THE IMPACT OF
INTERPRETATIVE MESSAGING ON
SUSTAINABLE LANDSCAPE PRACTICES
IN PUBLIC HORTICULTURE INSTITUTIONS

by
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ABSTRACT

Museums including botanical gardens and zoos have been using interpretative strategies such as display panels, brochures and guided tours to encourage and foster learning opportunities and experiences to visitors. To date, little research has been conducted on how interpretative strategies and messaging on sustainable landscape practices may motivate and influence a visitor’s learning and enhance their knowledge on the practices implemented by public horticulture institutions. This research aims to determine if visitors gained knowledge through the usage of different interpretative strategies on sustainable landscape practices; and to evaluate the preference types and effectiveness of the strategies based on knowledge gained and best learning experiences of visitors. The research site was Phipps Conservatory and Botanical Gardens (P.C) in Pittsburgh, Pennsylvania, a well-known role model of green initiatives and sustainability. Survey forms were given to every third visitor at the entrance of P.C’s indoor Conservatory. Visitors were required to finish “Pre-visit” survey before entering the indoor Conservatory and “Post-visit” survey after their garden visits as they exit the Conservatory. Results indicated visitors gained knowledge and increased learning experiences on the sustainable landscape practices through interpretative strategies implemented by P.C; and visitors preferred using display panels/storyboards and self-guided tours during visits. The research also found brochures and self-guided tours were most effective in helping visitors gain knowledge and learning experiences. Recommendations on display
panels/storyboards, guided tours, and suggestion of other interactive strategies were provided as guidelines to public horticulture institutions.
Chapter 1
INTRODUCTION

Public horticulture institutions such as botanical gardens, public gardens, and municipal parks and gardens are examples of public spaces developed for public enjoyment and use via relevant facilities and the plants they cultivate. These institutions attract many domestic and international visitors from around the world (Connell & Meyer, 2004). The quality of life and the motivation for these garden visitors are enhanced through their appreciation of display aesthetics, plant diversity, recreational and social interaction and interpretative signage on the message of environmental awareness and sustainability (Darwin-Edwards, 2000). Sustainable landscape practices such as implementation of Integrated Pest Management preserve the functional ecosystem amenities for future generations. They may be achieved through meticulous planning and design to promote plant vitality and soil functionality without relying on an over-usage of natural resources, such as water, during a maintenance period.

The management of these public horticulture institutions seeks to balance the protection and sustainability of the natural, cultural, and historical resources without compromising the visitor experience of appreciating these resources (Hammitt and Cole, 1998; Hendee and Dawson, 2002). The challenge is to meet the demands of the visitor experiences in light of limited capacities and resources, while addressing the conflicting social, political and environmental concerns such as public admission fees.
and sustainability of resources proves to be a challenge to the organization (Schwartz, Stewart and Backlund, 2012).

Several studies have reported the impact of visitor’s learning from museum exhibits (Borun et al., 1995; Prideaux and Lee-Jaye, 1999; Jeong and Lee, 2006) discovering that visitors tend to be “less motivated to learn” in botanic gardens, as compared to museums, zoos and other learning institutes (Bitgood, 2002; Ballantyne et al., 2008). A survey conducted by Crilley and Price (2005) found that 57% of the visitors to Adelaide Botanic Gardens indicated interest in “viewing plants” as a minor part of visiting the gardens, while only 15% of the visitors were motivated to learn more about plants during their visit to the gardens. A survey conducted by Connell (2004) discovered that about 70% of the garden visitors in the United Kingdom have a general interest in gardens, 20% visit for relaxation and 10% of the visitors have an interest in horticulture.

Interpretative strategies such as exhibitions, signage, labels, maps, brochures, demonstrations, programs and guided tours are developed to encourage and foster learning during a visitor’s trip. The way in which interpretative strategies are displayed in a free-choice learning environment, influences and impacts the visitor’s emotional and long-term learning effect by modifying his/her behaviors and learning outcomes. For interpretative strategies to be effective and receptive to visitors, materials must be customized exclusively to meet the knowledge, interests and desires of the targeted audiences (Ballantyne & Packer, 2005; Ballantyne, Packer & Beckmann, 1998). Even though museums such as zoos and botanical gardens have been using interpretative strategies in creating learning opportunities and experiences to visitors for a long time, it is only in recent years that research studies focused on the
importance and efficacy of interpretative messaging and methodologies that impact
visitors’ long-term learning and acceptance of sustainability movements (Ballantyne
and Packer, 2011; Ballantyne, Packer and Falk, 2011; Hughes, Packer and Ballantyne,
2011). The research studies identified crucial factors, such as stimulating visitor’s self-
reflections and emotions during and after the usage of interpretative strategies, and
providing precise and practical recommendations on how visitors may be able to
achieve sustainability for their environment, in order to promote long-term and off-site
behavioral outcomes (Hughes, 2011).

To date, little research has been conducted on how interpretative strategies and
messaging on sustainable landscape practices may motivate and influence a visitor’s
learning and enhance their knowledge on the practices implemented by public
horticulture institutions.

This thesis research is focused on evaluating the effectiveness of interpretative
strategies, such as display panels and websites, on sustainable landscape practices in
public horticulture institutions. The research seeks to determine which interpretative
strategies promote and enable the best learning experiences to visitors in achieving
new knowledge and understanding on the practices. The objective of the research is to
develop recommendations and guidelines for public horticulture institutions, to
increase the efficacy of the interpretative strategies on sustainable landscape practices
to their visitors.
Chapter 2

LITERATURE REVIEW

Sustainable Landscape Practices

The American Society of Landscape Architect (ASLA, 2013) defines “Sustainable landscapes” as landscapes, which are “responsive to the environment, regenerative, and can actively contribute to the development of healthy communities. Sustainable landscapes sequester carbon, clean the air and water, increase energy efficiency, restore habitats, and create value through significant economic, social and, environmental benefits.” The Sustainable Sites Initiative (SSI, 2009) embraced the Brundtland Report (WCED, 1987) and describes the term “Sustainability” as “design, construction, operations, and maintenance practices that meets the needs of the present without compromising the ability of future generations to meet their own needs.” The Millennium Ecosystem Assessment, a study conducted by the United Nations in 2005, emphasized the fact that true sustainability is not fully achieved until all the developmental needs of three important elements: social, environmental, and economic are completely addressed and harmonious (Figure 1).
As human populations increase annually, forested lands are acquired for the expansion of both agriculture and housing purposes. The rapid diminishment of these forested lands led to the exponential loss of habitats for plants and animals. Climate change is one of the contributing factors for the degradation of habitats; the escalating emission of carbon dioxide, nitrous oxide, methane, and other greenhouse effects has led to an increase in temperature and changing precipitation patterns (IPCC 2013).

Currently, the type of ecological habitats in public gardens are least explored and comprehended as compared to other types of urban green spaces (Mathieu et al., 2007).

Efforts to create sustainable landscapes that preserve and restore healthy ecosystems have been constantly challenged with the lack of support from the government and profit-making decision makers in the business industry. This lack of
support is due to the ignorance of the benefits and services that sustainable landscapes may provide as opposed to the conventional methods of landscape design, development and maintenance in the long-term. However, in recent years, concerns of sustainability have been on the rise as depleting food and water resources, energy consumption substitutes, and other investments proliferate (Bonfiglio, 2009; Louv, 2008; and Lawson, 2005). In addition, there has been a significant increase in scientific literature focusing on the theoretical attention of the features, purposes, amenities and positive contributions that gardens contribute to society (Cameron et al., 2012 and Gaston et al., 2005).

While gardening is associated as an environmentally leisure activity that promotes both mental stimulation and physical health in humans (Infantino, 2004), it can also reflect a negative impact on the environment through frequent application of chemicals such as fertilizers, herbicides and pesticides that results in nitrogen surpluses and contributes drastically to the greenhouse gas emissions in the environment (Lorenz and Lal, 2009; Grey, Nieuwenhuijsen, Golding, and Team, 2006; Kaye et al., 2006; and Howarth, Boyer, Pabich & Galloway, 2002).

The reduction in the usage of fertilizer application may significantly assist in mitigating greenhouse gas emissions into the environment (Livesley et al., 2010) and an alternative substitute is compost. Compost provides organic matter, offers lower carbon cost (Lillywhite and Rahn, 2008), improves aggregate stability, ground aeration, water infiltration and retention and aids in decreasing bulk density and soil erosion (Ros et al., 2001). The use of compost as a mulch covering also increases the concentrations and availability of both macronutrients and micronutrients in the soil.
(Martinez et al., 2003), while reducing nitrate leaching and water contamination (Mamo et al., 1999).

Countries all over the world are facing scarcity of freshwater resources and this is intensified through the revolving change in precipitation pattern that led to drought conditions in recent years. Landscaping comprises of a combination of different species of trees, shrubs, groundcovers, and turf, all of which require different levels of water demands. Water use efficiency in urban landscapes can be attained by supplying sufficient amount of water for plants’ vigor and aesthetic appearance and the amount of water consumption and use efficiency in agricultural crops can be easily determined (Bitar, 2004) than those in urban landscapes due to precise controlled environments in designated green spaces (Nouri et al, 2013 and Costello et al., 2000).

Recent studies have focused on over-irrigation on plants in private landscapes (Endter-Wada et al., 2008, and White et al., 2004) and minor landscapes (Kjelgren et al., 2000). It is predicted that 50 percent of over-irrigated water is lost through evaporation, wind, or surface run-off (U.S Environmental Protection Agency, 2008). Irrigation in unsustainable landscapes accounts for more than one-third of residential use, which translates to more than seven billion gallons of potable water utilized per day nationwide and it is estimated that an American family of four is able to use up to 400 gallons of water per day, and about 30 percent of that water is for outdoor uses such as washing of automobiles (U.S Environmental Protection Agency, 2008). Irrigation in landscaping ranked higher in the drier regions of highly populated West and Southwest of United States than in any other states (U.S Environmental Protection Agency, 2008).
Supply of residential irrigation water sources is usually abundant and is relatively cheap for private landscape users to purchase for use in their own landscapes, which has resulted in ignorance of water conservation in landscape uses (Devitt et al., 2008). Studies have shown that setting a higher fixed water price in the water pricing policy seem to aid in reducing and regulating irrigation water usage in private landscapes (Domene and Sauri, 2003; and Bauman et al., 1998). Modern time-based irrigation controllers equipped with rainfall sensors (McCreday et al. 2009 and St Hilaire et al., 2008) help to reduce the amount of water usage by about 11% – 75 %, while improving the visual aesthetic of the landscape (Devitt et al., 2008 and Hunt et al., 2001).

Healthy ecosystems consist of complex, inter-related systems of water, soil, air, flora and fauna that are constantly evolving in the natural environment and offers purification of air and water, water regulation and supply, and sustainable beneficial soil that improve both ecological and human systems (Calkins, 2012). Sustainable landscape practices, combined with sustainable land design and development, management practices and functions of healthy ecosystems may restore or boost the ecosystem services, increase economic cost-effectiveness, improve human health and well-being, and social and cultural identity to protect the world’s ecosystems for future generations (Calkins, 2012).

**Sustainable Source Of Revenues**

For many public horticulture institutions, it is imperative to maintain attractive landscapes to ensure a stable and continual flow of revenues from admission or membership fees, which are required to cover the maintenance and operational costs
of the gardens (Connell, 2005). However, the costs associated with the maintenance of these landscapes are usually high and not recoverable.

A study by the New York City Central Park Conservancy (2008) showed that Central Park attracts about 25 million annual visitors to its 843 acres of park and its annual expenditure of the manpower resources, horticulture operations, maintenance and other operations, such as salaries and related expenses, surpassed USD 10 million.

Some of the key challenges that public horticulture institutions face include rising competition from other leisure services and visitor expectations, and the decrease in availability of public funding or donations to promote and support activities at these institutions (Leask et al., 2013). Other challenges include a shift in the focus and effort of the management to study and improve income generation, manage their revenues and resources effectively, and increase the skills of professional staff (Leask, 2010).

For any revenue-management techniques to be effective, the management needs to constantly attend to and monitor on-going financial analysis to ensure that operating funds and profits are kept consistent for the long term (Huefner and Largay, 2008). Setting pricing for admission fees in a visitor-attraction industry has been overly restrained and conservative (Rogers, 1995). Many public horticulture institutions believe that the success of their performance is deeply connected to annual visitor numbers, as well as believing that admission fees should be kept low to urge indirect spending by the visitors (Garrod, Leask and Fyall, 2007).

There is a need for public horticulture institutions to operate both commercially and effectively (Swarbrooke, 2001). However, the use of relevant revenue-management techniques and decisions has been impeded by the lack of
accessible data and research (Lennon, 2003). Faced with an ever-increasing competitive industry and declining public sector funding, public horticulture institutions need to strive on developing effective management and strategies such as increasing visitation level through exhibitions and events for sustaining the revenues required for the daily operation costs of the institutions.

**Visitors’ Motivation And Learning Experiences In Museums**

Museums such as art, natural history, science museums; aquariums and zoos, botanical gardens and arboretums; and historical sites are sources of explicable information, where visitors can place their trust to acquire reliable, accurate, and comprehensible presentations of art, natural history and science objects and ideas to seek and find deep and personal meaning and connection from the past, present and future of humanity, with the natural world and the cosmos (Pitman, 1999). Over the years, museums have evolved and improved their presentation on the variety of exhibitions and programs, objects, ideas and information and this progression of change suggested a fundamental shift in the public’s values, priorities and perceptions of how museums can affect and transform their lives. With the turn of the century, museums are becoming more accountable and transparent to the public and serving visitors who are more educated, influential in social status, and having higher expectations and demands of customer service (Wells et al., 2013). With shifting demographics, radically evolving society, and the continuous advancement in technology, museums must prove and justify that they are strategically connected to the visitors, understand the public’s desires and values, and support the essence of the public in order to be successful and sustainable in the twenty-first century.
**Museums As Leisure Experiences**

In today’s society, museums are ranked as one of the most popular leisure experiences, with Lourve Museum in Paris, France attaining over 9.7 million annual visitors and Metropolitan Museum of Art in New York, United States achieving over 6 millions annual visitors in 2012 (The Art Newspaper, 2013). The museum industry in America has been blossoming since the twentieth century, with visitors expanding their knowledge and understanding of themselves and their world through leisure opportunities by immersing in new experiences and ideas. According to the annual surveys conducted by the American Alliance of Museums (AAM), an escalating number of Americans have visited the nation’s museums for education, information and entertainment purposes, despite economic insecurity from 2009 – 2012 (AAM, 2013; Figure 2).

**Museum Learning**

Gerald Edelman theorized learning as a cumulative, long-term process of meaning-making and finding connections, with an overall experience that involves the human’s physical, mental, emotions and senses (Rosenfield, 1990), and is often the attracting reason why visitors visit museums. Further, Falk and Dierking (2013) developed a “Contextual Model of Learning”, to describe and provide the framework for understanding the visitor’s multifaceted museum experience, interaction and relationship of different factors such as the motives, reasons and expectations that promotes the museum visitor’s learning behavior.

The Contextual Model resulted from observations of visitors in real settings and involves three overlapping contexts – (1) the *personal*, (2) the *sociocultural*, and
(3) the physical, which together define “learning” as the process/product of the interactions and close association between these three contexts.

![Reported annual changes in museum attendance (2009 - 2012)](image)

Figure 2  Museums reported increase in annual attendance. Source: American Alliance of Museums, Annual Condition of Museums and the Economy (April 2013).

Falk and Dierking (2013) eventually added a fourth dimension – time, to the model. This reflects the process of learning of an individual over a period of time, consistently building up his/her own meanings and connections with the exhibits as he/she moves through his/her sociocultural and physical world in the museum.

The Contextual model explained that visitors bring in their individual and personal experiences, predispositions, interests, beliefs and knowledge (“The Personal
context”) upon visiting the museum as a communal institution; the visitor’s experience is influenced by a variety of cultural influences that have an impact on their experiences within the general environment of museums and through interactions with different members of their own group or with other visitors and staff in the museum (“The Sociocultural Context”); the visitor’s experience within the physical setting of the museum such as the design of the museum’s buildings, display methods of the exhibitions and interpretative materials (“The Physical Context”); and the visitor’s experience in the museum is effected by the duration of the visit, which will change and evolve over time (“The Time Context”).

Every individual visitor has his/her own personal identity-related needs and values such as personal fulfillment, nurturing the child’s education, and novelty-seeking curiosity nature, which motivates him/her to visit the museum (Falk and Dierking, 1992). Falk and Dierking (2013) described seven categories of visitors based on their distinct identity-related visit motivations: (1) ‘Explorers’ are visitors who satisfy their curiosity and novelty-seeking nature through the unique exhibitions in the museum; (2) ‘Facilitators’ are publicly inspired visitors who are focused on educating and cultivating the learning experiences of other members in the social group; (3) ‘Professionals / Hobbyists’ are visitors who have a intimate relationship and ties between their professional or hobbies and the museum contents; (4) ‘Experience seekers’ are visitors who identify that the museum is a place of interest and leisure destination to complete their travel obligations; (5) ‘Recharges’ are visitors who seek spiritual, meditative and restoration experiences after a day’s work or to rejuvenate their religious beliefs; (6) ‘Respectful Pilgrims’ are visitors who visit museums based on their sense of duty to honor the memory of those symbolized by an institutional or
memorial; and (7) ‘Affinity seekers’ are visitors who visit the museums based on their heritage origins or personhood.

**Museums For Fun**

Museums have developed to offer visitors more than just pure education and have become social gathering places for dating couples, families, and other social groups. Most visitors visit museums in social groups and those who visit alone will still inevitably engage with other visitors and staff in the museums (Falk and Dierking, 2013). Museum visitors mainly fall into four different categories – (1) Family visitors are often the major visitor groups and consist of diverse learning groups of varied backgrounds and ages; (2) Adult visitors usually visit the museums in groups and social interactions between the adult visitor and the exhibits is an important component in permitting the adult visitor to share his/her experiences with his/her companions; (3) School children who visit the museums during their school field trips and social interactions begin with the museums’ specially customized programs and tours. The visiting school children typically counter for a significant proportion of the visitor’s attendance in the museums; and (4) lone visitors are visitors who visit the museums specifically to meet others or to meet someone new and interesting through museums’ programs created for singles. Though the lone visitors may be visiting alone, he/she can still be highly social interactive with other members of his/her own social network through the use of virtual technologies such as Twitter or Facebook to post photos of exhibits, comments, and invitations to encourage other members to join him/her (Falk and Dierking, 2013).

Museum visitors usually view museums as educational institutions and anticipate some fun and learning (Packer, 2006; and Fraser and Sickler, 2008) and are
strongly influenced by the deep belief that museums can satisfy his/her specific needs and desires within that particular place and time period, and his/her discernments in what museums can offer to him/her through the unique exhibitions (Falk and Dierking, 1992). Visitors arrive at the museums with an expectation to view specific exhibitions, read the labels, listen to the audio, watch videos, observe and interact with the displayed objects (Wells et al., 2013). In order to consistently attract a large group of visitors, museum management often curates different exhibitions such as period rooms, blockbusters, and ‘green’ exhibitions.

**Museum Design and Free-Choice Learning**

The designed layouts and spaces of the exhibition galleries often have the greatest influence on the visitor’s experience in the museum. Visitors react responsively, are in control of their own personal experiences and choose to focus on the exhibitions or objects that interest them (Falk and Dierking, 2013). Museums provide visitors with a free-choice learning setting and this free-choice learning is often non-linear, and allows the visitors to be intrinsically motivated to learn about anything that interest them, wherever and at their own pace in the museum. Visitors tend to be more motivated to learn in a supportive environment through participation of activities without feeling any anxiety, fear, or negative mental stress when tasked with a new challenge that meets their knowledge and skills and achieve true learning experiences when the experiences include their mental, sensory and emotional abilities (Csikszentmihályi and Hermanson, 1995).

Research conducted by Parker (2006) revealed that most people visit museums, parks and other leisure venues to experience learning, in which she defined as “learning for fun.” According to her research, visitors engage in a variety of leisure-
learning-related experiences to enjoy the process of learning in museum-like settings for discovery, enjoyment, exploration, excitement, multiple sensory interactions and mental stimulation; seek experiences that incorporate learning opportunities; and potential transformative experiences. Though, more often than not, the virtue and interest of the visitors in the exhibits also play a major role in determining their viewing decisions. Most museum visitors do not view exhibitions in a linear fashion such as a one-way flow through exhibition as they prefer to move through the exhibitions at whatever exhibits that capture their attention (Falk, et al., 1985).

Museum visitors are aware of and learn from the distinctions of the diverse exhibit varieties in different categories such as academic, corporate, community, entrepreneurial, and vernacular exhibition medium in museums (Gordon, 2008). The design of the exhibitions may determine if the visitors would spend a great deal of time focusing on most of the exhibit objects, or merely passing through the exhibition galleries and noticing few of the exhibit objects. Although the public naturally knows museums as educational institutions and that the learning of the museum visitor is based on his/her own personal, self-paced and exploratory nature, exhibitions are all too often designed for strict and exhaustive learning (McLean, 1993). Too many exhibitions are designed with the intention of controlling the visitor’s experience in the museum, while an effective exhibition is one that allures more than half of its visitors to stop, look and learn about more than half of the exhibition’s objects (De Rojas and Camarero, 2008).

**Participatory Experiences In Museums**

Visitors are attracted to exhibitions that are visually captivating and essentially fascinating to them at their own personal level. Simon (2009) highlighted that the
design frameworks of the exhibition does matter in contribution to the visitor’s participation in museum experience. The fulfillment of the visitor’s desires for self-expression and converting the one-way content distribution system to a more interactive and conversational system is achieved by the creation of opportunities for participation. In her article, Simon (2009) provided the example of a small-scale participatory experience from the rock poster-making activity at the Denver Art Museum. The educators of the exhibition encouraged the visitors to create their own posters through a simple, re-mixing activity that blended the visitors’ collections, assessments and re-creation of the exhibition of psychedelic rock posters and this activity stimulated the visitors to share their own personal opinions and elevated the confidence of visitors who were not confident in engaging art with positive results.

Isble (2010) explained the importance of shifting away from a hierarchical system of the exhibition development styles to a sustainable culture of collaboration in creating exhibitions that are more accessible and meaningful for visitors. He emphasized that museums should shift their focus away from object-centricity and objects with no context to displaying objects and information that will connect to the visitor’s prior knowledge of the objects; and any activity that does not motivate visitors to participate mentally will not stimulate any intellectual changes or retain information of the knowledge.

Over the years, in an attempt to connect and communicate with the visitors, museums have employed an increasingly diverse selections of interpretative tools and strategies such as banners, brochures, and different kinds of labels – printed and digital labels, placed or projected labels, small and large labels, which are all strategically situated within the exhibitions. Interactive components for the visitor’s experience
include the physical pushing of a button to hear or view a video, tour guides, docents, hand-held audio guides, and multi-media devices such as computer games and virtual reality stimulators.

With the emergence of social media and advanced development of technology in recent years, museum professionals and communication managers have become involved with two-way communication strategies such as Facebook and Twitter to broadcast the museum’s event listing, exhibitions, promotion and reaching out to a wider range of new visitors. Social media is circulated through online social interactions such as social networking sites, blogs, podcasts, video clips and photos sharing all within the virtual world. The advantage of the high speed and flexibility of the social media tool creates the opportunity for communication managers to increase the use of either two-way or multi-way communication through promoting interactions and strengthening the relationships between the organizations and the visiting public.

Fletcher and Lee (2012) conducted a study on how museums in America are utilizing social media to increase visitor engagement and maintaining strong relationship between the museums and the visitors. Their results imply that museum professionals concur that social media is an important tool and are continuously involved to create better interactions and gain participations from visitors. Through thoughtful customization and personalization, technologies can be entrenched within exhibitions or mobile devices to allow individual visitor to engage in different levels of highly pragmatic experiences as visitor glides through the exhibitions. With the increase presence of ubiquitous social media and exponential blossoming of processing speeds and technology capabilities, the museums’ managements have to
embrace the fact that amazing experiences are cultivated through communicating with
visitors and not towards the visitors.

**Museums And Sustainability**

Museums such as public horticulture institutions have rapidly evolved within
recent decades emphasizing the importance of environmental conservation and
sustainability through extensive varieties of educational interpretative strategies with
botanic gardens taking the lead (Willison, 2006). Public horticulture institutions
frequently showcase the benefits of environmental management practices, resources,
conservation, biodiversity, recreation and well being through gardening activities.
Indoor and outdoor plant displays in public horticulture institutions are usually
designed with the intention of attracting visitors through different plant themes, such
as natural geographical distribution, ethno-botany and ecology. Interpretation of these
plant displays requires professional knowledge and relevant interpretative skills by
professionals to create an appreciation and awareness by visitors. Various
interpretative strategies, such as exhibitions with interactive displays, have shown
success in attracting visitor’s attention and enriching the educational experience
(Fallon and Kriwoken, 2002).

He He and Jin Chen (2012) reported that throughout Mainland China, visitors
who utilize Visitor Education Centers (VECs) in botanic gardens tend to gain more
knowledge and achieved an enhanced learning experience than those who did not visit
the VECs. VECs are amenities that stress the importance of regional natural history,
botany and horticulture through interpretative educational displays such as specimens
and informative display panels to articulate stories to the visitors. The results of the
study highlighted the importance of setting up educational facilities, such as the VECs,
as a tool to create and increase visitor’s knowledge and appreciation of natural history and nature.

Visitors are an integral part of museums and both the visitors and museums need to create a symbiotic relationship to support each other in this ever-evolving society. In order to make museum experiences both engaging and memorable for the visitors, museums need to understand and emphasize on the values and interests of the visitors, customize and implement exhibits with different mood cultivating elements such as sensory, emotional, kinesthetically and intellectually captivating experiences to attract and capture the visitor’s attention, assuring visitors that they have ownership, full control and freedom of choice to all the museum experiences, and reinforcing these museums experiences so that museums become an integrated part of the visitors’ daily lives (Falk and Dierking, 2013).
Chapter 3

MATERIALS AND METHODS

Research Site

Phipps Conservatory and Botanical Gardens (P.C), a historic landmark set in the midst of Schenley Park in the City of Pittsburgh, Pennsylvania, and listed on the National Register of Historic Places, is known as one of America’s eco-friendlyest Public Gardens. The City Beautiful Movement that showcased tropical plants from the Columbian Exposition in Chicago inspired Henry Phipps, who founded P.C in 1893 as a gift to the City of Pittsburgh. The original stylish glass and building framework of P.C was designed and built by New York firm, Lord & Burnham that featured Victorian greenhouse architecture. In 2003, P.C revealed its plans for expansion of the conservatory project, which included a green-engineered Welcome Center encased by a neo-Victorian dome, the Production Greenhouses and a Tropical Forest Conservatory that encompassed a changing display and theme every two years.

In recent years, P.C has taken the lead as a strong advocate for green-building initiatives, sustainable landscape practices and creating new environmental awareness. In addition to being a strong advocate for green initiatives, P.C strives to promote and educate the public about its sustainable landscape efforts through educational classes, and programs such as ‘Sustainable Horticulture Program’, interpretative signage, brochures, exhibitions, events and tours.

Today, P.C is considered as one of the world’s most energy efficient and sustainable conservatories and serves as a role model for visitors and other public
gardens (P.C, 2014). Green-buildings such as the Tropical Forest Conservatory and the Production Greenhouses were designed with sustainable operations and practices to create an environment devoted to conservation and biodiversity, while the Center for Sustainable Landscapes (CSL) meets or exceeds the expectations of the utmost green-building standards such as generating its own energy and recycling and reusing water captured on site. The CSL building has won numerous awards such as the Living Building Challenge™, which achieved the Net Zero Energy Building Certification in February 2014; LEED® Platinum, which was awarded in August 2013, Sustainable Sites Initiative™ (SITES™), which attained a Four-Stars certification for landscapes in November 2013, and most recently, a WELL Platinum Pilot Certification, a protocol for measuring human wellness in built environment, was achieved in October 2014 (P.C, 2014).
Research Methods

The on-site survey was conducted at the entrance and exit of P.C’s indoor Conservatory (Figure 3), over a four-day period from 23 October 2014 (Thursday) to 26 October 2014 (Sunday), and a daily seven-hour period from 10am – 5pm.

In order to avoid any bias while sampling the visitors, the questionnaire was given to every third visitor. Every third visitor arriving at the main entrance through the stairway was approached and asked if he/she would like to participate in the survey (Figure 4). If the visitor agreed to participate, he/she would be provided with a brief tutorial on how to start and complete the survey.

Visitors completed the “Pre-visit” survey before entering the garden, (Figure 5) held onto the survey booklet throughout his/her garden visit, and completed the “Post-
“visit” survey after his/her garden visit. Pens and clipboards were provided to visitors for ease of completing the survey and a collection survey box was placed at the exit and shown to the visitor during the initial brief run-through of the survey (Figure 6). The questionnaire was coded for identification analysis and the date of survey was marked on each questionnaire at the end of each individual survey day.

Figure 4 Visitors walk up the stairway towards the entrance of the P.C’s indoor Conservatory.
Figure 5  Visitors complete the “Pre-visit” section of the survey prior to entering P.C’s indoor Conservatory.

Figure 6  Collection survey box with pens and clipboards provided to visitors for ease of completing “Post-visit” section of the survey after their visits.
The questionnaire was created with questions specifically for P.C and was in a form of a booklet that consisted of eight pages (Appendix B). The first page provided a brief introduction on the purpose of the survey with clear instructions to visitors on how to complete the questionnaire. The questionnaire was split into two sections – the “Pre-visit” and the “Post-Visit” surveys. There were five questions under the “Pre-visit” survey, which the visitor had to complete before entering the garden and there were fifteen questions under the “Post-visit” survey, which the visitor will complete after their garden visit.

The five questions under the “Pre-visit” survey section consisted of questions such as the starting time of their garden visit, their reasons for visiting P.C, the importance and benefits of sustainable landscape practices implemented by P.C, and different interpretative strategies by public gardens that enhance visitor’s learning experiences. The fifteen questions under the “Post-visit” survey section consisted of questions such as the ending time of their garden visit, if visitors had learned anything about the sustainable landscape practices implemented by P.C, if visitors had utilized any of the interpretative strategies employed by P.C, which of the strategies had enhanced the visitor’s knowledge and overall learning experiences on the sustainable landscape practices, other suggestive interpretative strategies that P.C may consider to use in the future, and the visitor’s demographics.

Some of the questions were rated with Likert-type scale with options “very important, important, somewhat important, not important” to determine if the sustainable landscape practices implemented by P.C held any significance to the visitor. Other questions used “very useful, useful, somewhat useful, not useful” to determine if the interpretative strategies employed by public gardens and P.C assisted
in enhancing their knowledge and overall learning experiences. Still, other questions used “strongly interested, interested, somewhat interested, not interested” to determine the type of suggestive interpretative strategies to be recommended and implemented by P.C in the future. Questions rated with Likert-type scale choices such as “strong factor, moderate factor, not a factor” were intended to determine the significance of the intent of the visitor’s visit to P.C. Other questions used “learned a lot, learned something, did not learn anything” to determine if the visitor has learned anything on sustainable landscape practices implemented by P.C, or “yes, somewhat, no” to determine if visitors had utilized any of the interpretative strategies used by P.C. Demographics questions were placed towards the end of the questionnaire, ending with the last question for visitor’s suggestions and comments.

Having post survey questions that were inter-linked with interpretative strategies such as display panels and guided tours that related to whether visitors gained any knowledge on sustainable landscape practices, helped to provide a more clear understanding of the level of improvement required at P.C.
Chapter 4

RESULTS

Descriptive Analysis

A total of 85 visitors completed the survey questionnaires at P.C during the survey period from 23 October 2014 (Thursday) to 26 October 2014 (Sunday), 10am – 5pm daily. The percentage results (Appendix C) and visitors’ comments (Appendix D) were tabulated and reflected in the survey instrument. The sample included both males (32%) and females (68%), with a higher percentage of males ages 60 and above and females ages 30 - 59 participating in the survey (Table 1). The data collected was analyzed and tested where applicable. Generally, visitors at P.C spent an average time of 82 minutes, with the minimum time spent at 27 minutes and the maximum time spent at 210 minutes (Figure 7).

“Pre-Visit” Section Of Survey Results

A majority of visitors came to P.C mainly for pure enjoyment and relaxation (95%), and to spend time with family and/or friends (77%), while taking a break away from their normal home and work routine (74%), while a minority of visitors came to Phipps Conservatory to socialize (31%) and challenge themselves to learn something new (27%) (Figure 8).
<table>
<thead>
<tr>
<th>Sample /Age Group</th>
<th>15 - 29</th>
<th>30 - 59</th>
<th>60 and above</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>37%</td>
<td>22%</td>
<td>41%</td>
<td>32%</td>
</tr>
<tr>
<td>Females</td>
<td>28%</td>
<td>50%</td>
<td>22%</td>
<td>68%</td>
</tr>
<tr>
<td>Total</td>
<td>31%</td>
<td>41%</td>
<td>28%</td>
<td></td>
</tr>
</tbody>
</table>

Table 1  Percent for gender by age group.

Figure 7  Average visiting time spent by visitors at P.C.
Under the “Pre-visit” section in the survey, we asked visitors to rate how important each of the following sustainable landscaping practices at P.C were to them and visitors felt that using reusable/recycled materials (85%), reducing pesticides uses (84%), conserving rainwater (80%) and using native plants (67%) were more important factors as compared to reducing air temperature (59%), composting garden waste materials (58%) and using organic fertilizers (57%) (Figure 9).

Visitors strongly agree and support the fact that sustainable landscape practices such as conserving natural resources by using reusable/recycled materials (92%), improving human health conditions (90%), planting more trees to promote comfortable climate (89%), planting native plants to support pollinators (88%), using organic fertilizers to reduce pollution of water bodies (84%), re-using rainwater for
irrigation (80%) and composting to increase nutrients to soil (77%) provide many different benefits to the environment and improve the health of human conditions (Figure 10).

Figure 9  Visitors’ ratings on the importance of sustainable landscape practices at P.C.
Figure 10  Visitors’ views on the benefits garnered from sustainable landscape practices.

The final question under the “Pre-visit” section inquired about visitors’ preferences towards, and efficacy of, the different kinds of interpretative strategies utilized by public gardens to improve learning experiences throughout the gardens. Most visitors preferred exhibitions and events (90%), demonstrations by professional staff/volunteers (84%), display panels/storyboards (81%), websites (71%) and self-guided tours (58%) to improve their learning experiences, while paid educational workshops (48%), social media such as Facebook and Twitter (37%) and QR codes (30%) were least useful in enhancing their learning experiences in the gardens. Visitors felt that guided tours (69%), news media such as newspapers, magazines and radio (67%), hands-on workshops with staff/volunteers (64%), digital touch screen
signage (62%), brochures (61%) and self-guided audio tours (58%) were generally useful (Figure 11).

Figure 11 Visitors’ preference of the different interpretative strategies utilized by public gardens in enhancing their learning experiences.
“Post-Visit” Section Of Survey Results

Under “Post-visit” section of the survey, visitors were asked to rate which exhibition(s) held at P.C was a strong attracting factor to their visit (Figure 12). The orchid room (80%), sunken garden (58%), tropical forest Conservatory (53%) and desert room (53%) were the top attracting factors. Other attracting exhibitions included tropical fruit and spice room (51%), garden railway (South Conservatory) (49%) and sustainable perennial gardens (49%).

![Exhibition(s) that attracts visitors to Phipps Conservatory](image)

Figure 12  Exhibition(s) that is strong attracting factor(s) for visitors to visit P.C.

After their visit, visitors were asked to rate their degree of knowledge gained from any of the sustainable landscape practices implemented in P.C. Visitors felt that they had gained some knowledge about conserving rainwater (73%), using native
plants (71%), reducing pesticides uses (64%), using reusable/recycled materials (58%), composting garden waste materials (55%), reducing air temperature (53%) and using organic fertilizers (52%) (Figure 13).

![Knowledge gained from sustainable landscape practices in Phipps Conservatory](image)

Figure 13   Knowledge gained from sustainable landscape practices in P.C by visitors.

Visitors were asked if they utilized any of the interpretative strategies in P.C during their visit and reading the information on the display panels/storyboards (66%) and self-guided tours (51%) were the top two strategies being utilized. Brochure (29%) and interaction with staff/volunteers (25%) were utilized occasionally. According to the survey results, digital touch screen (8%), social media such as
Facebook and Twitter (7%), QR Code (4%) and guided tours (2%), were drastically under-utilized by visitors during their visits (Figure 14).

![Interpretative method(s) utilized by visitors](image)

Figure 14    Interpretative method(s) utilized by visitors during their visit at P.C.

Visitors were asked to rate the effectiveness of the different interpretative method(s) presented by P.C to enhance their knowledge and overall learning experiences on the sustainable landscape practices. Visitors felt that display panels/storyboards (85%) and exhibitions and events (81%) were most useful, while self-guided tours (68%), demonstrations by professional staff/volunteers (62%), hands-on workshops with staff/volunteers (59%) and brochures (59%) were useful. Guided tours (49%), website (48%), digital touch screen signage (42%) and paid
educational workshops (35%) were somewhat useful. Social media such as Facebook and Twitter (20%) and QR Code (16%) were least useful in enhancing their knowledge and overall learning experiences on the practices in P.C (Figure 15).

![Effectiveness of interpretative method(s) implemented by Phipps Conservatory](image)

Figure 15 Visitors’ views on the effectiveness of interpretative method(s) implemented by P.C to enhance their knowledge and overall learning experiences on the sustainable landscape practices.

Visitors were asked to rate their interests in other interpretative strategies that P.C may consider introducing in the future and demonstrations such as composting by professional staff/volunteer (73%), hands-on activities such as planting of native plants (70%), self-guided audio tour (62%) and projection models explaining process of practices (59%) were the top few interpretative strategies that visitors were most
interested in being introduced (Figure 16). Visitors were asked if they would consider increasing the frequencies of their visits if P.C actively promotes its sustainable landscape practices through interactive exhibitions and events and majority (62%) of the visitors would increase their visits, while a minority (38%) of the visitors would not increase their visits (Figure 17).

Figure 16 Visitors’ views on proposed interpretative method(s) that P.C may consider in introducing in the future.
Figure 17  Visitors’ views on whether to increase the frequencies of their visits should P.C actively promotes its sustainable landscape practices through interactive exhibitions and events.
Data Analysis

In order to determine if visitors gained any knowledge through the interpretative strategies implemented by P.C, it is necessary to consider the key variables that measure (1) the importance of the sustainable landscape practices (S.L.P) in P.C under the “Pre-visit” section of the survey, and (2) the knowledge gained by visitors of the S.L.P in P.C under the “Post-visit” section of the survey (Table 2).

The survey instrument was designed so that the questions would form a scale. A model measures each of the questions with a Likert-type scale and creates a scale that is both effective and uni-dimensional. The creation and legitimation of a scale followed the following process. Firstly, the individual question distributions were examined to determine if any visitor had a singular or near singular response. These questions showed little to no variance and would not be useful in a scale. Secondly, the correlation between questions in a category was examined to determine if they were positively correlated at a moderate to strong level. Thirdly, Cronbach’s alpha was calculated to determine the reliability of the scale and lastly, principle component/factor analysis was used to ensure that the measure is uni-dimensional.

Cronbach’s alpha is a measure of the internal consistency that determines how closely related the number of items is as a set and measures the average inter-item correlations among the item pairs (SPSS, 2015). A reliability coefficient level of 0.70 or higher is deemed as the general standard for Cronbach’s alpha, though a high value for the alpha does not mean that the measure is uni-dimensional. In order to ensure that the measure is uni-dimensional, another analysis such as “principle components/factor analysis” may be used in addition to Cronbach’s alpha. Principle components/factor analysis is a variable-reduction technique that aims to reduce a
large set of variables into a smaller set of variables, that would account for the majority of the variance in the original variables in the data (Lund Research, 2013).

<table>
<thead>
<tr>
<th>Question Groups</th>
<th>No. of questions</th>
<th>Response categories for the Question Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge gained by visitors of S.L.P</td>
<td>1) Composting garden waste materials 2) Using organic fertilizers 3) Using native plans 4) Conserving rainwater 5) Reducing pesticides use 6) Using reusable/recycled materials 7) Reducing air temperature</td>
<td>Learned a lot</td>
</tr>
</tbody>
</table>

Table 2  Key question groups that reflect the number of questions in each group and response categories with a Likert-type scale.

The scale is uni-dimensional if there is only one Eigen value that is greater than one, and accounts for the majority part of the variance after entering the variables in both “Pre-visit” and “Post-visit” sections of the survey in principle components/factor analysis. The Eigen value of greater than one, together with a Cronbach’s alpha of 0.70 or greater may be used as evidences that the scale is both internally consistent and uni-dimensional.

Under the “Pre-visit” section of the survey, the importance of the sustainable landscape practices in P.C has a Cronbach’s alpha of 0.882. The principle
components/factor analysis has only one Eigen value greater than one and the first Eigen value is 4.23, which accounts for 60.50% of the variance. The positive correlation coefficient on visitors’ views on the importance of the sustainable landscape practices implemented in P.C shows a higher value between composting garden waste materials and using organic fertilizers i.e. 0.705, using organic fertilizers and conserving rainwater i.e. 0.712, conserving rainwater and reducing pesticides use i.e. 0.715 and reducing pesticides use and using reusable/recycled materials. Based on this result, an additive scale known as “Pre Importance” was created, which showed symmetrical distribution and a hypothesis of normality is reasonable for subsequent analysis.

Under the “Post-visit” section of the survey, the knowledge gained by visitors of the sustainable landscape practices in P.C has a Cronbach’s alpha of 0.937. The principle components/factor analysis has only one Eigen value greater than one and the first Eigen value is 5.11, which accounts for 73.01% of the variance. The positive correlation coefficient of whether visitors learnt something shows a higher value between composting garden waste materials and using organic fertilizers i.e. 0.898, composting garden waste materials and using reusable/recycled materials i.e. 0.766, composting garden waste materials and reducing air temperature i.e. 0.770, using organic fertilizers and reducing pesticides use i.e. 0.734, using organic fertilizers and using reusable/recycled materials i.e. 0.725, using organic fertilizers and reducing air temperature i.e. 0.768, using native plants and reducing pesticides use i.e. 0.720, and using native plants and reducing air temperature i.e. 0.757. Based on this result, an additive scale known as “Post Knowledge” was created, which showed symmetrical distribution and a hypothesis of normality is reasonable for subsequent analysis.
A summary table (Table 3) shows the compiled results of the scale construction. In every section, the items produced an internal consistency and uni-dimensional scale. In every scale, the Cronbach’s alpha showed the reliability coefficient higher than the standard level of 0.70 and the principal component/factor analysis showed that there was only one Eigen value that was greater than one and the greatest Eigen value was responsible for about 32 to 73 percentage of the variability in the data. Both of these measurements provided evidences that the scales are both acceptable and uni-dimensional.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Cronbach’s alpha</th>
<th>Eigen Value</th>
<th>% of Variance</th>
<th>Scale Mean</th>
<th>Scale Std Dev</th>
<th>Scale Min</th>
<th>Scale Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Importance</td>
<td>0.882</td>
<td>4.23</td>
<td>60.50%</td>
<td>15.14</td>
<td>4.99</td>
<td>1</td>
<td>22</td>
</tr>
<tr>
<td>Post Knowledge</td>
<td>0.937</td>
<td>5.11</td>
<td>73.01%</td>
<td>6.36</td>
<td>4.18</td>
<td>1</td>
<td>15</td>
</tr>
</tbody>
</table>

Table 3 Key measures in the development of Pre- and Post- scales on the importance of and knowledge gained on sustainable landscape practices in P.C.

Statistical correlation is used to determine if two variables are related by measuring the coefficient of correlation ($r$), which ranges from -1 to +1 that indicates the strength of the relationship between the variables and if the relationship is positive or negative. Generally, $r > 0$ indicates a positive relationship, while $r < 0$ indicates a negative relationship and $r = 0$ indicates no relationship between the two variables. A perfect positive correlation is indicated by $r = +1$ and a perfect negative correlation is indicated by $r = -1$. The closer $r$ is to -1 and +1, the stronger the strength of the relationship between the two variables. As a guideline, if the value of $r$ is between -1 to -0.5 or 1.0 to 0.5, the strength of the relationship between two variables is
considered strong; if value of $r$ is between -0.5 to -0.3 or 0.3 to 0.5, the strength of the relationship between the two variables is considered moderate; if value of $r$ is between -0.3 to -0.1 or 0.1 to 0.3, the strength of the relationship between the two variable is considered weak; and if value of $r$ is between -0.1 to 0.1, the strength of the relationship between the two variables is considered very weak (Explorable, 2015).

However, though statistical correlation is able to determine the strength and relationship between two variables e.g X and Y through examination of the value of $r$, it does not indicate if the relationship between X and Y remains the same with the control of a third independent variable. The survey questions included a key variable that may influence or have an effect on each other; partial correlation is used to understand the relationship between two variables while controlling or excluding the influencing effect of one or more other independent variables. For an instance, partial correlation coefficient, $r_{ABC}$ is achieved after eliminating the influencing effect of the third variable, C from the two variables A and B (Stats direct, 2015). The partial correlation of A and B adjusted for C is:

$$r_{ABC} = \frac{r_{AB} - r_{AC} r_{BC}}{\sqrt{(1 - r_{AC}^2)(1 - r_{BC}^2)}}$$

Statistical correlation between the two variables is known as the zero order coefficient since no factor is held constant, while in partial correlation, it is known as a first order coefficient as one variable i.e the third variable is held constant during the study between two variables. The range of partial correlation coefficient ($p_r$) varies between -1 and +1 and its calculation mainly derives from the statistical correlation coefficient (Explorable, 2015).
Statistical correlation and partial correlation are used to analyze if visitors gained any knowledge after using the interpretative strategies implemented by P.C. Question 3 in “Post-visit” section of the survey was identified to be the main dependent variable and was renamed as “Post Knowledge”, while question 3 in “Pre-visit” section of the survey acts as the independent control variable and questions 4 and 5 in “Post-visit” section of the survey were identified to be the main independent variables and were renamed as “Pre Importance”, “Post interpretative strategies used” (Table 4) and “Post interpretative strategies” (Table 5) respectively.

A confidence level means that the percentage of all possible samples in the study would be expected to include the true population parameter, thus, for instance, a 95% confidence level indicates that 95% of the confidence interval would include the true population parameter (Stat Trek, 2015). The confidence level defines the boundaries of a confidence interval and is usually set at 95% confidence level to concur with the 5% agreement of statistical significance in a hypothesis testing. A confidence interval (C.I) is an interval estimate, which includes a range of intervals that estimate the unknown population parameter. For example, a 95% confidence interval indicates a certainty that 95% of the analysis consists the true mean of a population (Stats direct, 2015). This set of data is analyzed using multivariate analysis and is tested on three confidence levels, i.e. 95% confidence level – alpha (α) level at 0.05, 90% confidence level – alpha (α) level at 0.01, and 99% confidence level – alpha (α) level at 0.001.

For results to be statistically significant, based on a one-tailed probability test, the \( p \)-value of correlation coefficient \( (r) \) and partial correlation \( (pr) \) has to be 0.180 or
greater at alpha (α) level – 0.05; 0.252 or greater at alpha (α) level – 0.01; and 0.331 or greater at alpha (α) level – 0.001.

<table>
<thead>
<tr>
<th>Post interpretative strategies used</th>
<th>Used (%)</th>
<th>Correlation coefficient (r) with Post Knowledge</th>
<th>Partial correlation (pr) with Pre Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>4a) Brochures</td>
<td>29%</td>
<td>0.366***</td>
<td>0.338***</td>
</tr>
<tr>
<td>4b) Display panels/storyboards</td>
<td>66%</td>
<td>0.284**</td>
<td>0.312**</td>
</tr>
<tr>
<td>4c) Interaction with staff/volunteers</td>
<td>25%</td>
<td>0.232*</td>
<td>0.205*</td>
</tr>
<tr>
<td>4d) Guided tours</td>
<td>2%</td>
<td>0.173</td>
<td>0.125</td>
</tr>
<tr>
<td>4e) Self-guided tour</td>
<td>51%</td>
<td>0.212*</td>
<td>0.242*</td>
</tr>
<tr>
<td>4f) Digital touch screen</td>
<td>8%</td>
<td>0.200*</td>
<td>0.209*</td>
</tr>
<tr>
<td>4g) Website</td>
<td>14%</td>
<td>0.257**</td>
<td>0.243*</td>
</tr>
</tbody>
</table>

Based on a 1-tailed probability test: * p <0.05; ** p <0.01; and *** p <0.001.

Table 4 Analysis of knowledge gained by visitors through utilization of interpretative strategies in P.C using correlation coefficient (r) with “Post Knowledge” and partial correlation coefficient (pr) with “Pre Importance”.
<table>
<thead>
<tr>
<th>Post interpretative strategies</th>
<th>Efficacy (%)</th>
<th>Correlation coefficient ($r$) with Post Knowledge</th>
<th>Partial correlation ($pr$) with Pre Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>5a) Brochures</td>
<td>59%</td>
<td>0.292**</td>
<td>0.253**</td>
</tr>
<tr>
<td>5b) Display panels/storyboard</td>
<td>85%</td>
<td>0.171</td>
<td>0.190*</td>
</tr>
<tr>
<td>5c) Guided tours</td>
<td>49%</td>
<td>0.112</td>
<td>0.014</td>
</tr>
<tr>
<td>5d) Self-guided tours</td>
<td>68%</td>
<td>0.389***</td>
<td>0.373***</td>
</tr>
<tr>
<td>5e) Exhibitions and events</td>
<td>81%</td>
<td>0.187*</td>
<td>0.171</td>
</tr>
<tr>
<td>5f) Paid educational workshops</td>
<td>35%</td>
<td>0.249*</td>
<td>0.204*</td>
</tr>
<tr>
<td>5g) Hands-on workshops with staff/volunteers</td>
<td>59%</td>
<td>0.154</td>
<td>0.111</td>
</tr>
<tr>
<td>5h) Demonstrations by professional staff/volunteers</td>
<td>62%</td>
<td>0.162</td>
<td>0.119</td>
</tr>
<tr>
<td>5i) Digital touch screen signage</td>
<td>42%</td>
<td>0.137</td>
<td>0.145</td>
</tr>
<tr>
<td>5j) Website</td>
<td>48%</td>
<td>0.153</td>
<td>0.164</td>
</tr>
</tbody>
</table>

Based on a 1-tailed probability test: * $p<0.05$; ** $p<0.01$; and *** $p<0.001$.

Table 5 Analysis of knowledge gained by visitors through the effectiveness of interpretative strategies implemented in P.C using correlation coefficient ($r$) with “Post Knowledge” and partial correlation coefficient ($pr$) with “Pre Importance”.
Chapter 5
DISCUSSION AND CONCLUSION

This study aims to identify if visitors gain knowledge on sustainable landscape practices and to determine preferred types and effectiveness of the interpretative strategies implemented in public horticulture institutions after their visits. The National Association for Interpretation (NAI, 2015) defines interpretation as a “communication process that forges emotional and intellectual connections between the interests of the audience and the meaning inherent in the resource.” Interpretative strategies provide factual information through the development in the design of themes, application of appropriate values, beliefs and techniques to connect relevancy of the topic and increase the level of interaction between the interpreter and visitors (Brochu and Merriman, 2002) through ignition of the cognitive and affective domains of visitors (Tilden, 1977). Visitors, who have their sensory and emotions engaged during the usage of interpretative strategies tend to increase in their prior knowledge, learning experiences and interests in the topic presented (Brochu and Merriman, 2002; Knudson et al., 2003).

The results from Table 3 and 4 showed a positive relationship between knowledge gained by the visitors after utilizing interpretative strategies implemented in P.C. The positive relationship did not happen by chance, as shown by the $p$-value, and still remains positive even after the adjustment of the dependent variable, i.e. Post Knowledge and independent variables, i.e. Post interpretative strategies used ($r$); and
Post interpretative strategies \( (r) \) respectively, with the control variable, i.e. Pre Importance \( (pr) \).

There is a very strong relationship in knowledge gained by visitors who used interpretative strategies such as brochures, display panels/storyboards and website, while there is a strong relationship in knowledge gained by visitors who used interpretative strategies such as interaction with staff/volunteers, self-guided tour and digital touch screen (see Table 3). Using Analysis of Variance (ANOVA), the data analysis showed that the more interpretative strategies visitors utilized, the more knowledge they gained on sustainable landscape practices \( (r^2 = 0.221; F \text{ ratio} = 23.548; p<0.0001) \). The results align with other studies that focused on visitor learning and satisfaction on the communicated key messages through a variety of interpretative strategies such as display panels and interaction with staff/volunteers on the aftermath of their visits (Birney and Shaha, 1982; Harris, 1995; Broad, 1996; Swanagan, 2000; Powey and Rios, 2002); and how visitors interact with and achieve learning from these interpretative strategies (Bitgood, Patterson and Benefield, 1988; Schnackenberg, Savenye and Jones, 1997; Margulis, Hoyos and Anderson, 2003).

There is a very strong relationship in knowledge gained by visitors through the effectiveness of interpretative strategies such as brochures, self-guided tours and paid educational workshops (see Table 4). Even though visitors indicated strong effectiveness in gaining knowledge through display panels/storyboards (efficacy – 85%) and exhibition and events (efficacy – 81%), the analysis showed that there is a weak relationship in knowledge gained by visitors through display panels/storyboards \( (r = 0.171, pr = 0.190; p<0.05) \) and exhibitions and events \( (r = 0.187; p<0.05, pr = 0.171) \). This may be due to the design layout, content display, overall structure and
placement of the display panels/storyboards that only managed to capture a portion of the visitor’s holding power and attention (Hughes, Ballantyne, and Packer, 2014), but failed to allow visitors to retain the information for long-term learning; and exhibitions and events that emphasized on the importance of sustainable landscape practices, but failed to provide suggestions and/or resolutions on how visitors could pro-actively do their part using their appropriate skills for the environment, may induce negative effects resulting in visitors having lower self-esteem in their abilities to contribute their part for the environment (Yalowitz, 2004).

It is observed from the data analysis in Table 3 that “guided tours” was significantly under-utilized by visitors (percentage used – 2%, \( r = 0.173; pr = 0.125 \)), even though P.C offers free guided tours of the Center for Sustainable Landscapes (CSL) on every Thursday through Saturday at 1pm, and group tours for an additional charge to the regular admission fee to visitors (P.C, 2015).

Visitors also rated a low efficacy in guided tours (see Table 4) provided by P.C (efficacy – 49%, \( r = 0.112, pr = 0.014 \)). Visitors, especially first timers, may not be aware of the free guided tour that P.C is offering to them during their visit, especially if prior information about the tour is not presented to them such as lack of research on P.C’s website prior to visiting P.C; lack of information by the staff at ticket counters; or miss the timing of the guided tour if they arrive at P.C after 1pm. In contrast, even if information was made known to visitors, they may have a pre-conceived wrong perception on the stereotyped image of participating in guided tours such as being perceived as being passive and immature (Boorstin, 1977), while gliding through pre-determined routes without raising inquiries on the objective of the tour. However, studies have shown positive effects and influences on visitors’ learning if personal
interpretation was utilized as compared to the absence having a personal interpretation (Dierking et al., 2002; Lehnhardt et al., 2004; Lindemann-Matthies and Kamer, 2006). The real reasons of why guided tours were drastically under-utilized were unclear in this research study and further research through interviews with visitors may shed some light to the findings.

Data of social media and QR code in Table 3 and 4 were removed from the analysis, as the number of visitors who utilized the strategies were far too few, i.e. six visitors for social media and three visitors for QR code, even though the correlation coefficient of social media \( (r = 0.352, p < 0.001) \) and its partial coefficient \( (pr = 0.334, p < 0.001) \) and correlation coefficient of QR code \( (r = 0.352, p < 0.001) \) and its partial coefficient \( (pr = 0.302, p < 0.001) \) were of significance. Though the mean levels of knowledge gained by visitors in social media and QR code were high, which resulted in the significance in the correlation coefficient \( (r) \) and partial coefficient \( (pr) \), there were not enough data to conclude that these visitors did gain substantial amount of knowledge after using social media and QR code.

Interpretative strategies of the intended messaging such as sustainable landscape practices must be prudently designed in such a way that inculcate and motivate the visitors’ sense of personal responsibilities for the environment. “Reflection” of a visitor has been recognized as an important predecessor to the development of pro-environmental behaviors in visitors (Ballantyne and Packer, 2011). It escalates the success of interpretative programs and strategies utilized by public horticulture institutions if visitors were provided with sufficient time and space to reflect on their emotions, and encouraged to create links between the environmental awareness and their on-site experiences. Reflection of the visitors may also be
enhanced through physical and social-cultural contexts such as the opportunity to discuss and express their site experiences with their family, friends or staff (Ballantyne et al., 2010).

Creating successful and effective interpretative strategies not only have a direct impact on visitors’ knowledge, but also influence visitors’ emotions, attitudes and environmental behaviors such as waste disposal and recycling, during and after their on-site experiences (Weiler and Ham, 2001; and Ballantyne, Packer and Hughes, 2009). Public horticulture institutions play a significant role and have the obligations in achieving effective interpretative strategies, to enhance knowledge and promote visitors’ long-term learning and behavioral outcomes on creating a sustainable environment through sustainable landscape practices.

**Limitations Of The Research Study**

The research study has limitations that may influence the findings and further research is required to achieve an in-depth understanding on the efficacy of interpretative messaging to visitors. Firstly, the number of visitors surveyed during the four-day, six hours (10am – 5pm) period was not extensive enough due to low peak season at the survey site. There may be better reflection of the results should the survey period be executed for at least one month during both peak and off-peak season to capture a wider range of visitors’ opinions through the survey.

Secondly, interviews with visitors were not conducted after their visits due to the limited survey period. Conducting interviews with visitors after their garden visits aid in understanding the amount of knowledge gained through the recall of information; and their opinions on the preferred types of and effectiveness on the interpretative strategies presented by public horticulture institutions in enhancing their
knowledge and learning experiences. By knowing the preferences of visitors, institutions may be able to evaluate and tailor the current interpretative strategies to suit and enhance efficiency of strategies to a wider range of visitors.

Lastly, pre-interviews with on-ground operational staff were not conducted due to the limitation of the research period. Pre-interviews with on-ground operational staff encourage them in reporting their findings on the effectiveness of interpretative strategies through their daily engagement with visitors. Only by combining information gathered from both visitors and staffs, may public horticulture institutions strive to achieve in enhancing knowledge and learning experiences of visitors in sustainable landscape practices through interpretative strategies.

Despite these limitations, the research study provides critical information on the preferred types and effectiveness of interpretative strategies utilized by visitors at P.C in enhancing their learning experiences and knowledge on sustainable landscape practices. It creates the opportunity for the management of P.C, to re-evaluate and improve on the existing interpretative strategies, especially on display panels/storyboards and guided tours, to engage both the cognitive and affective domains of visitors in increasing their knowledge and learning experiences on sustainable landscape practices.
Chapter 6

RECOMMENDATIONS

Display Panels/Storyboards

As visitors advance through the different exhibitions presented in a free-learning museum environment, their attention spans tend to decline with an increase in physical fatigue (Falk and Dierking, 1992; Dean 1994). It is vital for public horticulture institutions to set up display panels/storyboards with important messages on sustainable landscape practices in positions, where visitors would have their first encounters with the display panels/storyboards at the beginning of their visits to retain their maximum attention (Moscardo et al., 2007; Hughes et al, 2014). It is crucial to acknowledge that usually, only one-third of the visitors may be considered meticulous in reading information on all of the display panels/storyboards (Serrell, 1997) and positioning display panels/storyboards in close proximity to each other may have a negative counter-productive effect, resulting in visitors not reading information on all of the display panels/storyboards, regardless of the design layout and content of the panels/storyboards (Hughes et al, 2014). Throughout the exhibitions, visitors may be preoccupied by perceptual distraction (appealing stimuli that capture attention of visitors from items around them); item satiation (repetitive exposure to comparable items led to a decline in attention); and selective choices (visitors making conscious efforts to pay attention to items that they perceived are of greater value) that may prevent them from acquiring information on the display panels (Bitgood, Mckerchar, and Dukes, 2013).
Museum practitioners may be able to create visitor-friendly interpretative display panels/storyboards by prioritizing visitors through respecting and valuing visitors’ experiences, concerns, desires, expectations and perceptions of an exhibition. Successful interpretative display panels/storyboards should be visitor-friendly, appeal to a wide range of visitors, create positive learning experiences and encourage visitors to utilize the display panels/storyboards through recalling information that they have read or was read to them. Having open-ended interpretation such as agreeing or disagreeing with information provided, not only inspire visitors to be engaged with information presented to them, but also connects them to their own personal lives and experiences through drawing conclusions or making new discoveries on their own. Reading information on the interpretative display panels/storyboards requires efforts by the visitors and visitors may be increasingly motivated to read the information should the perception of this effort be diminished (Bitgood, 2002). Generally, females tend to commit more time and effort than males in acquiring information from the interpretative display panels/storyboards (Crane et al, 1994). Visitors’ interest and the number of words being used have equal influence in reading the information (Bitgood et al, 2006) and some visitors may find it boring or have difficulty in reading the information, while other visitors may perceive the information as of greater value such as helping them to understand the exhibits (Crane et al, 1994).

Display panels/storyboards are often created by specialists with specific skills and competence in the area of the exhibits, but not necessarily with the required writing skills, which result in the information being incomprehensible to a wide range of visitors. A suggestive guideline of the content is as follows:
1) Information on the display panel should have a direct relationship with the visitor’s five senses, i.e. see, hear, touch, feel, and smell to increase their experiences through photographs, diagrams and actual displayed items (Serrell, 1996).

2) Text with a font size of at least 16 – 18 creates readability within a short distance between the visitor and the display panel. Content on the panel should be well illuminated and having good contrasting colors between the words and the backgrounds. Using informative headline titles and subtitles provide a short summary that introduce new ideas to visitors and promote their transitions in between thoughts (Serrell, 1996).

3) Content may be less extensive by varying the length of the sentences. Having a variety on the length of the sentences helps to entertain the visitors and prevents them from getting bored. Sentences with more than 30 words tend to distract the visitors from their train of thoughts or remembering the facts provided. The longest length of the sentences should be around 25 words; the shortest around two to three words; and an average of about 10 to 15 words (Serrell, 1996).

4) Content should be broken up into short paragraphs with less than 50 words to give the readers a chance to reflect in between the ideas or connect the information with the physical items being displayed. Paragraphs that have more than 50 to 60 words tend to discourage and frustrate visitors from reading them (Bitgood and Patterson, 1993; McLean, 1993; Serrell, 1996).

5) Content should include familiar vocabulary, metaphors, quotations and humoristic designs that are understandable and appealing to a wide range of
age groups. “Tertiary information” that includes both technical and abstract facts attracts only a minority of visitors, while majority of the visitors may find it challenging and confusing (Hooper-Greenhill, 1994; Serrell, 1996).

6) Content should provide visitors with rewarding pleasures after reading the information. The rewards may be in the form of new discoveries, reinforcement of pre-imposed information, or in the form of closure (Serrell, 1996).

Display panels/storyboards with caption content that have equal numbers of words appear dull and uninteresting to visitors and catchy titles on every display panels/storyboards may become annoying and uncommunicative to visitors. Information on the display panels/storyboards should reflect, improves and resonates with their surrounding environment and exhibition settings. Visitors interact and socialize as a social group in the exhibition environment, and information on the display panels/storyboards (Figure 18) that narrate stories encourage the sharing and exchange of information among the visitors via a four-way conversation – between the absent content writer’s voice and point of views, and visitor and his/her companions and the exhibition (Serrell, 1996).

Display panel/storyboard is a very effective interpretative instrument that public horticulture institutions may utilize to its maximum potential through careful and thoughtful preparation of the key messages to be displayed, and the target audiences in mind (Mony and Heimlich, 2008). Suitable text readability and strategically designed informative elements and interactions are found to contribute to the effectiveness of the display panels/storyboards in enhancing the knowledge and learning experiences of visitors (Miglietta et al., 2011). Interpretative display
panels/storyboards should provide information that emphasize on developing visitors’ prior knowledge on the subject such as sustainable landscape practices, by providing them with information that is innovative and surprising, or instill an element of familiarity for different interpretative experiences (Ham, 1992; Tilden, 1997). Specialized staff designing the display panels/storyboards should take caution in not reiterating to visitors the same information that they already know (Moscardo et al., 2007), but rather focus on creating novel information that visitors may be able to actively process and engage with during their site experiences (Moscardo, 1999).

**Guided Tours**

Museums such as botanical gardens, zoos and aquariums often use paid educators or volunteers as tour guides in providing visitors with information and access to collections and buildings. Guided tours are often scrutinized and perceived by the younger generations as being boring (Mason and McCarthy, 2006) with a superficial and highly choreographed presentation (Boorstin, 1977; Schmidt, 1979) along a pre-determined route, that demands controlled behaviors (Edensor, 1998; Cheong and Miller, 2000). This perception was implanted in the younger visitors through their education system and environment, which tend to be more interactive and interesting than the typical guided tour (Buehl, 2001). Professionally trained tour guides, who strive to optimize visitors’ participation and engagement through interactions that prioritize the interests of visitors and the topics presented, may improve the mistaken perception by these younger visitors.

Guided tours have been in comparison with the teaching world and tour guides are often seen as being entertainers, who must be able to understand his/her visitors and use his/her humor, wit and charms to engage interesting interactions with his/her
visitors (Holloway, 1981). However, unlike a teacher in a school, a tour guide is not able to demand his/her visitors to be attentive, be silent and seated to listen to him/her and not cause interruption during the tour (Larsen and Meged, 2013). Bruner (2005) describes guided tour as having “the format of dialogic interaction where tourists bring their concerns and interests to the interaction. The result is a very open format, more like a discussion than a lecture, one that allows improvisation and that facilities the constructivist process.” Other than being equipped with the knowledge of a well-rehearsed “script”, a professional tour guide needs to be interpretative, creative (Reisinger and Steiner, 2006), and adaptive in their responses accordingly to the daily group of diverse and curious visitors. Tour guides often feel obliged to answer visitors’ inquiries and putting up with demanding visitors, who are often eager to ask trick questions in order to test the knowledge and experiences of the tour guides (Cohen, 1985; Meged, 2010). Tour guides generally enjoy some freedom and autonomy in their work and presenting the tour to different groups of people with different nationalities greatly increase their work satisfaction (Meged, 2010).

It is important to know and understand the type and demographic of visitors who are visiting when designing interpretative programs such as guided tours (Brochu and Merriman, 2002; Jacobson, 1999). Interpretative programs may be designed to stimulate and capture visitors’ attention by understanding the visitors and their true desires and preferences (Beck and Cable, 1998), resulting in higher visitors’ satisfaction that leads to public support, resource protection, increase in revenue earning, and lower operational costs (Brochu, 2003).

Other considerations when designing interpretative programs such as guided tours include the number of participants in a guided tour, the skills and knowledge of
the tour guide in creating quality experiences, and the environment in which the tour would be conducted. Ichiba, Anrui and Furuya (2008) did a research study on the visitors’ satisfaction with different guided tour group sizes in Oze National Park, Japan. The study showed that visitors in a small group e.g. five people, were more likely to increase in satisfaction and enjoyment of the guided tour than those with in a larger group, e.g. 20 people. The quality of the tour experience depends significantly on the presentation skills and knowledge of the tour guide. The basic tour guide’s role is defined as a pathfinder, who leads visitors around the pre-determined route; and as a mentor, who engages and provides vital and interestingly new information to visitors during the tour (Cohen, 1985). Orienting and explaining the tour route and the objective of the tour to first-time visitors before the tour via brochure and/or interactive website aid in easing any discomfort or fear that visitors may have prior to being in a new environment (Yamada and Knapp, 2010). Visitors, who feel relaxed and secured in their new environment, increase in their learning experiences, as they are able to better focus on learning what they see and experience during the tour (Loomis, 1996).

Interpretative strategies such as display panels/storyboards and guided tours are important in providing information and learning experiences to visitors who seek them, but display panels/storyboards and guided tours are just part of the equation that creates visitors’ flow experiences in the museum. A flow experience is described as an experiential state in which people are willing to invest psychic energy in activities that do not provide extrinsic rewards (Csikszentmihályi, and Hermanson, 1995). In addition to interpretative display panels/storyboards and guided tours, other variety of learning experiences such as self-guided audio tours (Figure 19), interactive video
games (Figure 20), environmental awareness video shows (Figure 21), educational video shows with modern digital technology (Figure 22) and its interpretation (Figure 23), interactive projection models with educational videos (Figures 24 and 25), hands-on activities with staff and demonstrations by professional staff that utilize the visitors’ five senses, may motivate visitors both intrinsically and extrinsically to increase their interests in gaining new knowledge and learning experiences, without them feeling restless or overwhelmed, while facing new challenges that align to their personal knowledge levels.
Figure 18  Creating display panels/storyboards that narrate stories encourage sharing and exchange of information among visitors.

Figure 19  Self-guided audio tours allow visitors to acquire information and knowledge at their own leisure pace.
Figure 20  Interactive video games engage visitors with their sensory experiences and aid in developing deeper knowledge on the topics presented.

Figure 21  Educational video show instills environmental knowledge and awareness to visitors and encouraging them to do their part for the environment.
Figure 22  Educational video show with digital projection to connect visitors through sensory experiences on the adaptive life cycle of *Banksia ornata*.

Figure 23  Interpretation that associates the story of adaptive life cycle of *Banksia ornata*, with the educational video show.
Figure 24  Interactive projection model with educational video to illustrate the story of sustainable landscape practices utilized in public horticulture institution to visitors.

Figure 25  Interactive project model that synchronizes with educational video.
REFERENCES


73. IPPC, 2013. Climate change 2013: The physical science basis. Working group I contribution to the fifth assessment report of the Intergovernmental Panel of Climate Change – Changes to the underlying Scientific/Technical Assessment, ed.WGI Co-Chairs, WGI Bureau, Dahe, Q., (China), and Thomas, S.


Appendix A

HUMAN SUBJECTS REVIEW BOARD APPROVAL LETTER
DATE: October 16, 2014

TO: Felicia Chua
FROM: University of Delaware IRB

STUDY TITLE: [671008-1] The Impact of Interpretative Messaging of Sustainable Landscape Practices to Guests in Public Horticulture Institutions

SUBMISSION TYPE: New Project

ACTION: DETERMINATION OF EXEMPT STATUS
DECISION DATE: October 16, 2014

REVIEW CATEGORY: Exemption category # (2)

Thank you for your submission of New Project materials for this research study. The University of Delaware IRB has determined this project is EXEMPT FROM IRB REVIEW according to federal regulations.

We will put a copy of this correspondence on file in our office. Please remember to notify us if you make any substantial changes to the project.

If you have any questions, please contact Nicole Farnese-McFarlane at (302) 831-1119 or nicolefm@udel.edu. Please include your study title and reference number in all correspondence with this office.
Appendix B

SURVEY INSTRUMENT INTENDED FOR USE BY P.C.

Survey form used during the on-site survey at P.C over a four-day period from 23 October 2014 (Thursday) to 26 October 2014 (Sunday), and a daily seven-hour period from 10am – 5pm.
The purpose of this survey is to study visitors’ experiences with ways of learning about sustainable landscape practices at Public Horticulture Institutions. This project is part of the research required for M.S in Public Horticulture at the University of Delaware.

This survey consists of 2 parts and will take about 5 - 8 minutes to complete. Please complete the Pre-visit survey before entering the garden. The Post-visit survey will be completed before exiting the garden. Participation in this survey is voluntary. This survey is anonymous with no identifying features of respondents recorded. Responses on completed surveys will be gathered and the collated data will serve as a basis for recommendations and guidelines specifically for the research project.

Thank you for your kind participation in this survey!

*Pre-visit Survey*

1. Please indicate the **starting** time of your visit _________________ am/pm

2. Visitors come to Phipps Conservatory for various reasons. Please rate each possible reason for your visit today. (Circle your responses)

   a) For educational reasons e.g. school project
   b) For educational reasons e.g. attending a program
   c) For enjoyment and relaxation
   d) To take a break from the normal home and work routine
   e) To spend time with family and/or friends
   f) To socialize
   g) To challenge myself to learn something new
   h) Other: ____________________________________

<table>
<thead>
<tr>
<th></th>
<th>Strong Factor</th>
<th>Moderate Factor</th>
<th>Not a factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>b)</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>c)</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>d)</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>e)</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>f)</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>g)</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>h) Other:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. Please rate the importance of each of the following factors at Phipps Conservatory to you. (Circle your responses)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Very Important</th>
<th>Important</th>
<th>Somewhat Important</th>
<th>Not Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Composting garden waste materials</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>b) Using organic fertilizers</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>c) Using native plants</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>d) Conserving rainwater</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>e) Reducing pesticides use</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>f) Using reusable/recycled materials</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>g) Reducing air temperature</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

4. Sustainable landscape practices provide many different benefits such as supporting native ecosystem. Please rate the importance of each of these benefits to you. (Circle your responses)

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Very Important</th>
<th>Important</th>
<th>Somewhat Important</th>
<th>Not important</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Compost increases nutrients to soil</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>b) Organic fertilizers reduce pollution of water bodies</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>c) Native plants support pollinators</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>d) Re-using rainwater for irrigation</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>e) Improving human health conditions</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>f) Conserving natural resources by using reusable/recycled materials</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>g) More trees to promote comfortable climate</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
5. Public gardens use different methods to enhance visitor’s learning experiences. Please rate how effective each of the method is to you. (Circle your responses)

<table>
<thead>
<tr>
<th>Method</th>
<th>Very useful</th>
<th>Useful</th>
<th>Somewhat useful</th>
<th>Not useful</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Brochures</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>b) Display panels / Storyboards</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>c) Guided tours</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>d) Self-guided tours</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>e) Self-guided audio tours</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>f) Exhibitions and events</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>g) Paid educational workshops</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>h) Hands-on workshops with staff / volunteers</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>i) Demonstrations by professional staff/volunteers</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>j) Digital touch screen signage</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>k) Websites</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>l) QR Codes</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>m) Social media such as Facebook, Twitter, etc</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>n) News media such as newspapers, magazines, radio, television, etc</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Enjoy your visit in the garden!

Please complete **Post-visit** survey after your visit and drop it in the collection box at the exit.
Post-visit Survey

1. Please indicate the ending time of your visit ___________________ am/pm

2. Visitors come to Phipps Conservatory to see a variety of different exhibitions. For each of the following exhibitions, please rate how strong a factor it is for your visit today. (Circle your responses)

<table>
<thead>
<tr>
<th>Exhibition</th>
<th>Strong Factor</th>
<th>Moderate Factor</th>
<th>Not a factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Orchid Room</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>b) Discovery Garden</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>c) Palm Court</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>d) Garden railway (South Conservatory)</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>e) Tropical fruit and spice Room</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>f) Serpentine Room</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>g) Center for Sustainable Landscapes</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>h) Fern Room</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>i) Stove Room</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>j) Production Greenhouses</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>k) Tropical Forest Conservatory</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>l) East Room</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>m) Desert Room</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>n) Sunken Garden</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>o) Sustainable perennial gardens</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>p) Japanese Courtyard Garden</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

3. Phipps Conservatory implements a variety of sustainable landscape practices within its facilities. Please rate how much you learned about each of the following practices during your visit today. (Circle your responses)

<table>
<thead>
<tr>
<th>Practice</th>
<th>Learned a lot</th>
<th>Learned something</th>
<th>Did not learn anything</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Composting garden waste materials</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>b) Using organic fertilizers</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>c) Using native plants</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>d) Conserving rainwater</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>e) Reducing pesticides use</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>f) Using reusable/recycled materials</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>g) Reducing air temperature</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
4. Phipps Conservatory uses different interpretative methods to enhance the learning experiences of visitors about their sustainable landscape practices. Please tell us which method(s) you used today. (Circle your responses)

<table>
<thead>
<tr>
<th>Method</th>
<th>Yes</th>
<th>Somewhat</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Did you take and read the brochures?</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>b) Did you read the information on the display panels / storyboards?</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>c) Did you interact with staff/volunteers?</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>d) Did you join any guided tours?</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>e) Did you do a self-guided tour?</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>f) Did you use the digital touch screen?</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>g) Did you use the website?</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>h) Did you use social media such as Facebook, Twitter, etc?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Did you use the QR Code?</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

5. Which method(s) presented by Phipps Conservatory is/are useful in enhancing your knowledge and overall learning experiences on the sustainable landscape practices? (Circle your responses)

<table>
<thead>
<tr>
<th>Method</th>
<th>Very useful</th>
<th>Useful</th>
<th>Somewhat useful</th>
<th>Not useful</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Brochures</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>b) Display panels / Storyboards</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>c) Guided tours</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>d) Self-guided tours</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>e) Exhibitions and events</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>f) Paid educational workshops</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>g) Hands-on workshops with staff / volunteers</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>h) Demonstrations by professional staff/volunteers</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>i) Digital touch screen signage</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>j) Website</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>k) QR Code</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>l) Social media such as Facebook, Twitter, etc</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
6. There are other interpretative methods that Phipps Conservatory may consider introducing in the future. Please rate your interest in each of these methods. (Circle your responses)

<table>
<thead>
<tr>
<th>Method</th>
<th>Strongly interested</th>
<th>Interested</th>
<th>Somewhat interested</th>
<th>Not interested</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Video screening</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>b) Interactive electronic media such as iPad</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>c) Projection models explaining process of practices</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>d) Self-guided audio tour</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>e) Hands-on activities such as planting of native plants</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>f) Demonstrations such as composting by professional staff/volunteer</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

7. Would you increase your visits to Phipps Conservatory if it actively promotes its sustainable landscape practices through interactive exhibitions and events?
   [ ] Yes
   [ ] No

8. How often do you visit Phipps Conservatory?
   [ ] First visit
   [ ] 1 – 2 times per year
   [ ] 3 – 5 times per year
   [ ] > 5 times per year
9. Are you a member, non-member or a student for your visit to Phipps Conservatory today?

☐ Member
☐ Non-member
☐ Student
☐ Student with free entry to Phipps Conservatory

10. Did you visit Phipps Conservatory alone or with company?

☐ Alone
☐ With family
☐ With friends
☐ With partner

11. What is your highest educational level achieved? If you are currently enrolled, please indicate your highest qualification achieved.

☐ Less than high school
☐ High school, diploma or the equivalent (e.g. GED)
☐ Junior College
☐ Community College (2 year Associate’s Degree)
☐ Professional Degree
☐ Undergraduate: Bachelor’s Degree
☐ Postgraduate: Master’s Degree
☐ Postgraduate: Doctoral Degree

12. What is your ethnicity?

☐ White
☐ Hispanic or Latino
☐ Black or African American
☐ Native American or American Indian
☐ Asian / Pacific Islander
13. What is your age group?

☐ 15 – 19
☐ 20 – 29
☐ 30 – 39
☐ 40 – 49
☐ 50 – 59
☐ 60 and above

14. What is your gender?

☐ Male
☐ Female

15. For any other comments, please write in the space below:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Thank you once again for your participation and time in this survey!
Appendix C

SURVEY RESULTS GATHERED AT P.C.

Survey data collected from the on-site survey at P.C over a four-day period from 23 October 2014 (Thursday) to 26 October 2014 (Sunday), and a daily seven-hour period from 10am – 5pm.
The purpose of this survey is to study visitors’ experiences with ways of learning about sustainable landscape practices at Public Horticulture Institutions. This project is part of the research required for M.S in Public Horticulture at the University of Delaware.

This survey consists of 2 parts and will take about 5 - 8 minutes to complete. Please complete the Pre-visit survey before entering the garden. The Post-visit survey will be completed before exiting the garden. Participation in this survey is voluntary. This survey is anonymous with no identifying features of respondents recorded. Responses on completed surveys will be gathered and the collated data will serve as a basis for recommendations and guidelines specifically for the research project.

Thank you for your kind participation in this survey!

**Pre-visit Survey**

1. Please indicate the starting time of your visit ________________ am/pm

2. Visitors come to Phipps Conservatory for various reasons. Please rate each possible reason for your visit today. (Circle your responses)

<table>
<thead>
<tr>
<th>Reason</th>
<th>Strong Factor</th>
<th>Moderate Factor</th>
<th>Not a factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>For educational reasons e.g. school project</td>
<td>5%</td>
<td>18%</td>
<td>77%</td>
</tr>
<tr>
<td>For educational reasons e.g. attending a program</td>
<td>6%</td>
<td>14%</td>
<td>80%</td>
</tr>
<tr>
<td>For enjoyment and relaxation</td>
<td>95%</td>
<td>5%</td>
<td>0%</td>
</tr>
<tr>
<td>To take a break from the normal home and work routine</td>
<td>74%</td>
<td>20%</td>
<td>6%</td>
</tr>
<tr>
<td>To spend time with family and/or friends</td>
<td>77%</td>
<td>16%</td>
<td>7%</td>
</tr>
<tr>
<td>To socialize</td>
<td>31%</td>
<td>41%</td>
<td>28%</td>
</tr>
<tr>
<td>To challenge myself to learn something new</td>
<td>27%</td>
<td>47%</td>
<td>26%</td>
</tr>
<tr>
<td>Other:</td>
<td>With: 9%</td>
<td></td>
<td>Without: 91%</td>
</tr>
</tbody>
</table>

| Other:                                              | With: 9%      |                  | Without: 91% |
3. Please rate the importance of each of the following factors at Phipps Conservatory to you. (Circle your responses)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Very Important</th>
<th>Important</th>
<th>Somewhat Important</th>
<th>Not Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Composting garden waste materials</td>
<td>27%</td>
<td>31%</td>
<td>26%</td>
<td>16%</td>
</tr>
<tr>
<td>b) Using organic fertilizers</td>
<td>27%</td>
<td>30%</td>
<td>28%</td>
<td>15%</td>
</tr>
<tr>
<td>c) Using native plants</td>
<td>32%</td>
<td>35%</td>
<td>22%</td>
<td>11%</td>
</tr>
<tr>
<td>d) Conserving rainwater</td>
<td>46%</td>
<td>34%</td>
<td>19%</td>
<td>1%</td>
</tr>
<tr>
<td>e) Reducing pesticides use</td>
<td>64%</td>
<td>20%</td>
<td>14%</td>
<td>2%</td>
</tr>
<tr>
<td>f) Using reusable/recycled materials</td>
<td>61%</td>
<td>24%</td>
<td>13%</td>
<td>2%</td>
</tr>
<tr>
<td>g) Reducing air temperature</td>
<td>28%</td>
<td>31%</td>
<td>31%</td>
<td>10%</td>
</tr>
</tbody>
</table>

4. Sustainable landscape practices provide many different benefits such as supporting native ecosystem. Please rate the importance of each of these benefits to you. (Circle your responses)

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Very Important</th>
<th>Important</th>
<th>Somewhat Important</th>
<th>Not important</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Compost increases nutrients to soil</td>
<td>49%</td>
<td>28%</td>
<td>19%</td>
<td>4%</td>
</tr>
<tr>
<td>b) Organic fertilizers reduce pollution of water bodies</td>
<td>54%</td>
<td>30%</td>
<td>15%</td>
<td>1%</td>
</tr>
<tr>
<td>c) Native plants support pollinators</td>
<td>55%</td>
<td>33%</td>
<td>8%</td>
<td>4%</td>
</tr>
<tr>
<td>d) Re-using rainwater for irrigation</td>
<td>56%</td>
<td>24%</td>
<td>18%</td>
<td>2%</td>
</tr>
<tr>
<td>e) Improving human health conditions</td>
<td>65%</td>
<td>25%</td>
<td>8%</td>
<td>2%</td>
</tr>
<tr>
<td>f) Conserving natural resources by using reusable/recycled materials</td>
<td>64%</td>
<td>28%</td>
<td>7%</td>
<td>1%</td>
</tr>
<tr>
<td>g) More trees to promote comfortable climate</td>
<td>64%</td>
<td>25%</td>
<td>9%</td>
<td>2%</td>
</tr>
</tbody>
</table>
5. Public gardens use different methods to enhance visitor’s learning experiences. Please rate how effective each of the method is to you. (Circle your responses)

<table>
<thead>
<tr>
<th>Method</th>
<th>Very useful</th>
<th>Useful</th>
<th>Somewhat useful</th>
<th>Not useful</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Brochures</td>
<td>13%</td>
<td>48%</td>
<td>35%</td>
<td>4%</td>
</tr>
<tr>
<td>b) Display panels / Storyboards</td>
<td>36%</td>
<td>45%</td>
<td>19%</td>
<td>0%</td>
</tr>
<tr>
<td>c) Guided tours</td>
<td>21%</td>
<td>48%</td>
<td>24%</td>
<td>7%</td>
</tr>
<tr>
<td>d) Self-guided tours</td>
<td>40%</td>
<td>41%</td>
<td>17%</td>
<td>2%</td>
</tr>
<tr>
<td>e) Self-guided audio tours</td>
<td>25%</td>
<td>33%</td>
<td>25%</td>
<td>17%</td>
</tr>
<tr>
<td>f) Exhibitions and events</td>
<td>57%</td>
<td>33%</td>
<td>8%</td>
<td>2%</td>
</tr>
<tr>
<td>g) Paid educational workshops</td>
<td>13%</td>
<td>35%</td>
<td>27%</td>
<td>25%</td>
</tr>
<tr>
<td>h) Hands-on workshops with staff / volunteers</td>
<td>20%</td>
<td>44%</td>
<td>27%</td>
<td>9%</td>
</tr>
<tr>
<td>i) Demonstrations by professional staff/volunteers</td>
<td>39%</td>
<td>45%</td>
<td>14%</td>
<td>2%</td>
</tr>
<tr>
<td>j) Digital touch screen signage</td>
<td>22%</td>
<td>40%</td>
<td>30%</td>
<td>8%</td>
</tr>
<tr>
<td>k) Websites</td>
<td>28%</td>
<td>43%</td>
<td>22%</td>
<td>7%</td>
</tr>
<tr>
<td>l) QR Codes</td>
<td>26%</td>
<td>21%</td>
<td>49%</td>
<td>4%</td>
</tr>
<tr>
<td>m) Social media such as Facebook, Twitter, etc</td>
<td>15%</td>
<td>22%</td>
<td>31%</td>
<td>32%</td>
</tr>
<tr>
<td>n) News media such as newspapers, magazines, radio, television, etc</td>
<td>13%</td>
<td>54%</td>
<td>22%</td>
<td>11%</td>
</tr>
</tbody>
</table>

Enjoy your visit in the garden!

Please complete **Post-visit** survey after your visit and drop it in the collection box at the exit.
Post-visit Survey
1. Please indicate the ending time of your visit __________________ am/pm

2. Visitors come to Phipps Conservatory to see a variety of different exhibitions. For each of the following exhibitions, please rate how strong a factor it is for your visit today. (Circle your responses)

<table>
<thead>
<tr>
<th>Exhibition</th>
<th>Strong Factor</th>
<th>Moderate Factor</th>
<th>Not a factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Orchid Room</td>
<td>80%</td>
<td>18%</td>
<td>2%</td>
</tr>
<tr>
<td>b) Discovery Garden</td>
<td>32%</td>
<td>33%</td>
<td>35%</td>
</tr>
<tr>
<td>c) Palm Court</td>
<td>40%</td>
<td>49%</td>
<td>11%</td>
</tr>
<tr>
<td>d) Garden railway (South Conservatory)</td>
<td>49%</td>
<td>38%</td>
<td>13%</td>
</tr>
<tr>
<td>e) Tropical fruit and spice Room</td>
<td>51%</td>
<td>35%</td>
<td>14%</td>
</tr>
<tr>
<td>f) Serpentine Room</td>
<td>45%</td>
<td>42%</td>
<td>13%</td>
</tr>
<tr>
<td>g) Center for Sustainable Landscapes</td>
<td>34%</td>
<td>38%</td>
<td>28%</td>
</tr>
<tr>
<td>h) Fern Room</td>
<td>35%</td>
<td>52%</td>
<td>13%</td>
</tr>
<tr>
<td>i) Stove Room</td>
<td>35%</td>
<td>40%</td>
<td>25%</td>
</tr>
<tr>
<td>j) Production Greenhouses</td>
<td>26%</td>
<td>39%</td>
<td>35%</td>
</tr>
<tr>
<td>k) Tropical Forest Conservatory</td>
<td>53%</td>
<td>39%</td>
<td>8%</td>
</tr>
<tr>
<td>l) East Room</td>
<td>48%</td>
<td>39%</td>
<td>13%</td>
</tr>
<tr>
<td>m) Desert Room</td>
<td>53%</td>
<td>33%</td>
<td>14%</td>
</tr>
<tr>
<td>n) Sunken Garden</td>
<td>58%</td>
<td>27%</td>
<td>15%</td>
</tr>
<tr>
<td>o) Sustainable perennial gardens</td>
<td>49%</td>
<td>37%</td>
<td>14%</td>
</tr>
<tr>
<td>p) Japanese Courtyard Garden</td>
<td>48%</td>
<td>40%</td>
<td>12%</td>
</tr>
</tbody>
</table>

3. Phipps Conservatory implements a variety of sustainable landscape practices within its facilities. Please rate how much you learned about each of the following practices during your visit today. (Circle your responses)

<table>
<thead>
<tr>
<th>Practice</th>
<th>Learned a lot</th>
<th>Learned something</th>
<th>Did not learn anything</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Composting garden waste materials</td>
<td>12%</td>
<td>43%</td>
<td>45%</td>
</tr>
<tr>
<td>b) Using organic fertilizers</td>
<td>11%</td>
<td>41%</td>
<td>48%</td>
</tr>
<tr>
<td>c) Using native plants</td>
<td>17%</td>
<td>54%</td>
<td>29%</td>
</tr>
<tr>
<td>d) Conserving rainwater</td>
<td>19%</td>
<td>54%</td>
<td>27%</td>
</tr>
<tr>
<td>e) Reducing pesticides use</td>
<td>26%</td>
<td>38%</td>
<td>36%</td>
</tr>
<tr>
<td>f) Using reusable/recycled materials</td>
<td>17%</td>
<td>41%</td>
<td>42%</td>
</tr>
<tr>
<td>g) Reducing air temperature</td>
<td>12%</td>
<td>41%</td>
<td>47%</td>
</tr>
</tbody>
</table>
4. Phipps Conservatory uses different interpretative methods to enhance the learning experiences of visitors about their sustainable landscape practices. Please tell us which method(s) you used today. (Circle your responses)

a) Did you take and read the brochures?  
   Yes: 29%  Somewhat: 21%  No: 50%

b) Did you read the information on the display panels / storyboards?  
   Yes: 66%  Somewhat: 32%  No: 2%

c) Did you interact with staff / volunteers?  
   Yes: 25%  Somewhat: 32%  No: 43%

d) Did you join any guided tours?  
   Yes: 3%  Somewhat: 2%  No: 95%

e) Did you do a self-guided tour?  
   Yes: 51%  Somewhat: 14%  No: 35%

f) Did you use the digital touch screen?  
   Yes: 8%  Somewhat: 8%  No: 84%

g) Did you use the website?  
   Yes: 14%  Somewhat: 9%  No: 77%

h) Did you use social media such as Facebook, Twitter, etc?  
   Yes: 7%  Somewhat: 6%  No: 87%

i) Did you use the QR Code?  
   Yes: 4%  Somewhat: 1%  No: 95%

5. Which method(s) presented by Phipps Conservatory is/are useful in enhancing your knowledge and overall learning experiences on the sustainable landscape practices? (Circle your responses)

<table>
<thead>
<tr>
<th>Method</th>
<th>Very useful</th>
<th>Useful</th>
<th>Somewhat useful</th>
<th>Not useful</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Brochures</td>
<td>26%</td>
<td>33%</td>
<td>27%</td>
<td>14%</td>
</tr>
<tr>
<td>b) Display panels / Storyboards</td>
<td>53%</td>
<td>32%</td>
<td>12%</td>
<td>3%</td>
</tr>
<tr>
<td>c) Guided tours</td>
<td>15%</td>
<td>34%</td>
<td>28%</td>
<td>23%</td>
</tr>
<tr>
<td>d) Self-guided tours</td>
<td>30%</td>
<td>38%</td>
<td>20%</td>
<td>12%</td>
</tr>
<tr>
<td>e) Exhibitions and events</td>
<td>36%</td>
<td>45%</td>
<td>13%</td>
<td>6%</td>
</tr>
<tr>
<td>f) Paid educational workshops</td>
<td>12%</td>
<td>23%</td>
<td>33%</td>
<td>32%</td>
</tr>
<tr>
<td>g) Hands-on workshops with staff / volunteers</td>
<td>24%</td>
<td>35%</td>
<td>20%</td>
<td>21%</td>
</tr>
<tr>
<td>h) Demonstrations by professional staff/volunteers</td>
<td>28%</td>
<td>34%</td>
<td>24%</td>
<td>14%</td>
</tr>
<tr>
<td>i) Digital touch screen signage</td>
<td>13%</td>
<td>29%</td>
<td>33%</td>
<td>25%</td>
</tr>
<tr>
<td>j) Website</td>
<td>14%</td>
<td>34%</td>
<td>30%</td>
<td>22%</td>
</tr>
<tr>
<td>k) QR Code</td>
<td>6%</td>
<td>10%</td>
<td>31%</td>
<td>53%</td>
</tr>
<tr>
<td>l) Social media such as Facebook, Twitter, etc</td>
<td>7%</td>
<td>13%</td>
<td>38%</td>
<td>42%</td>
</tr>
</tbody>
</table>
6. There are other interpretative methods that Phipps Conservatory may consider introducing in the future. Please rate your interest in each of these methods. (Circle your responses)

<table>
<thead>
<tr>
<th>Method</th>
<th>Strongly interested</th>
<th>Interested</th>
<th>Somewhat interested</th>
<th>Not interested</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Video screening</td>
<td>18%</td>
<td>31%</td>
<td>28%</td>
<td>23%</td>
</tr>
<tr>
<td>b) Interactive electronic media such as iPad</td>
<td>14%</td>
<td>25%</td>
<td>38%</td>
<td>23%</td>
</tr>
<tr>
<td>c) Projection models explaining process of practices</td>
<td>26%</td>
<td>33%</td>
<td>32%</td>
<td>9%</td>
</tr>
<tr>
<td>d) Self-guided audio tour</td>
<td>33%</td>
<td>29%</td>
<td>19%</td>
<td>19%</td>
</tr>
<tr>
<td>e) Hands-on activities such as planting of native plants</td>
<td>41%</td>
<td>29%</td>
<td>19%</td>
<td>11%</td>
</tr>
<tr>
<td>f) Demonstrations such as composting by professional staff/ volunteer</td>
<td>46%</td>
<td>27%</td>
<td>20%</td>
<td>7%</td>
</tr>
</tbody>
</table>

7. Would you increase your visits to Phipps Conservatory if it actively promotes its sustainable landscape practices through interactive exhibitions and events?

- Yes – 62%
- No – 38%

8. How often do you visit Phipps Conservatory?

- First visit – 34%
- 1 – 2 times per year – 20%
- 3 – 5 times per year – 26%
- > 5 times per year – 20%
9. Are you a member, non-member or a student for your visit to Phipps Conservatory today?

☐ Member – 40%
☐ Non-member – 45%
☐ Student – 8%
☐ Student with free entry to Phipps Conservatory – 7%

10. Did you visit Phipps Conservatory alone or with company?

☐ Alone – 5%
☐ With family – 42%
☐ With friends – 24%
☐ With partner – 29%

11. What is your highest educational level achieved? If you are currently enrolled, please indicate your highest qualification achieved.

☐ Less than high school – 0%
☐ High school, diploma or the equivalent (e.g. GED) – 8%
☐ Junior College – 1%
☐ Community College (2 year Associate’s Degree) – 3%
☐ Professional Degree – 12%
☐ Undergraduate: Bachelor’s Degree – 41%
☐ Postgraduate: Master’s Degree – 28%
☐ Postgraduate: Doctoral Degree – 7%

12. What is your ethnicity?

☐ White – 92%
☐ Hispanic or Latino – 1%
☐ Black or African American – 1%
☐ Native American or American Indian – 0%
☐ Asian / Pacific Islander – 6%
13. What is your age group?

☐ 15 – 19 – 4%
☐ 20 – 29 – 27%
☐ 30 – 39 – 12%
☐ 40 – 49 – 9%
☐ 50 – 59 – 20%
☐ 60 and above – 28%

14. What is your gender?

☐ Male – 32%
☐ Female – 68%

15. For any other comments, please write in the space below:

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Thank you once again for your participation and time in this survey!
Appendix D

VISITORS’ COMMENTS FROM SURVEY

Visitors were encouraged to provide comments on the last question under “Post-visit” section of the survey. These comments are attached herein for reference.
Post-Visit Survey

Q15: For any other comments, please write in the space below:

ID No. 4: Beautiful exhibits!

ID No. 8: Love Phipps. Like when have dirt and seeds out.

ID No. 10: Loved the Fall show – Thanks for doing seasonal displays!

ID No. 14: Everything was really beautiful + if possible will revisit – would love to have a more-guided tour. Thanks!

ID No. 15: Guided tours would be helpful. Did not have opportunity, as no one was available!

ID No. 17: We like Phipps a lot.

ID No. 19: QR Code?

ID No. 22: Good Luck

ID No. 26: Thanks!

ID No. 27: Phipps is special because of the “oldness” of space. I want the sense of timelessness performance of structure of the newness of the plants. I come here to get away from electronics and learning something.

ID No. 30: I find this a peaceful place.

ID No. 31: Maybe distinguish/identify native from non-native plants.

ID No. 34: Thanks!

ID No. 36: Lovely place. Orchid room was my favorite, because I love orchids. Would recommend Phipps to my friends if they come to Pittsburgh.

ID No. 39: Start to sustainable building displays. More information and displays need to be added inside and outside of building. Programs or displays for local gardeners (hints of what to add in their own yards) would be beneficial also. Tips on gardening techniques for various seasons.
ID No. 56: It will be more interested to know more detail about the plants. Where they come from some story about them.

ID No. 61: I love coming here with my mother. Very relaxing.

ID No. 76: The best place locally. Never tired for coming here for years. Good is good!

ID No. 83: Love this place! Need more parking.

ID No. 84: You’re doing a great job – please continue.

ID No. 85: Thanks!

ID No. 87: Great place, please continue having this.

ID No. 89: My husband I come to Phipp’s Conservatory mainly just for the flowers and relaxation. I know all the factors in this brochure help to make Phipp’s what it is, but still mainly all we notice are just the flowers.

ID No. 90: Beautiful place, nicely maintained

ID No. 94: Pre Part 3 temperature should be test for plants. Post Part 3 – not a negative – members for several years and visit monthly – don’t learn much new on any one visit.