. Through the discussion, participants learned about not only the 3 Rs, but also public speaking and voicing their opinions in front of others.

Deborah recalled a lesson about tending to plants in her garden plot:

[The instructors] were showing us . . . the proper way of putting the plants in the ground. They were showing us each part of the plant, the roots, the stems, the leaves, the petals, and they [were] guiding us, . . . slowly but surely to make sure . . . that we just don't rush it in, that we delicately . . . put it in, that we make sure we water it, we pat it. And . . . they told you [that you] could even talk to the plants, . . . to make [them] our friends. . . . To me, that was hilarious because say me talking to a plant like am I crazy? . . . They said it helped the growth . . . because you treat .

. . . a plant just like . . . any person . . . , and they'll grow up to be beautiful. . . . I guess they feel by us doing that it makes the plant feel good, but to me I [felt] strange about it then. But then as I got older, I understand what they [were] talking about, and I've used that when I'm say watering my plants. I feel that by not watering them, by not taking care of them, when they start to wither away and die, that was going to be on my part that I wasn't there carefully taking care of them, talking to them like I should be. . . . I guess [I] would go around, say hello, . . . introduce [myself], say [my] name, and . . . pat [or] rub the plant. Say 'Hey, it's a beautiful day, out in the bright sun. . . . You're getting ready to blossom. You'll be with your other friends.' And we just had fun with it, just be yourself.

When asked to describe his favorite activity, Richard said,

Just weeding. After I found out that the weeds hurt the garden, I guess I took it very personally, that these weeds would be ruining our plants. So I made sure I took care of them, and I dealt with the weeds. As soon as I saw them, I picked them out.

All alumni said that meeting other children and adults had been important to them. They appreciated the opportunity to make new friends. Mary recounted the PGR instructor who interviewed her. Until that point, Mary had had very little interaction with people outside her family:

We had the interviews . . . in the office, and . . . I was really, really nervous to tell you the truth. Besides my teachers, [she] was one of the first . . . white women that I had really interacted with, so I was really nervous, really, really nervous. And I thought she would never accept me because I was black, but I kept on thinking like I know I could really impress her. . . . I remember sitting across from her. I even remember my posture. . . . I remember the feeling, . . . sheltered, head down, shoulders, . . . and not looking at her in the eye. . . . She would try to make eye contact with me, and it was really difficult to think. . . . I'm really a dark skinned girl. . . . I remember shaking hands, and there being an incredible contrast with seeing my hand in her hand. And, at that time, . . . I remember shaking her hand and . . . [thinking] her hand is so clean and mine is so dirty because I'm just really, really dark skinned.

Participants were observed working with their partners to tend their garden plots. The older children who had more experience in gardening (the plant investigators) and had returned for a second year in the program, mentored the younger children (the junior botanists) who had less experience maintaining their plots and evaluating vegetables for ripeness. During an indoor activity in which the instructors and children were discussing preparations for an upcoming 3-day field trip, one girl started laughing while a fellow classmate was speaking. The instructor stopped the discussion, reprimanded the girl, waited for the noise to settle, and then talked about the importance of being a good listener when others are speaking and showing respect for others. A simple activity on preparations for a field trip turned into a lesson on respect and listening to others.

On an evaluation form, one instructor described the value of having a small student–teacher ratio:

The fact that the ratio of students to teachers was 4 to 1 enabled us as teachers to provide effective oversight and provided us with an acute understanding of the personality types which existed in each group. The idea of three distinct groups promoted a closer bond between group members and the staff member working with their particular group. This system of separating the students into groups worked well and produced many positive results, for example, the need for team work and strengthened interpersonal relationships.

These findings are consistent with previous studies showing that learning about plants can be related to life lessons about interacting with others, building self-esteem, and respecting others. By experiencing how their actions affect other living things such as plants, children learn valuable life lessons and grow as social beings (Finch, 1995; Pentz & Straus, 1998; Waliczek, Bradley, & Zajicek, 2001).

### **Theme 6: Positive Life Experience**

PGR provides a positive life experience for participants. Typed notes from a PGR staff member after a junior botanist reunion in 1993 described a mother's account of PGR's positive effect on her daughter's life:

Mother said the Junior Botanist Summer Adventures turned around her daughter's life; she now loves science; whereas she had been doing very poorly in science (40s) she now is top in her class, takes care of the principal's plants and helps the teacher with plant information; she loves science.

In the garden, participants were observed picking the vegetables they had grown in their plots and displaying their produce to each other and their instructors. One male participant brought a cucumber he had harvested to the first author and insisted on posing for a photograph, smiling and proudly holding up the fruit of his labor.

This overall positive experience remained with the alumni to adulthood. All of the participants we interviewed described PGR with enthusiasm, using terms like *fun*, *productive*, *meaningful*, or *a great experience*, despite their having been hot outside, having to get dirty and sweaty, and doing hard work. They enjoyed harvesting produce to take home and share with their families. They recalled proudly showing their garden plots and artwork to their parents at graduation day. Deborah remembered the surprise she experienced at receiving her certificate and being excited and proud that her mother was there.

Each alumni indicated that he or she would recommend the program, and Sasha has already recommended PGR to others in her community. They also said that when they have children, they would take them to BBG. Deborah, already a parent, said that she would take her daughter to the garden so that she could have some of the same experiences she herself had had as a child. Though not yet a parent, Richard described bringing his nephew, niece, and family to BBG to show them the garden area where he had worked.

Mary addressed her protected upbringing. She said that her participation in PGR was a highlight of her childhood. She described her experience as follows:

It was different from any other summer that I had because even up until I moved to college, summer was pretty much spent inside. That was where I would be. I never did anything else but stay inside. So I know that getting up every morning to go somewhere was really exciting. . . . It was one of the only summers that I didn't spend the day at home watching TV. I remember feeling really colorful, and I remember being really happy. I remember being in the sun a lot, so I guess it just meant to me being really happy being in nature.

Former staff member Sally described a discussion with the mother of a boy who had participated in PGR. The mother thanked Sally for the program and said, "It was this program that had kept [my] son off the streets and out of the black jackets and out of the expensive cars [I think] that drugs would have brought to him." Sally also described other parents' comments:

There were numbers of parents that told us that they could see such a difference in their children, the way they were able to get along with the people after the summer, because they had been taught honesty. They had been taught . . . how to get along, learning how to understand people, learning how to use other people's things and not keep them but give them back. They felt they had received many lessons that are very difficult to teach in a regular public school system, and they felt that was very good for their children in learning to get along at home and learning to get along in the workplace.

This result is consistent with other studies that have shown that children from urban and at-risk environments respond positively to gardening activities (Blandford, 2002; Finch, 1995; Pentz & Straus, 1998; Rahm, 2002; Tims, 2003).

### **Theme 7: Culturally Significant to the Participants' Community**

BBG became culturally significant in the participants' lives, primarily as a result of their involvement with PGR. The cultural diversity of the participants reflected the diversity of the Brooklyn community. On one side of BBG, one can see million-dollar homes and their wealthy residents, whereas on the other side of the garden one can see a community living in rundown buildings with graffiti and window bars.

Supporting these observations, Sally, a former PGR instructor, thought the location of BBG within the community was a major part of the success of PGR:

I think [it's] unique that Brooklyn Botanic Gardens is located at a very strategic point. It's located at the division line between a very affluent neighborhood, Park Slope, and a very lower economic neighborhood, so these kids are right there. Like in Chicago, I understand they have tried some programs like this summer gardening thing but they have to take buses and go out and find them because they're from such a distance away. These kids are right there.

The central location of the garden within the community makes it more viable and more easily integrated into the participants' daily lives. BBG is perhaps more accessible to people of all backgrounds and economic situations than are many of its counterparts that exist in more homogenous, higher-income neighborhoods throughout the country. This may be a reason for the program's success.

Richard and Sasha included the Gardens as a part of their community and neighborhood along with other cultural institutions, such as nearby Prospect Park, Brooklyn Public Library, Brooklyn Children's Museum, and Brooklyn Museum of Art. Sasha also likened BBG to an amusement park:

I . . . grew up going to the Brooklyn Museum and the Brooklyn Botanic Gardens on a very regular basis. I considered that as part of the neighborhood, and I have seen over the years, it really has grown into some things that everyone can go to. It's for everyone, and people from other neighborhoods and other states can come in and really enjoy that particular area. I really like the neighborhood for that because it's really growing into something that's really good.

Sally also said that when interviewing applicants for selection in the summer program, the staff tried to select a diverse group of students who represented a variety of cultures and ethnicities, which would represent the Brooklyn community. During the program, the staff encouraged discussion and conducted activities relating to ethnobotany and the children's various cultures. We examined documents related to activities like working on family trees and collecting recipes of traditional ethnic dishes. Sally emphasized this diversity as a main focus of the program. She tried to hire a diverse

staff as another way to recognize and celebrate the community's diversity. Current and previous staff members represented a variety of ethnic backgrounds and geographic regions, including Puerto Rico and Central America. Sally said,

Another thing that was very interesting was the diversity of those who participated in the program, both in the staff and in the children. I was quite often one of the only Caucasians involved, and of course that was very good because of the fact that most of the kids were not Caucasian.

Sasha also viewed BBG's role in her community in the following way:

I was just seven or eight, and . . . this neighborhood . . . it's versatile. It's becoming more and more versatile each day, . . . but some people are still kind of closed minded to certain things, . . . especially African Americans. Some of them are still closed minded. . . . They feel like "Well, I'm going to spend money to put my kids in that?" . . . I would think that it would be a great experience for a child to have because it would be different. It will open their minds up, but . . . we are becoming a little bit more versatile.

BBG documents also show support for diversity in the summer program. A report to a foundation in 2000 stated,

Since the program was founded, it has consistently served a high number of students from families that have recently immigrated to the United States. The 2000 Junior Botanists represented eight different countries, including the Caribbean Islands, China, India, Ireland, Jamaica, Nigeria, Pakistan, and Trinidad.

These findings describe the role that a public garden can play within its community, particularly within an urban community. It shows that the garden can be a significant cultural institution. BBG certainly plays this role in that it is embedded directly within the community that it serves, providing members of the community with easy access to its physical property, cultural offerings, and people resources.

## **Recommendations and Conclusions**

In the present exploratory case study of BBG's PGR Summer Program, we identified seven themes related to the program's effect on alumni. Additional research to further explore PGR and its meaning for participants is needed. Furthermore, the ability to locate potential qualified alumni participants for interviews posed a serious challenge during data collection. We identified a need for BBG to maintain alumni records so that deeper, more rigorously developed, and well-supported research may be conducted. Further study of the PGR program could provide greater depth on the long-term effects on alumni and the meanings that are constructed.

Future researchers may use focus groups to draw out alumni memories of the experience and reflections about the program. Conducting the focus group at the BBG site, near the children's garden and providing hands-on materials for participants to look at and review could aid participants in recollecting their experiences. Also, a longitudinal study that follows current participants into adulthood may provide additional insights into the long-term effects of the program. Alumni in the present study participated during the early years of the program. Because the program has evolved into mentorship opportunities for older children and opportunities for them to return for consecutive years, it would be interesting to track children from more recent years.

It would also be worthwhile to follow up with the present study's alumni, who are now in their early 20s, as they become older adults. Older adults may be more reflective about their childhood experiences and influences. There are also opportunities to study and document the school-year program of PGR, a unique program offered to a traditionally underserved population. Documenting the program to inform other public gardens and schools may enhance its use as a model for other communities. Interviewing teachers whose classes participate in the PGR school-year program about what they learn, their views of BBG, and how their curriculum and daily teaching have been affected may contribute to an understanding of what this population gains from a program such as PGR.

We found that PGR provides a positive experience, through hands-on gardening and science activities, for youth who come from challenging home and school environments. PGR is serving Brooklyn's Title I school teachers and children through plant-based education and is fostering a positive relationship between this traditionally underserved population and the BBG. The cultural significance of BBG to the participants' Brooklyn community and how this program celebrates the cultural diversity of its participants are important factors to the success of PGR. The present study of the long-term outcomes of PGR at the Brooklyn Botanic Garden is one of the first of its kind to contribute to an understanding of the role of plant-based youth education at a public garden.

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#### NOTES

1. Of the 98 potential contacts from program years 1990–1994 and 1996, 43 potential contacts had wrong or disconnected phone numbers, and 16 had no number listed. Twenty-eight potential interview participants were never reached. Five potential interview participants who were reached either did not participate in the summer program or were not willing to participate in the interview. Two interview participants who qualified for the study and verbally consented to participate did not appear for their interviews. Several unsuccessful attempts were made to reschedule.

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## APPENDIX A

### INTERVIEW GUIDE FOR FORMER PROJECT GREEN REACH SUMMER PROGRAM PARTICIPANTS

1. Tell me about the community you grew up in.
2. Tell me about your gardening experiences, if any, as a child prior to participating in the program and then after participation.  
*Possible Prompts:* Did you garden at home? In school? In a community garden? Did your family have a garden at home? Who did you garden with?
3. Describe your experiences at the BBG's Project Green Reach Junior Botanist Program as a child.  
*Possible Prompts:* What did you like? Dislike? What stands out in your memory? What do you remember the most? What were your favorite activities? Least favorite activities? How old were you? What grade were you in when you participated? How did you find out about the program? Describe how you felt when you found out you were selected to participate. Did you eat the vegetables you harvested from the garden? Did you share with your family?
4. Describe your gardening experiences while participating in the program.  
*Possible Prompts:* What did you take interest in?
5. Tell me about the staff in the program.  
*Possible Prompts:* Did you keep in touch with him/her afterwards?
6. Describe your memories of other Junior Botanists/Plant Investigators who participated with you.  
*Possible Prompts:* Whom did you make friends with? How old were they?  
How did you view the other participants?
7. What did the Summer Program mean to you as a child?
8. What do you think is the likelihood of your participating in the Summer Program without the special funding and transportation?
9. What meaning, if any, does the Summer Program hold for you as an adult?
10. Tell me about how this experience has influenced your life.  
*Possible Prompts:* Do you visit BBG? Do you have children? Do you bring them to BBG? Do you spend much time outdoors? Do you garden now?
11. Demographic Questions:
  - Age
  - Gender
  - Family Background—Ethnicity, Race, Nationality
  - Educational background
  - Profession/Occupation

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## APPENDIX B

### INTERVIEW GUIDE FOR FORMER PROJECT GREEN REACH SUMMER PROGRAM STAFF

1. Tell me about your educational and gardening background.
2. How long were you with the program?
3. Tell me about how the program was started.
4. In your own words, describe what you found to be the most important features for the success of the program.
5. Did the goals of the program change from inception until you left?
6. Did your procedures for selecting children to participate in the program change over the course of your involvement?  
How? What selection criteria were most helpful or important?
7. Tell me what you think has led this program to achieve success over such a long period.
8. Describe what is unique about this program.
9. Describe how you think participation in this program affects or changes the children who participate.
10. What would you do new or differently if you had to do it over again?
11. Have you kept in touch with any of the past participants? If so, please describe your relationship. Have you received any feedback from past participants about the program which you are able to recall and share?