

## **Plant-Play Pushcart for Hospitalized Children**

### **Administrative Information**

Organization: University of North Carolina at Chapel Hill on behalf of North Carolina Botanical Garden

Title: Plant-Play Pushcart for Hospitalized Children

Award Amount: \$25,000 and Total Project Cost \$53,000

Grant Start Date: 8/1/2012 – Grant End Date 10/29/15

Project Director Name: Nancy Easterling (Katie Stoudemire served as Project Manager)

Formal Project Partner Organizations (as applicable): NC State University College of Design, UNC Hospital School

### **Project Summary**

Botanical gardens and museums have largely ignored hospitalized children and their families because they do not often visit these institutions. Not only are hospitalized children at risk of developing infections from being in public spaces such as museums, natural materials may harbor bacteria, viruses, and fungi, which could infect immune-compromised children. Infection control measures and the need for sterile environments prevent hospitalized children from having access to nature.

These restrictions and the failure of outside institutions to make their own activities more accessible and compliant cause hospitalized children and their families to be excluded from the nature-driven educational experiences they provide. This project provides a way for institutions, like museums and botanical gardens, to meet the needs of hospitalized children by creating a replicable model that is safe, easy to use, and educational.

The Plant-Play Pushcart (now called the WonderSphere) was conceptualized by Healing and Hope Through Science (HHTS) as a way to address the need for nature-based programming for hospitalized children. The goal was to create a device that enabled hospitalized children to have access to natural experiences involving live plants while in their hospital bed. In order to make this project a reality, HHTS used the expertise of infection control experts in order to design a module that enables children to work with live plant materials without danger of infection.

As a science education tool, the WonderSphere focuses on the flora of North Carolina. This mobile unit is used in children's hospital rooms and provides a bedside field trip that is hands-on, experiential, multi-sensory, and safe. Interacting with the WonderSphere increases enjoyment and positive distraction, and provides science education to hospitalized children. In addition,

WonderSphere supports the mission and increases awareness of the North Carolina Botanical Garden, improving their ability to provide accessible resources to underserved populations.

A recent article in the magazine *Public Gardens* discussed how gardens are engaging the public in new ways and highlighted the need for innovative programming. The WonderSphere is an example of such an innovation. While this module is designed for bedside use with hospitalized children, it could easily be used in hospital waiting rooms, nursing care facilities for adults, and public schools. The WonderSphere and accompanying evaluation provides an example of new outreach opportunities for educational institutions and libraries nationwide.

## **Process**

Conceptual design work for the WonderSphere was done by North Carolina State University (NCSU) students, and innovative design and fabrication was completed by the BresslerGroup. Infection Preventionists at the UNC Healthcare Epidemiology Department supervised the design and fabrication process. This new tool enables children to safely interact with plant materials and soil using a sealed greenhouse type structure and changes the field's ability to provide natural science programming to hospitalized children.

The design and fabrication of the WonderSphere took two years longer than originally expected and was completed in the summer of 2015.

HHTS staff members learned a significant amount about the design process over the course of this project. The actual design process conflicted with the original timeline and original cost estimates. Originally, when HHTS applied for the IMLS Sparks! Grant, they thought that NCSU students could design and build the WonderSphere over the course of a semester, with college students doing the bulk of the work. As the project progressed, HHTS staff members learned about the benefits and disadvantages of working with college students. On the positive side, the students were very creative and asked great questions. They came up with innovative approaches to several different design problems and did great brainstorming and concept drawings. In the future, HHTS welcomes work with college students during a concept design phase.

However, due to the lack of design expertise on the part of NCSU students and their professor, as well as the need for additional safety considerations, HHTS had to hire an engineering and product design firm (BresslerGroup). BresslerGroup was hired to fabricate the WonderSphere and to refine the design. This required significant additional costs, which in turn required additional fundraising efforts of \$3,000 beyond the initial \$25,000 IMLS Sparks! Grant and the \$25,000 Ribbon of Hope grant from the North Carolina GlaxoSmithKline foundation. When hiring BresslerGroup, HHTS required a specific timeline and specific deliverables, which were met in a professional and timely manner.

UNC Hospitals Department of Epidemiology was a great resource in evaluating the design and fabrication of the WonderSphere for safe patient use.

The evaluation tool for the WonderSphere was refined several times over the course of this grant period, incorporating feedback from patients and families as well as professional evaluators.

The WonderSphere was first used in fall 2015 and will continue to be used throughout 2016.. Pediatric patients have particularly enjoyed exploring Venus fly traps as well as dissections flowers and making flower arrangements.

**Project Results**

As a result of this project, the Plant-Play Pushcart, now called the WonderSphere, was created along with a series of evaluations. Please see the Resources section for links to the design drawings and evaluations.

HHTS’ other main goal was to provide services using the WonderSphere with following outcomes:

- Increase interest in science
- Increase science competence and process skills
- Increase positive emotions

<b>Increase interest in science</b>				
Indicator(s)	Applied to	Data Source	Data Interval	Target
% of participants who report an interest in natural sciences	Students & Parents	Pre and Post Surveys	Before and After programming	80%
Results				
<p>Student report: 100% of students reported enthusiasm for science, with a 11% positive change from no enthusiasm to enthusiasm for science from pre- to post-session and a 11% increase in “a lot” of enthusiasm for science in the post-session survey. 89% of students said their Wonder Connection science activity was fun.</p> <p>In addition, before programming, 50% of patients reported feeling bored, but after the activity 0% of</p>				

patients reported feeling bored. One student remarked “This is more fun than an iPad!”

Parent report: 100% of parents who responded to “Did Wonder Connection stimulate your child’s interest in science?” answered yes. One parent commented “:) Lots of smiles and laughs with this project- great to break the boredom and learn something new!”

<b>Increase students’ science competence and ability to perform science process skills</b>				
Indicator(s)	Applied to	Data Source	Data Interval	Target
# and % of participants who develop an interest in and knowledge of natural sciences & increase their science process skills	Students	Student Survey	After programming	80%
Results				
Student report: Overall 89% of the students who responded cited positive examples of science learning. Examples included : “Venus fly traps close by feeling with their sensors” and “flowers have eggs that make seeds.”				

<b>Increase pediatric patients’ positive emotions</b>				
Indicator(s)	Applied to	Data Source	Data Interval	Target
# and % of participants who report an increase in positive emotions	Students & Parents	Survey	Before & after programming	80%
Results				

100% of students report feeling interested, an increase of 33% from the pre-session survey.

100% of students reported feeling happy in the post-session survey and 0% of students reported feeling sad in the post session survey (12% reported feeling sad in before the activity). 100% patients reported that they activity made them feel proud, an increase of 22% from before the activity.

100% of parents surveyed said their child felt interested, 100% said their child felt happy. One parent noted that they felt that ‘being able to do something normal with personal modifications’ (such as flower dissection and flower arranging with the WonderSphere) was something that others in their situation might like.

These results demonstrate that hands-on interactions with plants and plant materials have positive effects on participants. This is important to the field of science museums and botanical gardens because they can use these types of activities to elicit positive emotions as well as to encourage science learning and interest.

HHTS’s evaluation research on positive emotions is inspired by what another UNC researcher, Barbara Fredrickson, theorizes as the Broaden and Build and Upward Spiral aspects of her work. Positive emotions lead to better resilience and optimism and positive emotions can undo physiological effects of negative emotions<sup>1</sup>. The research supports the idea that HHTS’ work with the WonderSphere is helping children build enduring personal resources and increase their creativity and ability to problem solve. These elements are important for learning and can also have deep and enduring effects. Essentially, Fredrickson’s work demonstrates that the the better someone feels mentally, the better he or she feels physically. If her theory is expanded for the children HHTS serves, when the patients are experiencing fun and positive emotions, it is easier for them to learn and also perhaps easier to heal.

The benefits of creating positive coping experiences for children during their hospitalization extend beyond benefits for just the child. Reduction of anxiety in terminally ill children also affects the long-term well-being in bereaved parents. These potential benefits are particularly relevant for this current evaluation, as some of the children who participate in WonderSphere programming are terminally ill<sup>2</sup>.

In addition, these results demonstrate that museums and botanical gardens could seek out innovative, creative solutions that are well executed in order to better serve diverse audiences (such as hospitalized patients).

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<sup>1</sup> Fredrickson, B. (2003). The value of positive emotions. *American Scientist*. Vol. 91, 330.

<sup>2</sup> Li Jalmsell, L. Kreicbergs, U., Onelo, R. Steineck, G., Henter, J. (2010). Anxiety is Contagious—Symptoms of Anxiety in the Terminally Ill Child Affect Long-Term Psychological Well-Being in Bereaved Parents. *Pediatric Blood Cancer*, 54, 751-757

While the results are not yet statistically significant<sup>3</sup>, HHTS feels that the results thus far represent a trend that will continue. These initial results imply that the WonderSphere is an effective tool for eliciting positive emotions in pediatric patients. The results also imply that the WonderSphere is an effective tool for building science knowledge and interest as well as general knowledge about the NCBG.

Only 20% of families had ever heard of the North Carolina Botanical Garden before programming- and comments from those families indicate that their knowledge pre-activity was limited to seeing signage across the street from the Ronald McDonald House. Thus, this programming increased awareness of the NCBG by 80%. This result demonstrates that this type of outreach can also public increase awareness of institutions such as botanical gardens and museums.

HHTS plans to collect more results from use with the WonderSphere through 2016 and beyond. If the evaluation results continue along the trend of those already collected, HHTS would love to see the WonderSphere used by botanical gardens, museums, and other children's hospitals across the country. HHTS recommends that other museums/gardens consider creating their own WonderSpheres in order to serve hospitalized children (and adults).

## **Resources**

WonderSphere website  
(includes downloadable CAD design files as well as evaluation documents):  
<http://www.wonderconnection.org/wondersphere/>

### *Media Coverage:*

<http://www.wral.com/lifestyles/healthteam/video/14909561/>

<http://news.unchealthcare.org/uncchildrens/news/2015/november/wondersphere>

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<sup>3</sup> Results were collected from 9 patients and 5 parents. HHTS intends to continue collecting results over the next year.